
**Central East
Health Information Partnership**

**Health Information Systems
to Support Primary Care
Capitation**

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Health Information Systems to Support Primary Care Capitation

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Executive Summary

Since the mid-1990s various professional associations, health policy organizations, interest groups and physicians in Canada have published position statements declaring their vision of primary health care reform. The vast majority of these proposals endorsed rostering and new approaches to financing. As many of the proposals prescribing reform in Ontario recommend transition to enrollment-based rostering and the use of capitation funding in primary care, this paper addresses the ramifications of this approach to the design and use of health information systems.

Capitation refers to a method of payment whereby the amount of funds paid to a health care organization is determined prospectively on the basis of the characteristics of a defined or rostered population. This approach to financing shifts the financial risk associated with insuring health services from Canadian governments to capitated health care organizations that assume responsibility for the unpredictable nature of illness and health service utilization. There are two important types of risk associated with capitation funding and enrollment-based rostering. Individual-level estimation risk relates to the likelihood that a capitation rate will not be exactly the same as the costs associated with providing services to an enrollee. This type of risk creates financial incentives to selectively roster healthy individuals and discriminate against the sick, and the magnitude of individual-level estimation risk influences the size of this incentive. Roster-level financial risk relates to the likelihood that the sum of premiums received by a capitated health care organization will not be the same as the sum of the costs associated with services used by rostered individuals. This type of risk exists subsequent to the presence of individual-level estimation risk and represents the net financial impact of inaccurate premiums for each enrollee (i.e., net of over-payment & under-payments). The magnitude of this roster-level financial risk depends on the degree of bias in need and demand among rostered enrollees, the predictive accuracy of the capitation formula, the size of the premiums, and the size of the roster. A high degree of financial risk can threaten the sustainability and solvency of health care organizations.

There are two mechanisms that can be used by payers to minimize risks and differential selection in enrollment-based markets. These include the use of capitation rate adjusters that have predictive accuracy, and contractual clauses that identify acceptable, and limit inappropriate hedging practices. A capitation formula that has predictive accuracy results in rates or premiums for each enrollee that accurately reflect the future costs of providing service and compensate providers for uncertainty regarding estimation of these expenditures. A formula that has a high degree of predictive accuracy results in lower risk and reduced incentives for differential selection. The development, refinement and implementation of a capitation formula that has predictive accuracy is highly dependent on health information.

Research evidence is convincing - the addition of information regarding functional status, health status, chronic conditions, diagnoses and/or prior utilization significantly improves the predictive accuracy of a capitation formula that includes age and gender. In addition, information is more valuable if it is derived from time periods during which capitation payments are made and collected from enrollees over the course of time. In spite of this, a significant degree of individual-level estimation and roster-level financial risk remain, and these findings speak to the need to identify acceptable and inappropriate hedging practices.

The implications of these research findings to the design and use of health information systems to support primary care capitation is clear. Electronic information systems are required by payers and capitated health care organizations to:

1. Verify eligibility status. This requires tracking of births, deaths, immigration and emigration, as well as information regarding other characteristics of people that influence their eligibility.
2. Develop, evaluate and refine a capitation formula that has predictive accuracy. As mentioned, this may require extensive (possibly longitudinal) information on health status, disability status, chronic conditions, diagnoses and/or utilization.
3. Determine capitation premiums for each enrollee. This requires information regarding the characteristics of enrollees that are used to adjust capitation rates (e.g., age, gender).
4. Track the utilization of covered services obtained by enrollees from health care organizations to which they are rostered and from providers other than their designated health care organization.
5. Monitor differential selection.
6. Manage roster-level financial risk.
7. Maintain outcome measures to ensure that services promote the health of the population in ways that are congruent with the objectives of health policy.

This paper focuses on the ramifications of enrollment-based rostering and capitated, primary care services to the demand for health information, and the design and use of information systems. Section 2 summarizes the various policy options regarding rostering, and the implications of these approaches to the determination of capitation rates. Section 3 describes the important types of risks assumed by payers and providers in enrollment-based, capitation contexts, as well as the contribution of health information systems to profiling and managing risk. Section 4 summarizes research that has been conducted to determine the type of health information required to develop a capitation rate

formula that has predictive accuracy, while Section 5 summarizes the features of data infrastructure that support primary care capitation.

Key Messages

- Capitation with explicit, enrollment-based rostering is currently used by Health Service Organizations and participants in the primary care reform pilot project in Ontario. This approach has been recommended for implementation across the province by the Health Services Restructuring Commission.
- An enrollment-based approach to rostering requires that payers and providers require more individual-level information than they would in geographically-defined rostering contexts (Section 2).
- There are two important types of risks in enrollment-based, capitated contexts: individual-level estimation risk and roster-level financial risk. Individual-level estimation risk occurs when premiums do not offset the cost of services received by the enrollee. Roster-level estimation risk relates to the likelihood that the sum of premiums received by a capitated organization will not be the same as the sum of costs associated with services used by rostered individuals over the term of a contract (Section 3).
- There are two mechanisms that can be used by payers to minimize these risks, including: the use of capitation rate adjusters that have predictive accuracy, and contractual clauses that specify acceptable and inappropriate mechanisms for hedging risk (Section 3).
- The following types of health information can improve the predictive accuracy of an age and gender capitation rate formula: health status, chronic conditions, diagnoses and/or prior utilization. In addition, information is more valuable if it is derived from time periods during which capitation payments are made and collected from enrollees over the course of time (Section 4).
- Information systems are critical if payers and providers to: (a) identify the eligibility status of individuals, (b) develop, implement, evaluate and refine a rate adjustment formula, and (c) monitor the health and utilization profiles of enrollees (Section 5).
- The value of a health information system to users is impacted by the utility of the measures included, the completeness and accuracy of data, and the unit of measurement and analyses. One important mechanism that can be used to enhance the utility of data in profiling individuals and rosters is linkage, as this enables one to expand the types of information used for

Section 1

Introduction

Since the mid-1990s various professional associations, health policy organizations, interest groups and physicians in Canada have published position statements declaring their vision of primary care reform. The vast majority of these proposals endorse rostering and new approaches to financing. As many of the proposals prescribing reform in Ontario recommend transition to enrollment-based rostering and the use of capitation funding in primary care, this paper focuses on the ramifications of this approach to the design and use of health information systems.

The population rostered to each capitated provider may represent a sample of individuals from the community (i.e., enrollment-based rostering), or all of the people who reside in a specified region (i.e., geographically-defined rostering). Section 2 summarizes the various policy options regarding rostering - and the implications of these approaches to the determination of capitation rates and demand for health information.

In an enrollment-based context, individuals are able to select from a number of health plans or service organizations. Capitated providers compete with others to assume and retain the responsibility for providing specific health services to these individuals. Section 3 describes the important types of risks assumed by payers and providers in enrollment-based, capitated contexts, and the contribution of health information systems to profiling and managing risk.

There are two mechanisms that can be used by payers to minimize the risks associated with capitation funding. These include the use of capitation rate adjusters that have predictive accuracy, and contractual clauses that identify acceptable, and limit inappropriate hedging practices. Section 4 summarizes research that has been conducted to evaluate potential capitation rate adjusters, and highlights the types of measures that might be considered for inclusion in health information systems.

Implementation of capitation financing requires the use of information to: (a) profile and track enrollees, and (b) develop, refine and monitor the performance of a rate adjustment formula. Section 5 summarizes the features of data infrastructure that support primary care capitation in enrollment-based markets.

Appendix A lists initiatives in Canada that incorporate capitation financing, and Appendix B provides definitions for terms used in this document.

