



research REPORT

FINANCIAL AND RISK CONSIDERATIONS FOR SUCCESSFUL DISEASE MANAGEMENT PROGRAMS

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INTRODUCTION

Disease Management refers to a patient-centered, disease-specific approach to providing healthcare services to a set of patients with the same disease or set of symptoms. Under a disease management approach to a particular disease, the screening and care provided to the patients are tailored to reflect the conditions and common comorbidities of that disease. The diseases most commonly covered by disease management programs include AIDS/HIV infection, asthma, cancer, cardiovascular diseases, chronic obstructive pulmonary disease, depression and diabetes. There are disease management programs for many other diseases as well.

A disease management approach to a group of patients offers advantages to the patients, providers, and the health plan responsible for the patients' care. For patients, disease management offers the advantage of an integrated approach to their care, provided by practitioners who specialize in their disease. While excellent care may be provided under other types of delivery systems, it is reasonable to expect that a system focusing on a particular disease or condition will improve the skills, expertise and tools available to screen populations, diagnose conditions, and treat patients with that disease. That focus should lead to better care. For providers, disease management provides a supportive environment for practicing in their specialty area. A focus on a particular disease provides the opportunity to create or expand a regional center of excellence, which in turn can lead to a more reliable stream of patients and revenue. For health plans, disease management creates a mechanism to improve outcomes (survival, patient satisfaction, etc.), reduce the financial risk from potentially high-cost patients, and improve financial results due to efficiency.

Successful disease management companies must address the clinical and administrative aspects of providing the required care to the identified population of patients. The ultimate test to determine the success of a disease management contract must be an evaluation of its impact on the quality of care provided to the covered population. While it is critical for a disease management company to provide high-quality care, doing so does not ensure that the program will be successful. Another factor often crucial to the success of a disease management company is its ability to evaluate the financial aspects of a proposed risk contract with a health plan. This presents a challenge because costs and utilization of healthcare services can fluctuate greatly, making it difficult to project costs and utilization. These fluctuations can threaten the financial viability of disease management arrangements. The actuarial tools of risk analysis and risk management provide a basis for making sound management decisions for successful disease management contracts.

This paper introduces disease management risk concepts in general, along with a discussion of risk and financial evaluation considerations, and a brief case study illustrating these principles. The case study and examples used in this paper come from cancer disease management contracts, but the basic principles apply to other diseases as well.



DESCRIPTION OF DISEASE MANAGEMENT PROGRAMS

Disease management programs direct and provide care to individuals with a given disease or set of symptoms, by establishing a group of providers and treatment protocols to ensure the care required to treat the disease is provided effectively and efficiently. Some disease management programs function as components of global healthcare service contracts. These programs are part of a larger risk management program. Other disease management programs are separate, contractual agreements between two independent parties. Under such a disease management risk contract, the disease management company agrees to provide some or all of the care that the health plan is obligated to provide to its members. These agreements are true transfers of risk. For simplicity, the remainder of this paper is written under the assumption that two separate entities are involved.

A disease management risk contract is fundamentally an insurance contract, because one party is accepting risk for financial outcomes of an unknown future event (in this case, providing care to a group of patients), in exchange for a financial consideration. As a result, the fluctuations in program costs are transferred to the disease management entity.

Financing Arrangements

The two traditional forms of disease management contracts are capitation contracts and case rate contracts. Under a capitation contract, the health plan pays the disease management company a fixed amount per member per month. Under a case rate approach, the health plan pays the disease management company a fixed amount per patient treated. Some case rate contracts present the rates on a stratified basis, with higher reimbursement rates provided for patients with more advanced disease or more complications.

An increasingly popular arrangement for risk sharing in disease management contracts is the shared savings approach. Under a shared savings contract, the costs or revenues of the disease management company are subject to performance conditions generally tailored specifically to meet the needs of the two parties.

Goals and Objectives

The goals and objectives of the health plan and the disease management company may be different. The objectives for a health plan to negotiate a disease management risk contract may include any or all of the following:

- To minimize financial risk associated with high-cost claims.
- To reduce aggregate healthcare costs by negotiating a capitation or case rate lower than the corresponding cost of care provided in their network.
- To simplify and reduce in size or scope the panel of physicians and other professionals, thus reducing administrative effort and the expenses associated with maintaining a physician panel.
- To improve the marketing position of the health plan or HMO by creating a strategic alliance with a regional center of excellence, whose reputation for providing high-quality treatment will enhance the reputation of the health plan by association.
- To improve its risk-based capital (RBC) position by transferring risk to the disease management company.

The goals and objectives of each disease management company vary according to its market approach. The objectives of the disease management company in negotiating a disease management risk contract can include any or all of the following:

- To maintain a flow of patients and revenue.
- To support treatment in core areas of expertise to improve outcomes.
- To support clinical trials to evaluate protocols or drugs.
- To improve market share by expanding its service area or potential referral network.
- To improve market share by enhancing reputation.