Section 2

Capitation and Rostering

Capitation funding has been incorporated in primary care or integrated health system reform projects in Alberta, British Columbia, Nova Scotia, Ontario, Quebec and Saskatchewan (Hutchison et al., 1999; Health Canada, 1998; 1999a; 1999b). During 1999 approximately 440,000 residents of Ontario were enrolled in capitated Health Service Organizations, and as many as 450,000 more people were expected to enroll with a family doctor who received capitation payment (Graham, 1999). A 1999 report by the Health Services Restructuring Commission (HSRC) in Ontario recommended swift transition to capitated, primary care networks throughout the province.

Capitation Funding

Capitation refers to a method of payment whereby the amount of funds paid to a health care organization is determined prospectively on the basis of the characteristics of a defined or rostered population. Under capitation payment, providers are obligated to render a specified range of services when and if they are deemed to be appropriate. Payment is made prospectively or retrospectively, and funds are dispersed on an annual or more frequent basis (e.g., per month). Capitation contracts between payers and health care organizations specify the rate of payment, the scope of services covered by the contract, and the duration or term of the agreement. These documents may include clauses that indicate criteria for enrolling and dis-enrolling individuals, what will occur when enrollees seek care from external providers, and the methods that will be used by payers to monitor utilization, quality of care, and/or satisfaction of rostered populations.

Types of Rosters

Rostering refers to a process whereby individuals enroll, register or sign-up with a provider who assumes the responsibility for delivering specified services when they are deemed to be appropriate. The rostering process can be: (a) explicit or implicit from the enrollees perspective; and (b) based on enrollment, geography, or a combination of these two approaches. Table 1 summarizes and provides examples of these approaches to rostering.

When the process of rostering is *explicit*, enrollees are fully aware that a specific health organization is responsible for providing their care. For example, rostering is explicit when individuals sign a contract to enroll with a health care organization. The process of rostering is *implicit* when all enrollees are not fully aware that a specific organization has been assigned responsibility for their health care. This might occur in the context where utilization patterns of eligible enrollees are tracked, these individuals are assigned to health organizations on the basis of where they seek care, and capitation payments are determined on the basis of these 'virtual' rosters.

Table 1: Examples of Types of Rosters

| | Explicit | Implicit |
|--|--|---|
| Enrollment-Based | Explicit, enrollment-based rostering describes a context where: (a) organizations roster a sample of individuals from the community, and (b) enrollees are fully aware that a specific organization is responsible for providing their care. ^A | Implicit, enrollment-based rostering describes a context where: (a) organizations roster a sample of individuals from the community, and (b) enrollees may or may not be aware of the organization designated as responsible for their care. ^B |
| Geographically-Defined | Explicit, geographically-defined rostering describes a context where: (a) organizations receive capitated payments for assuming the responsibility to provide specific health services to all of the people who reside in a defined location, and (b) enrollees are aware of the designated health organization, as well as the repercussions of seeking care from external providers. | Implicit, geographically-defined rostering describes a context where: (a) organizations receive capitated payments for assuming the responsibility to provide specific health services to all of the people who reside in a defined location, and (b) enrollees may or may not be aware of the designated health organization, as well as the repercussions of seeking care from external providers. ^C |
| Enrollment-Based & Geographically-Defined | This type of rostering occurs when: (a) an organization receives capitated funding to assume the responsibility to manage and monitor care for a geographically-defined roster, (b) these organizations sub-contract with service providers for delivering health care, (c) capitation is used as a mechanism of funding sub-contracted providers, and (d) enrollees select from an array of health organizations and roster with a provider of their choosing by signing a contractual agreement. | This type of rostering occurs when: (a) an organization receives capitated funding to assume the responsibility to manage and monitor care for a geographically-defined roster, (b) these organizations sub-contract with service providers for delivering health care, (c) capitation is used as a mechanism of funding sub-contracted providers, and (d) enrollees may or may not be aware of the designated health organization, as well as the repercussions of seeking care from external providers. |

^A This approach to rostering is currently used in Ontario by Health Service Organizations, and participants in the primary care reform pilot project. It has been recommended for implementation throughout the province (HSRC, 1999).

^B This approach to rostering is currently used by the Primary Care Demonstration project in British Columbia. Menec et al. (1999) evaluated the feasibility and implications of assigning individuals to providers on the basis of their usual source of care using administrative health services data from Manitoba.

^C This approach is used to fund an array of services in Alberta and Saskatchewan. Primary care physician services are not covered.

The population rostered to each capitated provider may represent a sample of individuals from the community, and this process has been termed *enrollment-based rostering* (Hutchison et al. 1999). In this context, eligible enrollees are able to select from a number of health organizations or service providers and this choice influences how funds are allocated. In enrollment-based markets, health organizations compete to assume and retain the responsibility for providing specific services to individuals. Care that is sought from outside providers is typically the financial responsibility of the capitated organization to which the patient was enrolled.

Health Service Organizations and the primary care pilot projects in Ontario provide examples of arrangements of explicit, enrollment-based rostering. In these contexts, residents select from an array of physician organizations or networks who offer primary care services, and sign a contractual agreement when enrolling with a capitated provider. The population rostered to each primary health care provider represents a sample of individuals from the community.

By comparison, the population rostered to each capitated provider may include all of the people who reside in a specific location, and this type of enrollment has been termed *geographically-defined rostering* (Hutchison et al., 1999). In this context, a health care organization assumes the responsibility for providing specific health services to all residents and does not compete for enrollees. Individuals who reside in the specified geographic region receive care from the designated, health care organization. Care that is sought outside of the region may or may not be the financial responsibility of the designated provider - this too is specified in the capitation contract. Capitation that involves rostering on the basis of geographically-defined populations can only be used in jurisdictions where a single payer is responsible for financing health services for all residents.¹

It is possible to have geographically-defined and enrollment-based rostering in the same jurisdiction. While this situation does not currently exist in Canada, it is an option given the devolving authority for health services across provinces.

The co-existence of geographic- and enrollment-based capitation in the same jurisdiction would involve the use of an 'intermediary' capitated organization. This entity would receive capitated payments in exchange for assuming the responsibility for managing and monitoring health services to all of the residents in a geographically-defined region. Sub-contracts would be established with local providers for service delivery, capitation would be used as a mechanism of funding, and rostering would occur on an enrollment-basis.²

Implications of Enrollment-Based Rostering on Demand for Health Information

An enrollment-based approach to rostering requires that payers and providers require more individual-level information than they would in geographically-defined rostering contexts, because of the selective nature of enrollment. The reasons for this are described here.

In geographically-defined jurisdictions, data collected and disclosed by other organizations such as Statistics Canada can be used to profile the characteristics of a roster when the same unit of geography is used (e.g., census metropolitan area or regional health authority).^D

By comparison, in enrollment-based jurisdictions a sample of individuals from one or more geographic areas is rostered to a provider. Research suggests that this approach to rostering may result in differential selection by enrollees and providers and results in rostered populations that are not representative of people who live in the community. As a consequence, the applicability of community-based measures derived from other organizations (e.g., the Census or population-based health surveys) to profiling enrollment-based rosters is compromised.^E Consequently, more individual-level data that is collection directly from enrollees or a sample of enrollees is required in enrollment-based jurisdictions.

Section 3 Capitation & Risk

The simplest approach to financing health care would be to have consumers pay providers for the services that they receive. However, most individuals seek to minimize the extent to which they rely on the use of this approach to payment - as it is difficult to predict the onset of an illness that is expensive to treat. Therefore, it is the unpredictable nature of illness that drives people to pool their resources and pay insurance premiums to a third-party. “Insurance is a way to distribute risks by pooling expected costs both across time, and across a wider population” (Deber, 2000, p. 8).

In the fee-for-service context to funding primary care delivery in Canada, residents pay premiums (i.e., taxes) to third-party payers (i.e, governments) that assume risk by financing health care services that are provided to these individuals. It is through this insurance process that the financial risk associated with the unpredictable nature of illness and health service utilization is transferred from tax payers to governments. Variability in utilization, billing patterns and subsequent expenditures on primary care services - either across time or among populations - remain the responsibility of governments.³

^D For instance, the mean, median and range of incomes of individuals enrolled in a geographically-defined roster that includes all of the people who reside in a census metropolitan area (CMA) is exactly the same as the mean, median and range of incomes reported for that CMA in the Census.

^E For instance, the mean, median and range of incomes of individuals listed on an enrollment-based roster would not be the same as the mean, median and range of incomes reported on the Census unless rostered individuals were randomly sampled and representative of a census geographic area. In an enrollment-based context, Census measures only describe the social and economic contexts in which enrollees reside.

Capitation would shift the financial risk currently assumed by Canadian governments to capitated health care organizations. In this context, a health care organization would receive a capitation rate or premium for each enrollee and assume responsibility for providing services over the term of a contract. Variability in utilization and subsequent expenditures become the responsibility of capitated health care organizations.

Types of Risk

There are two types of risk associated with capitation funding and enrollment-based rostering: individual-level estimation risk and roster-level financial risk.

Individual-level estimation risk relates to the likelihood that a capitation premium will not be exactly the same as the costs associated with providing services to an enrollee over the time frame of the contract. The premiums paid for each enrollee may be either be higher than the future cost associated with health service utilization (i.e., over-payment) or lower (i.e., under-payment).

The existence and extent of individual-level estimation risk has important implications for policy and planning for two reasons. First, the presence of this type of risk creates a financial incentive for providers to selectively enroll relatively healthy individuals and discriminate against the sick.^F Second, the size of over- or under-payments directly influences the magnitude of this incentive. Therefore, individual-level estimation risk is particularly important for payers to monitor and manage in enrollment-based jurisdictions.^G

There are two mechanisms that can be used to minimize individual-level estimation risk and/or differential selection of enrollees. First, the use of a capitation rate formula that has predictive accuracy minimizes this type of risk and thereby reduces financial incentives for differential selection. Second, contractual clauses that identify acceptable and limit inappropriate hedging practices restricts differential selection despite individual-level estimation risk.

^F Capitation payments motivate selection of individuals whose capitation rate is expected to exceed the future cost of care, and avoidance of whose capitation rate is lower than the future cost of care. In fact, capitation penalizes providers who intentionally roster this latter group of people - as these individuals tend to be those in highest need for services.

The extent to which differential selection occurs, however, depends on a number of factors such as the absolute level of funding, terms of the funding agreement, the use of quality assurance initiatives, implementation of performance monitoring programs and the ethical culture of capitated providers (Hutchison et al., 1999).

^G Although individual-level estimation risk exists where rosters are geographically-defined, it does not have significant meaning. In this context, this type of risk can not promote differential selection as capitated providers are assigned enrollees based on geography. In addition, the net financial impact of this risk is most appropriate to measure at the roster-level.

A capitation formula that has predictive accuracy results in rates or premiums for each enrollee that accurately reflect the future cost of providing service and compensate providers for uncertainty regarding estimation of these expenditures. Therefore, a formula that has a high degree of predictive accuracy results in low individual-level estimation risk.

The easiest formula that could be used to determine capitation rates would be to divide planned expenditures (i.e., total funds available to finance services) by the number of enrollees. The predictive accuracy of this type of formula at the individual-level is extremely low as this approach to rate determination assumes that the future cost associated with providing health services to each enrollee is the same.

A more common approach to calculating capitation rates or premiums is to divide planned expenditures by the number of enrollees and adjust this value either upward or downward depending on whether a specific enrollee has certain characteristics that are known to influence their utilization of covered services. This process (also known as case-mix or risk-adjustment) improves the predictive accuracy of a capitation formula. One way to risk-adjust capitation rates is on the basis of the age of an enrollee. A formula that age-adjusts rates would result in higher premiums for elderly enrollees than those paid for younger individuals. The rationale for making this type of age adjustment is based on research evidence that consistently demonstrates that increased age is associated with higher utilization of primary care physician services (e.g., Federal, Provincial and Territorial Advisory Committee on Population Health, 1999; Public Health Research, Education & Development Program [PHRED], 2000).

To optimize the predictive accuracy of capitation formula in enrollment-based jurisdictions, premiums should be adjusted to account for differences between individuals in characteristics that influence their need for and utilization of health services. Inadequate adjustment increases individual-level estimation risk, creates financial incentives for providers to roster a non-random sample of individuals from a community, and does not appropriately compensate providers for the future cost and uncertainty they assume when enrolling different types of individuals.

There is research evidence derived from jurisdictions outside of Canada that differential selection occurs in enrollment-based markets, and results in the creation of rosters of people that differ in health status and their use of health services (Bailey et al., 1999; Kravitz et al., 1992; Lichenstein et al., 1991; Morgan et al., 1997).⁴ This evidence suggests that either: (a) the formula used to adjust rates is inadequate, or (b) it is very difficult to develop a formula that has predictive accuracy at the individual-level.

The co-existence of inadequate rate adjustment and differential selection has unfortunate consequences for providers, consumers and payers. If the capitation rates paid to providers do not adequately compensate them for the future cost of serving very sick individuals and the risk

associated with financing this care, these health organizations may elect to avoid enrolling or disenroll these people from their rosters. As a consequence, very sick individuals would have difficulty finding a provider to assume the responsibility for their care. Consequently, payers would eventually be unable to find health care organizations willing to receive capitated payments to care for these people. Alternatively, if capitation rates paid to providers more than adequately compensated them for future costs and uncertainty regarding estimating these expenditures, this would result in more money being paid to providers than could be given. This ‘over-payment’ represents a potential source of financial savings to payers and consumers.

Roster-level financial risk relates to the likelihood that the sum of the premiums received by capitated health care organizations will not be the same as the sum of the costs associated with services used by rostered individuals over the time period of the contract. Therefore, roster-level risk represents the net financial impact of over-payments and under-payments for each individual on the roster.⁵ When the net financial impact is positive (i.e., over-payments exceed under-payment) providers realize a profit, but when the net financial impact is negative these organizations experience financial losses and solvency may be threatened.

Roster-level financial risk exists subsequent to the presence of individual-level estimation risk. The degree of individual-level estimation risk associated with a capitation formula, however, does not appear to be directly related to the degree of roster-level risk (Watson, 2000). Therefore, when evaluating the predictive accuracy of a capitation formula, it is important to assess both types of risk.

The existence and extent of roster-level financial risk has important implications for policy and planning, as a high degree of this type of risk can threaten the sustainability and viability of a health care organization. The extent of financial risk assumed by capitated organizations, however, depends on the degree of bias in need and demand for services among enrollees, the adjusters included in the capitation formula, the size of premiums, and the size of the roster.

Implications of Risk-Adjustment on Demand for Health Information

An enrollment-based approach to rostering requires that payers and providers use health information systems to assist in the process of risk-adjusting rates. The reasons for this are described here.