RISK IN DISEASE MANAGEMENT AGREEMENTS

Disease management companies must pay meticulous attention to the clinical aspects of their business, including treatment protocols and provider panel design, since the program can be successful only if it provides good care. An analysis of a prospective disease management agreement should address not only the clinical issues regarding screening, preventive care and treatment of the disease in question and its common complications, but also risk issues.

Financial Risk

The disease management company is accepting financial responsibility for providing the specified care to patients covered by the disease management contract, and faces the risk that the cost of care will exceed its revenue. Unfavorable variation from the expected levels of utilization or cost of services can cause losses to the disease management company. The disease management company should take steps to reduce its financial risk, including:

- Identifying financial, contractual and other factors affecting the level of financial risk and the volatility of the risk.
- Estimating the revenue and capital required to accept financial responsibility for the risk.
- Projecting the possible outcomes under different scenarios for factors that influence overall program costs.
- Managing the risk effectively to ensure that clinical and financial goals are achieved.

Types of Risk

The major sources of risk in disease management contracts include:

- *Prevalence:* The risk that the population will include a greater-than-expected number of patients with the disease or condition.
- *Patient Severity:* The risk that the patients from the population will present at a more-advanced stage of the disease than expected.
- *Complication:* The risk that a greater-than-expected proportion of the patients from the population will present with complicating conditions.
- *Cost:* The risk that the unit cost of services will be greater than expected.
- *Protocol:* The risk that the accepted protocols for treating the disease will change over time toward more intensive or expensive treatments.
- *Duration:* The risk that the treatment will last longer than expected. Disease management companies may be victims of their own success. If they can improve survival in the patients they treat, those patients will be treated longer, on average, than patients not treated by the disease management company.

To some extent these risks are interrelated. For example, an expensive new anti-nausea drug that allows more aggressive chemotherapy to be delivered to cancer patients with advanced cancer is initially an example of protocol risk. However, the more aggressive chemotherapy may be more expensive than the prior standard (cost risk), and may improve survival, increasing the average duration of treatment (duration risk).

All disease management contracts are subject to other risks as well as the usual risks inherent in providing patient care. These include asset risks (e.g., bond defaults), credit risks (e.g., clients will be unable to pay bills) and general business risks (e.g., fire, theft, inappropriate management decisions). Although the primary focus of this paper is on risks associated with patient care, the others should be evaluated as well.



RISK AND CONTRACTING CONSIDERATIONS

Disease management contracts vary according to the needs of the parties to the contract. In addition to key clinical issues, the contracts should address the following risk issues:

- *Which diseases or conditions are included?* It is important to define clearly in clinical terms the criteria for the covered conditions.
- *What is the financial nature of the contract?* The financial structure of a disease management contract typically will be negotiated to reflect the unique situation of the parties involved. The most common financial options are capitation arrangements, case rate arrangements, and shared savings arrangements. Capitation contracts transfer the risk associated with utilization from the health plan to the disease management company, while case rate contracts leave that risk with the health plan. An entity that accepts capitation, therefore, is subject to greater financial risk than a company that accepts case rates for the identical risks, and should be rewarded for accepting that risk. Shared savings contracts can be structured in different ways, and the degrees of risk sharing can vary significantly. The extent of risk being transferred to the disease management company can be greater than initially appears to be the case, because of the structure of the guarantees or incentives of the contract. Note that the “savings” can vary significantly from what is expected for a variety of reasons, including random fluctuations as well as the risk factors described in the prior section.
- *What population is covered?* Many diseases are more prevalent among older people. Similarly, some diseases are more prevalent in one gender. The capitation rates for commercial (predominantly under-age-65) populations generally are significantly lower than the corresponding rates for Medicare (over-age-65) populations. The Medicaid population presents different patterns, because of the significantly different age and gender distribution and different socioeconomic status.
- *Which procedures are covered?* A contract that includes services with low frequency and high cost (e.g. high-dose chemotherapy and stem cell replacement for cancer patients) will have higher risk of significant fluctuations in cost than will a contract that does not include such services. A contract covering only these services will likely have volatile costs.
- *What is the duration of coverage?* The contract requires a clearly defined beginning and (if applicable) end of treatment for each individual. The criteria can be measured clinically or by time. Generally, the risk reverts to the health plan when the patient is considered to have “recovered”.
- *What is the scope of treatment provided under the terms of the contract?* Some contracts cover only the treatment for the disease and its common complications. Other contracts cover all care provided to the individuals covered by the contract. If the contract covers only disease-related care, the boundary between disease-related care and care that is not directly related to the disease (and therefore excluded from the contract) must be carefully delineated. Complicated boundaries may be difficult to administer, but boundaries that are too simple may lead to disagreements concerning responsibility for treatment. Such disagreements can have a significant impact on the quality of care provided and can undermine the program. If the contract covers all treatment, then a significant amount of risk (and revenue) will transfer from the health plan to the disease management company, which now must be prepared to provide a much more comprehensive scope of services.
- *Is screening covered under the terms of the contract?* Screening has advantages and risks for both parties to the agreement. The health plan may want to increase the frequency and improve the scope of its regular screening, with greater involvement of clinicians specializing in the disease. This advantage could be partially offset by the need to integrate these clinicians and screening services into the health plan’s existing provider network. A disease management company specializing in a disease



that presents serious health risks, such as cancer, may want to control the screening to ensure that cases are diagnosed as early as possible, when outcomes are generally more favorable and total costs of treatment are lower. This may lead to an increase in diagnosed cases in the first year of a contract. Under a case rate approach, this should be an advantage for the disease management company, since the additional cases diagnosed should be at earlier stages and hence less severe than average. Under a capitation approach, however, this may be an advantage for the health plan, since the fixed price (per member per month) is independent of the number of cases treated. Because early detection of most conditions is in the best interest of the patients, it is advisable to create financial incentives to improve screening.