In enrollment-based rostering contexts, payers require health information systems to establish a capitation rate formula that has predictive accuracy at the individual- and roster-level. The adjusters that should be incorporated into a formula can be determined by identifying the characteristics of people and rostered populations that explain differences in their need for and utilization of health services. In addition, the relative contribution of these characteristics to explaining differences can be determined through a statistical process known as weighting (Judge & Mays, 1994; Sheldon, Smith & Bevan, 1993). Section 4 outlines the types of health information that could be collected for this purpose.

In enrollment-based jurisdictions, payers and providers both require health information systems to document the characteristics of enrollees, determine the premium that should be paid for each individual, as well as to monitor the performance of and suggest refinements to a capitation formula. Section 5 provides more insights into the purpose and use of health information systems in enrollment-based, capitated jurisdictions for these purposes.

Evaluating Individual-Level Estimation and Roster-Level Financial Risk

A research project was conducted at a large, academic primary care practice in southwestern Toronto to evaluate potential capitation rate adjusters (Watson, 2000). Some of the results of this initiative are presented in Figure 1 to illustrate how individual-level estimation and roster-level financial risk can be measured and monitored retrospectively. The analysis was conducted as if rostering had occurred using an implicit,^H enrollment-based approach.

The horizontal axis on this illustration plots the premiums^I that the provider organization would have received for each rostered adult - if the practice had received the global capitation rate offered to participants in the primary care reform project in Ontario. The vertical axis plots funds that were received for each rostered adult under fee-for-service. Each data point represents one enrollee.

If the capitation rate for each enrollee equaled the amount of funds received by the provider organization, then all data points would cluster along a diagonal line intersecting the bottom left and upper right corners of the graph. This is clearly not the case. The results of this analysis, as depicted in Figure 1, suggest a high degree of individual-level estimation risk with age and gender adjustment, and statistical analyses supports this observation.^J

The net financial impact of the situation depicted in Figure 1 was determined, and roster-level financial risk was calculated as follows:

$$\frac{(\sum GCP - \sum FFS)}{\sum FFS}$$

where, \sum = sum of

GCP = global capitation premiums

FFS = fee-for-service payments

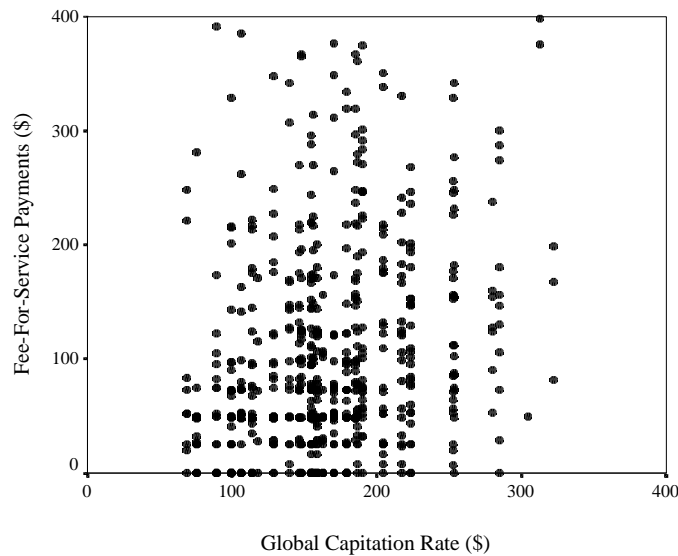
^H Eligibility criteria were established for participants in this study to ensure that these individuals could be considered rostered to the practice.

^I Rates as proposed July, 1998.

^J When a regression line was fit to the data, the R^2 value was 0.0034 or 0.3%.

The results of the assessment of roster-level financial risk suggest that the provider organization would have been paid approximately 25% more funds if they had received global capitation rather than fee-for-service for serving this population.^K

Figure 1: Expected and Actual Primary Care Costs by Enrollee



Section 4 Predicting Utilization of Primary Care Physician Services

Research evidence consistently supports conventional wisdom - it's very difficult to predict an individual's use of health service in the future. However, research findings provide other important insights into the predictability of health service utilization:

1. It is easier to predict the degree to which an individual will use outpatient than inpatient services.⁶
2. It is easier to predict the degree to which a group of people (i.e., roster) will use health services than to estimate an individual's utilization.⁷
3. It is easier to predict health service utilization using data derived from concurrent time periods than to estimate future utilization with historic data.⁸
4. It is easier to predict health service utilization using information that has been collected about people over the course of time.⁹

^K This analyses assumes that the utilization rates observed in the fee-for-service context would have remained the same if capitation funding and implicit, enrollment-based rostering had been in place.

Potential Capitation Rate Adjusters

As the predictive accuracy of a capitation rate formula is dependent on the validity of risk adjustment, research has been conducted to identify and evaluate potential adjusters. Table 2 lists the relative predictive accuracy of different capitation rate adjusters.

Table 2: Predictive Accuracy of Rate Adjusters in Enrollment-Based, Primary Care Capitation

| | Predictive Accuracy | | |
|---------------------------|--|------------------------------------|---|
| | Low | Medium | High |
| Individual-level measures | Age Gender Education Socioeconomic status | Functional status Health status | Prior utilization Diagnostic information |
| Community-level measures | Socioeconomic environment | | |

A word of caution is warranted ~ it is difficult to determine the predictive accuracy of these adjusters for adjusting primary care capitation rates in Ontario for the following reasons. First, most researchers have evaluated the predictive accuracy of the measures listed in Table 2 as determinants of outpatient and/or inpatient expenditures. The predictive accuracy of these measures as determinants of primary care services requires further evaluation. Second, many studies have been conducted in other jurisdictions and in different policy contexts. Therefore, the applicability of the findings to an enrollment-based approach to primary care capitation in Ontario requires evaluation.

Age is one of the most common measures used to adjust premiums, as research findings consistently suggest that there is a positive association between age and health status or service utilization. It would appear that gender is also a potential adjuster, as females in Ontario tend to use more primary care physician services than men (McIsaac et al., 1997; PHRED, 2000). However, the predictive accuracy of information regarding age and gender at the individual-level is small as illustrated in Figure 1 (Reid et al., 1999; Watson, 2000). Therefore, the exclusive use of these demographic adjusters in a primary care capitation formula in enrollment-based jurisdictions will result in a high degree of individual-level estimation risk.

Roster-level risk in jurisdictions that use age and gender adjustments is also high. In fact, the size of over-payments associated with extreme bias in the selection of healthy enrollees appears to be greater than the size of under-payments associated with differential enrollment of unhealthy people (Fowles et al., 1996; Gruenberg et al., 1996; Watson, 2000).

Education, work and immigration status have been associated with health status and service utilization among Ontario residents (McIsaac et al., 1997; PHRED, 2000). Despite these findings, the addition of this type of information to demographic (i.e., age and gender) primary care capitation formula does not significantly improve predictive accuracy at the individual- or roster-level in jurisdictions with explicit or implicit, enrollment-based rostering (Fowles et al., 1996; Watson, 2000). In addition, the inclusion of information regarding enrollee's socioeconomic status to a demographic primary care capitation formula does not significantly improve predictive accuracy at the individual- or roster-level in enrollment-based jurisdictions (Fowles et al., 1996; Watson, 2000).

Research supports the premise that the characteristics of an individual, as well as the community in which they reside, make independent contributions as determinants of health and/or service utilization (Locker et al., 1996; Locker & Ford, 1996; Phillips et al., 1998; Watson, 2000). Therefore, community-level measures of socioeconomic context have been evaluated for their predictive accuracy.

The inclusion of community-level measures of socioeconomic environment into a demographic primary care capitation formula does not significantly improve predictive accuracy at the individual- or roster-level (Watson, 2000). In addition, this type of formula does not appear to significantly alter resource allocations made to capitated providers that would otherwise have been made using age and gender adjusters (Hutchison et al., 2000). Both of these studies were conducted in enrollment-based jurisdictions in Ontario.

Information regarding the functional^L or disability^M status of individuals demonstrates promise for risk-adjusting premiums for outpatient services and/or inpatient rehabilitation care (Hornbrook & Goodman, 1996; Sutton et al., 1996). The predictive accuracy of using these measures in conjunction with demographic information to estimate primary care utilization of rostered individuals is moderate. Predictive accuracy at the roster-level is not substantially better than an age and gender formula (Watson, 2000).

It would appear that inclusion of information regarding self-reported chronic conditions to a demographic capitation formula significantly improves predictive accuracy at the individual-level when estimating outpatient and inpatient expenditures. In fact, this measure of morbidity is just as accurate at the individual-level to predict future expenditures as the use of disability status, health

^L “Are you limited in the kind or amount of activity you can do because of a long term physical condition, mental condition or health problem? Yes or no”.

^M “Do you have any long-term disabilities or handicaps? By long-term I mean a condition that has lasted or is expected to last more than 6 months?”

status or diagnostic adjusters (Fowles et al., 1996; Gruenberg et al., 1996). Predictive accuracy when estimating primary care utilization at the individual- and roster-level is moderate (Watson, 2000).

Research conducted in Ontario and nation-wide consistently demonstrates an association between self-rated health status and the use of general practitioner services (Dunlop et al., 2000; McIsaac et al., 1997). The inclusion of a popular measure of self-reported health status^N in a demographic, primary care capitation formula improves predictive accuracy at the individual- and roster-level (Watson, 2000).

Although the use of information regarding self-reported health status has been assessed and recommended for rate adjustment purposes in other jurisdictions (Hornbrook & Goodman, 1995; Parkerson et al., 1995), the feasibility of collecting this type of information at the individual-level for risk adjustment in enrollment-based jurisdictions in Canada should be a topic for discussion (Hutchison et al., 1999; 2000). Predictive accuracy is only one of the criteria by which capitation rate adjusters should be selected - consideration must also be given to policy objectives, face validity, feasibility, reliability, stability and 'game-ability'.

Research evidence suggests that measures of prior utilization are the most powerful predictors of expenditures on health services and more powerful than measures of functional status, health status and/or chronic conditions (Ash, 1989; Gruenberg et al., 1996; Newhouse et al., 1989; 1998; van Vliet & van de Ven, 1992; 1993; Watson, 2000). For example, the addition of information regarding utilization of inpatient services in the preceding 12 months to a demographic, primary care capitation formula improved the predictive accuracy of rates at the individual- and group-level (Watson, 2000).

Alternatively, the addition of information regarding utilization of primary care physician services in the preceding 12 months to an age and gender capitation formula for primary care services significantly improved predictive accuracy of premiums at the individual- and group-level.^O In fact, a primary care capitation formula that includes this type of information is more accurate than an age-gender-health status or an age-gender-hospital admission formulae (Watson, 2000).

The use of information on prior costs or the frequency of prior primary care visits may provoke controversy, due to the creation of an incentive that rewards providers who prescribe high volume services inappropriately. However, in order to reduce this incentive it has been recommended that adjustments for prior use occur when utilization reaches a specified threshold (e.g., 99th percentile of prior costs, or more than six prior visits) (Lamers & van Vliet, 1996; Watson, 2000). In addition,

^N "In general, would you say your health is excellent, very good, good, fair, or poor?"

^O The findings presented here hold true irrespective of whether prior utilization of primary care physician services is calibrated using a continuous measure, a two-part measure (i.e., 0-5 visits, ≥ 6 visits) or a four-part measure (i.e., 0-2, 3-5, 6-8, ≥ 9 visits).

it has been argued that while capitation provides a financial incentive to under-serve populations, this type of adjuster reduces the incentive to stint on care.^P

Although the use of diagnostic information for risk adjustment requires complex methodology, this approach to rate adjustment demonstrates promise (Dunn, 1998; Fowles et al., 1996; Lamers & van Vliet, 1996; Lamers, 1998; Reid et al., 1999). The accuracy of a capitation formula that includes diagnostic and demographic data is high at the individual-level when predicting in-patient and/or outpatient costs (Fowles et al., 1996; Ellis et al., 1996) or expenditures on physician services (Reid et al., 1999). This type of formula also demonstrates superior predictive accuracy at the group-level, in comparison to age-gender and age-gender-prior cost formulae (Ellis et al., 1996; Lamers & van Vliet, 1996). Although the purpose of using diagnostic profiles is to measure morbidity, it has been suggested that these data also gauge prior utilization because diagnostic information is derived during visits (Reid et al., 1999).

One researcher group determined that the predictive accuracy of diagnostic data was more powerful than health status measures when predicting retrospective utilization (Fowles et al., 1996).^Q The accuracy of diagnostic information, however, declines significantly when used to predict utilization in future time periods (Ellis et al., 1996; Fowles et al., 1996).

Implications of Research Regarding Rate Adjustment on Policy, Planning and Health Information Systems

The evidence is convincing - the addition of information regarding functional status, health status, chronic conditions, diagnoses and/or prior utilization significantly improves the predictive accuracy of a demographic capitation formula. In spite of this, there remains a significant degree of individual-level estimation and roster-level financial risk.

Research results derived from a study conducted in southwestern Toronto suggest that there are measures that improve the predictive accuracy of a demographic primary care capitation formula, and some of the information required to operationalize these adjusters is available in existing administrative data. In spite of this, there remains a significant degree of individual- and roster-level risk that must be managed and monitored using mechanisms other than rate adjustment. During the course of this research project, 27 different socioeconomic, health and illness^R measures were used to predict future utilization of primary care physician services by a roster of adults. The

^P Stinting refers to the practice of “not performing services or procedures in which the benefit to the patient exceeds the cost” (Newhouse, 1998, p. 129).

^Q Retrospective utilization refers to expenditures that occur during the same year. Otherwise, predictive accuracy ~ in the context of this paper ~ refers to estimates regarding prospective utilization or use in future time periods.

^R This project did not involve an evaluation of the predictive accuracy of diagnostic information.

statistical model that was developed using all of this information accurately estimated expenditures for approximately 30% of individuals. Predictive models that included information on age, gender and functional status, health status, or chronic conditions predicted utilization costs or rates for 10 to 15% of individuals (Watson, 2000). Predictive models that included information on age, gender and prior utilization predicted primary care physician expenditures for approximately 20 to 25% of individuals (Watson, 2000). These findings are consistent with research conducted in other jurisdictions (e.g., Newhouse et al., 1989; 1998).

The policy and planning implications of individual-level estimation and roster-level financial risk in enrollment-based jurisdictions are as follows. First, the formula used to adjust capitation rates should have the highest degree of predictive accuracy attainable. Second, contractual arrangements should include clauses that limit differential selection, as well as identify acceptable and limit inappropriate hedging practices. Third, consideration should be given to retrospective adjustment as the predictive accuracy of a capitation formula is higher when using data derived from concurrent time periods. Fourth, information should be collected about enrollees over the course of time to enhanced the predictive accuracy of capitation formula. Fifth, providers and payers will require more sophisticated health information systems than would be necessary in settings that employ fee-for-service funding or jurisdictions that use a geographically-defined approach to defining rosters.

Section 5

Data Infrastructure to Support Primary Care Capitation and Enrollment-Based Rostering

The many purposes for which health information systems should be used in the context of capitation and enrollment-based rostering are described here. As mentioned previously, the use of this approach to rostering has many implications for the design of health information systems. Most importantly, payers and providers require more individual-level information than they need in jurisdictions where rostering occurs on a geographically-defined basis. In addition, this type of individual-level information is necessary to evaluate the predictive accuracy of rate adjusters and thereby design an adequate capitation formula, as well as to profile the characteristics of individuals to determine the premium that will be paid for each enrollee.

Table 3: Data Infrastructures to Support Enrollment-Based Rostering

| | |
|--|---|
| <p>Health information should enable <i>payers</i> to:</p> <ul style="list-style-type: none"> • Identify the eligibility status of all individuals in the population. This requires tracking of births, deaths, immigration and emigration; as well as the characteristics of people that influence their eligibility.¹⁰ • Maintain accurate and up-to-date records regarding the health care organization with which each eligible enrollee is rostered.¹¹ • Establish and monitor the performance of a capitation rate formula. A valid formula should have predictive accuracy. • Retain a complete and accurate record of information regarding the characteristics of enrollees, so that the formula can be applied to determine the premium that will be paid for each enrollee. • Track utilization for each enrollee to determine whether services are obtained and rendered from the health care organization with whom they have rostered or from others. These data enable payers to monitor utilization within and between rosters, and to respond to situations where individuals use services rendered by providers with whom they are not rostered.¹² Information systems are essential for undertaking this task in jurisdictions that use an implicit, enrollment-based approach to rostering. • Ensure that the health service system promotes the health of the population in ways that are congruent with the objectives of health policy. | <p>Health information should enable <i>health care organizations</i> to:</p> <ul style="list-style-type: none"> • Keep complete and accurate records regarding the enrollment status of individuals on their roster. This requires tracking of births, deaths, immigration and emigration; as well as the characteristics of people that influence their eligibility. • Retain a complete and accurate record of information on the characteristics of enrollees, so as to confirm that the premium received for each enrollee is accurate and to update payers regarding status changes that influence rates. • Maintain health and utilization to manage and monitor care, and account to enrollees and payers. • Maintain data regarding premiums and costs per enrollee to: (a) assess and monitor financial risk, (b) target interventions to manage this risk, and (c) evaluate the predictive accuracy of the capitation formulae. The factors that influence financial risk are the capitation rate per enrollee, utilization patterns, costs of care and the size of the roster. |
|--|---|

Purpose of Health Information Systems

Health information systems enable payers and capitated health care organizations to: (a) profile the characteristics of individual enrollees that influence their health and service utilization, (b) develop and refine a rate adjustment formula, (c) evaluate the performance of a capitation formula, (d) monitor differential selection of enrollees, and (e) manage health and service utilization of enrollees. Table 3 summarizes the purposes toward which payers and capitated health care organizations can use information systems to support enrollment-based rostering. In jurisdictions where capitated intermediaries have been established to serve an administrative role between payers and providers, these organizations should also be able to use information systems for purposes described in Table 3.

Features of Data Infrastructure

The value of a health information system to users is influenced by the utility of the measures included, the completeness and accuracy of data, the unit of data measurement and analyses, and the potential to conduct data linkage.

Utility of Data

In the context of capitation, data can be collected and analyzed by health care organizations to describe an enrollee, profile a roster, determine the probability of future events or identify certain traits, and/or assess the effectiveness of treatment.

When capitated organizations roster individuals on an enrollment-basis, they require data to describe enrollees and profile their rosters. At a minimum, health information systems should include enough information on each enrollee to confirm their eligibility status and to determine the premium that should be paid given the capitation funding formula. For example, when premiums are age and sex adjusted, capitated organizations should have information systems to enable them to determine the eligibility status, age and gender of each rostered individual.

Capitated health care organizations that wish to measure and monitor roster-level financial risk will require individual-level information regarding premiums and costs for each enrollee or a representative sample of these people. In the context where premiums are age and sex adjusted, capitated organizations should have information systems to enable them to determine eligibility status, age and gender for each rostered individual, as well as premiums, utilization rates and costs for each rostered individual or a representative sample of these enrollees.

Organizations that wish to monitor financial risk and evaluate efforts to improve the predictive accuracy of a capitation formula will require all of the information described in the preceding paragraph, as well as information on the characteristics of enrollees that are expected to influence health and service utilization. Table 2 lists characteristics of people that have been evaluated for

their potential to predict health service utilization. It is these types of characteristics that could be measured and electronically recorded for use.

Completeness and Accuracy of Data

Health information systems are most useful when they contain data that are relevant, complete and accurate. Data that is incomplete is of little value as the absence of information biases or limits the knowledge that can be derived from any analyses. Complete electronic data is assured when all enrollees or individuals in a selected sample of rostered enrollees provide information, and all of the data derived from these people are completely entered into an information system.

The accuracy of data in an information system is a function of its validity and reliability. Valid data correctly gauges what it was intended to measure. Reliable data has been collected and/or transcribed in an inconsistent manner. An ideal measure is both valid and reliable and therefore totally free of error. While perfect measurements do not exist, users of health information systems should be aware of the level of confidence that can be placed in the information obtained.

Unit of Measurement and Analyses

The 'unit' at which data is collected refers to whether: (a) information is collected from individuals in order to be representative of these people (i.e., individual-level), or (b) information is collected from a sample of individuals to be representative of a group (i.e., group-level). Group-level data is representative when it is derived from individuals who have been appropriately sampled from the population of interest. Data is not representative if it is derived: (a) from a group of people that have not been appropriately sampled, or (b) from a biased selection of respondents.

The unit of measurement is important as it determines the types of analyses that can be conducted. For example, individual-level information can be collected and analyzed to describe the characteristics of each enrollee on a roster (e.g., age). By comparison, group-level data can be sampled, collected and analyzed to profile sub-groups of enrollees (e.g., proportion of enrollees in an age group), or report on the characteristics of a roster (e.g., average age).

Group-level information can not be used to describe a person or profile another cohort of people. This is an important point, as aggregated information derived from publicly-available data sources (e.g., the Census) is derived by sampling a group of individuals in order to represent people who reside in a 'specified region' (i.e., Census unit of geography). These data will be representative of a geographically-define roster only in the situation where the roster boundaries are defined using the

same ‘specified regions’ (i.e., Census unit of geography). The applicability of these data to profiling enrollment-based rosters has limitations.⁵

As described in the section of this paper entitled “Implications for Enrollment-Based Rostering on Demand for Health Information”, payers and providers in enrollment-based roosting jurisdictions require more individual-level information than they would if roosting occurred using geographically-defined populations. The unit of measure that is of interest in enrollment-based jurisdictions is the individual if the data is to be used to describe an enrollee and profile a roster.

Data Linkage

One important mechanism that can be used to enhance the utility and/or completeness of data is record linkage. Records from two or more different data sources can be ‘linked’, when files contain one or more of the same elements. For example, if: (a) two health care organizations provided services to the same individual, (b) an electronic record is created by both organizations, and (c) the person has a unique insurance plan number that exists on both electronic files, then (d) the records generated by each organization can be linked. This process would enhance the scope of information available for each enrollee.

There are two potential data linkages that may have utility to fee-for-service organizations in Ontario that are, or will be, shifting to capitation financing. First, linkage could occur to merge electronic clinical information with administrative data such as billings. Billing data contains information regarding the frequency and dates of prior visits, the type and volume of services provided and diagnostic information. As mentioned previously, this type of information has relatively high predictive accuracy when estimating future health service utilization (See Section 4). In this situation, the primary linkage variables could include health insurance plan number, date and year of birth, last and/or first name, and/or gender.

Second, linkage could occur to merge electronic clinical information and/or administrative data with publically available data such as the Census. This type of linkage would provide information about the socioeconomic context in which enrolled populations reside. In this situation, the primary linkage variable would be the postal code or forward sortation area (i.e., first three digits of the postal code).

While specialized software is available to facilitate linkage between data sets, files can be ‘merged’ in spreadsheet programs such as Excel or ‘aggregated’ in statistical packages such as SPSS®.

⁵ There is an exception to the above described limitation regarding the appropriate use of data derived from groups of individuals (i.e., community-level data). Researchers have evaluated the validity of using group-level measures of wealth (e.g., median household income)

Section 6

Conclusion

A transition from fee-for-service to capitation financing has implications for the demand for health information and the design and use of information systems. This is particularly true when an enrollment-based rostering is employed, and this is the approach to primary care capitation that has been recommended for Ontario and implemented in some jurisdictions in the province.

An enrollment-based approach to rostering requires that payers and providers require more individual-level information than they would in geographically-defined rostering contexts. In enrollment-based jurisdictions, payers and providers both require health information systems to document the characteristics and eligibility status of enrollees, determine the premium that should be paid for each individual, as well as to monitor the performance of and suggest refinements to a capitation formula.

Research evidence suggests that measures of prior utilization, functional status, health status, diagnoses and/or chronic conditions are powerful predictors of health service utilization and significantly improve the predictive accuracy of demographic formula. In spite of this, there remains a significant degree of individual-level estimation and roster-level financial risk. Therefore, health information systems can also be used to monitor differential selection of enrollees and manage risk.

This paper has been structured to provide insight into the policy options for capitation financing of primary care, describe the types of risk inherent in enrollment-based approaches to rostering, and offer an overview regarding how health information systems can and should be designed and/or used to support primary care capitation. As people in the province of Ontario continue to make strides toward increasing the number of residents served by capitated, primary care organizations, health information systems will become an essential component to managing and monitoring care.

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Appendix A
Capitated Primary Care or Integrated Health System Reform Projects in Canada

| | Project/Initiative | Scope of Services | Rostering | Rate Adjusters | Other |
|------------------|--|--|--|--|---|
| Alberta | Regional Health Authority Global Funding Model (Alberta Health, 1999; Alberta Health & Wellness, 2000) | Inpatient, hospital-based ambulatory care, continuing care and home care, as well as protection, prevention and promotion services | Geographically-defined at the Regional Health Authority level. | Age, sex and socioeconomic status; with adjustments for cross-boundary flows and remote locations. No loss clause. | http://www.health.gov.ab.ca/funding/funpop.htm |
| British Columbia | Primary Care Demonstration Project (British Columbia Ministry of Health, 2000) | Primary care; excludes obstetrics, anaesthesia & emergency services | Implicit, enrollment-based. | Age, gender, diagnostic and geographic information. | Co-sponsorship by the British Columbia Ministry of Health and Health Canada. Received \$9.542 million from the Health Transition Fund. http://www.hlth.gov.bc.ca/care/primdemo/index.html |
| Nova Scotia | Strengthening Primary Care in Nova Scotia. | Primary care services. | <i>Information not available at time of printing.</i> | <i>Information not available at time of printing.</i> | Co-sponsorship by the Nova Scotia Department of Health and Health Canada. Received \$2.85 million from the Health Transition Fund. http://www.gov.ns.ca/health/ |

| | Project/Initiative | Scope of Services | Rostering | Rate Adjusters | Other |
|--------------|---|---|--|---|---|
| Ontario | Health Service Organizations (Hutchison, Birch & Gillett, 1996; Hutchison et al., 1999) | Primary care services. | Explicit, enrollment-based. 1900 enrollees per FTE physician, with maximum of 2,500 per FTE physician. | Age and gender. | |
| Ontario | Primary Care Pilot Project | Services provided by Primary Care Networks that include 5 to 23 physicians. | Explicit, enrollment-based. | Age and gender. | Project managed by the Ontario Ministry of Health in partnership with the Ontario Medical Association. Received \$18.5 million from the Health Transition Fund. |
| Saskatchewan | District health boards (Saskatchewan Health, 1994; 1995). | Long-term care, inpatient care, outpatient non-primary care, home-based services, and rural health initiatives. | Geographically-defined at the district level. | Age and gender. Standardized mortality, fertility and low birth weight rates to adjust funds for acute care. The proportion of the elderly who live alone or with others to adjust funds for home-based and long-term care. | |

| | Project/Initiative | Scope of Services | Rostering | Rate Adjusters | Other |
|--------|--|--|-------------------------------|---|---|
| Quebec | Regional County Municipality of Haut-Saint-Laurent | Physical and mental health services. | Population of Regional County | <i>Information not available at time of printing.</i> | Project managed by Montérégie Regional Health and Social Services Board, Longueuil. Received \$3.238 million from the Health Transition Fund. http://www.hc-sc.gc.ca/english/archives/releases/9945ebk.htm |
| Quebec | SIPA Demonstration Project (Health Canada, 1998). | Integrated services for the frail elderly. Community-based primary care with full range of health and social services, as well as case management. | 600 frail elderly | Age, gender and disability status. 'Negotiated sum per month' | Project managed by Régie régionale de la santé et des services sociaux de Montréal-Centre & McGill University Research Group. Received \$4.8 million from the Health Transition Fund. http://www.hc-sc.gc.ca/english/archives/releases/9824bke2.htm |

Appendix B

Glossary of Terms

Capitation

Capitation refers to a method of payment whereby the amount of funds paid to a health care organization is determined prospectively on the basis of the characteristics of a defined or rostered population.

Capitation Rate

The amount of money paid to an organization for a contract of insurance. A capitation rate is paid by a third-party organization to a health organization that assumes the responsibility to render a specified range of services to enrollees when and if they are deemed to be appropriate. These fees are paid prospectively or retrospectively, and funds are dispersed on an annual or more frequent basis (e.g., per month). The capitation rate is also referred to as a 'premium'.

Case-Mix Adjusters

Capitation rates or premiums are typically adjusted to account for differences between individuals or groups of people in certain characteristics that are known to influence their utilization of covered services (e.g., age and gender). The characteristics selected for use to adjust rates are called 'adjusters', and the process of altering rates based on these characteristics is known as 'case-mix adjustment' or 'risk-adjustment'.

Case-Mix Adjustment

The adjustment of a value (e.g., capitation rate) to account for differences between individuals or groups of people in certain characteristics that are known to influence their utilization of covered services (e.g., age and gender). The characteristics selected for use to adjust rates are called 'adjusters', and this process is also known as 'risk-adjustment'.

Demographic Capitation Formula

A capitation formula that adjusts rates on the basis of the age and gender of each enrollee.

Enrollment-Based Rostering

The population rostered to each capitated provider represents a sample of individuals from the community. In this context, eligible enrollees are able to select from a number of health plans or service providers and providers compete with others to assume and retain the responsibility for providing specific health services to individuals.

Explicit Rostering

When the process of rostering is explicit, enrollees are fully aware that a specific health organization is responsible for their providing care. For example, rostering is explicit when individuals sign an agreement to enroll with a provider.

Financial Risk

The financial or monetary risk associated with the unpredictable nature of illness and health service utilization.

Geographic-Defined Rostering

The population rostered to each capitated provider includes all of the people who reside in a specific location. In this context, a health care organization assumes the responsibility for providing specific health services to all residents and does not compete for enrollees. Individuals who reside in the specified geographic region receive care from the designated, health care organization.

Individual-Level Estimation Risk

This type of risk relates to the likelihood that a capitation rate or premium will not be exactly the same as the costs associated with providing services to an enrollee over the time frame of the capitation funding contract.

Implicit Rostering

The process of roosting is implicit when enrollees are not be fully aware that a specific health organization has been assigned responsibility for their health care.

Predictive Accuracy

A capitation formula that has predictive accuracy results in rates or premiums for each enrollee that accurately reflect the future cost of providing service and compensate providers for the uncertainty regarding estimation of these expenditures.

Premium

The amount of money paid to an organization for a contract of insurance. A premium is paid by a third-party organization to a health organization that assumes the responsibility to render a specified range of services to enrollees when and if they are deemed to be appropriate. Premiums are paid prospectively or retrospectively, and funds are dispersed on an annual or more frequent basis (e.g., per month). This premium is also referred to as a capitation rate.

Risk Adjustment

The adjustment of a value (e.g., capitation rate) to account for differences between individuals or groups of people in certain characteristics that are known to influence their utilization of covered services (e.g., age and gender) . This process is also known as case-mix adjustment.

Rostering

Rostering refers to a process whereby individuals enroll, register or sign-up with a provider who assumes the responsibility for delivering specified services when they are deemed to be appropriate.

Roster-Level Financial Risk

This type of risk relates to the likelihood that the sum of capitation premiums paid by payers and received by providers will not be the same as the sum of the costs associated with services used by enrollees over the time period of the contract. Roster-level risk represents the net financial impact of over-payments and under-payments for each individual on the roster.

Endnotes

1. Rostering on the basis of geographically-defined regions has been used since the mid-1990s to allocate funds to regional health authorities and district health boards in Alberta and Saskatchewan for the provision of a range of health services. Primary care physician services, however, are not included in this funding arrangement. Although the formula used to allocate financial resources considers the number of residents in each geographic area and any differences in the relative need of different populations (i.e., case-mix), adjustments are also made for regional differences in factor input costs, cross-boundary utilization, and historic financial allocations. Apparently, these last adjustments [historic spending] significantly alter the allocations made on the basis of case-mix (Alberta Health, 1999; Saskatchewan Health, 1994). One could argue, therefore, that capitation has been used in these provinces simply as a mechanism to establish global budgets.

2. There are a number of different derivatives of the organizational context that includes intermediaries. For example, an intermediary may be budget financed to assume responsibility for a network of providers that each receive capitation premiums for enrollees. These providers could roster enrollees on an enrollment or geographically-defined basis.

Alternatively, capitated intermediaries may or may not elect to capitate contracted providers. In fact, payments from a capitated intermediary to the local provider could be made using a fee-for-service, salary or blended approach. Health Maintenance Organizations (HMOs) in the United States provide an example to illustrate these arrangements. HMOs receive capitated payments from employers, individuals and the government to assume the responsibility for managing specified, health services for enrollees. HMOs may use a discounted fee-for-service arrangement to pay providers (i.e., this type of HMO are called a Preferred Provider Organizations [PPO]). Alternatively, some HMOs use capitation to finance providers of health care. Physician organizations that receive capitation payments from HMOs are called Independent Provider Associations (IPA).

3. Due to growth in utilization and the financial uncertainty associated with funding physician services in Canada, all governments have used mechanisms (e.g., hard and soft caps on expenditures) to limit and/or share financial responsibility with providers (Barer, Lomas & Sanmartin, 1996; Lomas et al., 1989).

4. Selection bias has been documented in quasi-experimental, controlled studies and randomized trials that seek to compare capitated and fee-for-service health care organizations. Two studies have been conducted in Ontario that provide conflicting evidence of differential selection by capitated providers in Health Service Organizations (Hutchison et al., 1996; 2000). The result of differential selection by providers and enrollees is that the rosters differ in their relative health and propensity to use services.

Research evidence indicates that capitated providers may intentionally or unintentionally roster enrollees who use health services more or less frequently and/or more or less intensely. Organizations who deliberately seek to enroll individuals that are relatively healthy have been

referred to in the literature as >cream-skimmers= or >cherry-pickers=. Research also indicates that individuals who use physician services more or less than others may be bias in their selection of capitated organizations. Evidence from randomized trials suggests that unhealthy people withdrawal from their assignment to capitated providers in favour of seeking fee-for-service care (Buchanan, et al., 1996; Leibowitz et al., 1992; Mauldon et al., 1994).

5. To illustrate this point - consider a capitated provider that has five enrollees. The premium receive for three of the enrollees was 100 dollars higher per individual than the cost associated with the provision of care over the term of the contract (i.e., over-payment). In addition, the premium received for the remaining two enrollees was 50 dollars lower per individual than the cost associated utilization (i.e., under-payment). While the financial risk associated with this scenario represents the chance that there will be a difference between revenues derived from premiums and the costs associated with utilization, the net financial impact (i.e., \$200) is calculated by summing over-payments (i.e., \$300) and under-payments (i.e., -\$100).

6 The most impressive statistical models that have been designed to predict future annual health care costs (i.e., inpatient and outpatient expenditures) accurately estimate these expenditures for less than 15 percent of individuals (van Vliet & van de Ven, 1992; 1993). It has been suggested that predictive models will not be able to explain any more than 50 percent of the variance in outpatient expenditures (Newhouse et al., 1989; Welch, 1985).

7 For example, 82 percent of Ontario residents visit a family physician/general practitioner on an annual basis. Eighty-seven percent of women and 75 percent of men visit their family physician/general practitioner at least once in the previous 12 months. These statistics have remained stable over time (Federal, Provincial and Territorial Advisory Committee on Population Health, 1996; 1999; Public Health Research, Education & Development Program, 2000;).

Evidence of improved predictive capability for groups of individuals is particularly important, as capitated providers are able to moderate or hedge financial risk by enrolling a group of people.

8 This evidence has important policy implications, as the use of retrospective rate adjusters - that is, the use of information derived from the year in which payment occurred rather than from the preceding year - may improve the predictive accuracy of capitation formula (Newhouse et al., 1997).

To illustrate the use of a retrospective adjuster, consider the situation where rates are adjusted on the basis of self-rated health. In 1997 an individual rated their health as excellent, but in 1998 they rated their health as poor. The use of 1997 data to determine payment for 1998 is in keeping with the principle of determining and paying capitation rates prospectively. However, the use of data derived from 1998 to determine rates in 1998 has been referred to as a retrospective adjuster, and evidence suggests that self-rated health is a stronger predictor of concurrent utilization than of use in future time periods.

9 See Lamers, 1998.

10. This is no small task. For example, in 1999 when the National Health Service in the United Kingdom moved toward capitated resource allocation in the primary care sector, estimates of the size of the rosters derived from government versus health agencies varied by an average of six percent. In one instance, the variability in estimates was 23 percent (Carr-Hill & Roberts, 1999).

11. Enrollment represents a mutual (often contractual) agreement between eligible enrollees and providers. The Selection Committee on Public Administration of the Health Service Ombudsman's Office for the National Health Service recommended that: (a) providers should not be able to remove individuals from their roster without just reason, and (b) people should be informed of the reasons for their removal and retain the right to appeal (Ferriman, 1999).

12. Capitation contracts typically include clauses that specify what will occur when enrollees seek care from external providers. For example, in these situations the providers who rostered the individual may receive a reduced payment or be responsible to pay the full cost of external service use. This process is also known as negotiation. In addition, this information may be used by payers to update or confirm roster enrollment status.