- *What service categories are included within the contract?* The contract may cover all service categories, or only some categories of care (e.g., inpatient services). The contract should reflect the expertise and efficiency of the two parties, and the responsibilities should be assigned in a manner that allows the best fit to the clinical needs of the patients. In general, healthcare services provided on an integrated basis achieve good results, so wide coverage is best. This should give the disease management company the flexibility to provide services in the appropriate venue, choosing from hospital inpatient, extended care facility/skilled nursing facility, home healthcare, and other providers. Note that the health plan may have preexisting contracts that cover some segment of healthcare services (such as a prescription drug management contract). These contracts may be exclusive arrangements that cannot be abrogated, or they may simply be more attractive than the terms available from the disease management company.
- *What providers will give treatment?* The disease management company may seek to improve medical outcomes and operating margins by using its own network of facilities, clinicians and other providers. As an alternative, it may use the providers from the health plan, improving medical outcomes and operating margins via disease management protocols and decision support systems. The former has the advantage of the disease management company having greater control over the care provided. The latter has the potential advantage of the patient's care being better coordinated across categories of care.

The two parties to a disease management risk contract should recognize the comparative advantage of production of services, rather than the absolute advantage, and should tailor the agreement to suit their own unique situation.

The final test must be an evaluation of the likely impact of the agreement on the quality of care provided. For many diseases, timely screening and treatment are essential. Successful disease management contracts provide required care quickly and efficiently. A contract that creates barriers to care will likely have poor outcomes, high administrative costs, and potential public relations problems.



EVALUATING THE CONTRACT

Any disease management contract presents challenges to both the disease management company and the health plan. The challenges can be financial and administrative as well as clinical in nature. Some diseases (e.g., cancer) have many different treatment pathways and more volatile costs. These diseases present significant challenges. Prospectively, the plan and the disease management company should evaluate the risk associated with the contract. This evaluation should demonstrate the potential financial impact of the program under different potential scenarios.

Benchmarks

An important element of managing the risk is the projection of results required for success. These performance indicators, or benchmarks, serve as the basis for evaluating the success of the contract. Benchmarks allow for comparison of actual results to expected results. The benchmarks should reflect clinical requirements, financial elements, and administrative elements, such as the following:

- Proportion of target population screened (e.g., proportion of eligible women given mammography for breast cancer).
- Utilization by major service category, particularly for categories of services where utilization will be reduced if the program is effective (e.g., emergency room visits per thousand by asthmatics).
- Cost of care (e.g., cost of chemotherapy per cancer patient treated, by type and stage of cancer).
- Administrative effectiveness (e.g., cost of administrative functions per patient or per dollar of revenue).

Evaluation Criteria

Both the health plan and the disease management company should periodically evaluate the emerging results of the contract. Health plans should evaluate the results under several criteria:

- Are the outcomes under the capitated contract consistent with clinical goals for patient treatment?
- Has the delivery of care been consistent with best-observed practice?
- Are the costs of the program meeting the financial targets?
- Are patients satisfied with the program?

Disease management companies should evaluate the programs they negotiate under other criteria:

- Did the membership and revenue covered by the contract meet or exceed the projected levels?
- Was the contract profitable?
- Was utilization by service category consistent with treatment protocols?
- If the contract was structured on a capitated basis, was the number of cases consistent with the levels assumed in setting the contract price? Was the distribution of cases by severity level consistent with the distribution assumed in setting the price?
- Under either a capitated or case rate contract, was the cost per case treated consistent with pricing assumptions?
- Under a shared savings contract, were the savings, as measured under the terms of the contract, consistent with the expected levels? With independent assessments?

In evaluating financial outcomes, the disease management company should define costs consistently with the basis used to compensate providers, rather than some other definition of “fees” or “charges”. The evaluation should reflect any subcapitation arrangements (e.g., for laboratory) and any incentive compensation arrangements, to ensure that the costs and profitability of the program are appropriately stated. Similarly, the health plan should evaluate the financial outcomes of the program using a basis consistent with its own cost structure.



MANAGING RISK

The key to managing risk in disease management contracts is knowledge. By understanding the dynamics of the disease and the associated treatment costs, the disease management company can make appropriate management decisions.

Financial Models

One mechanism for measuring and managing risk is a financial model. These models permit the evaluation of the potential impact of key risk factors on the overall cost of a program or on the range of reasonably expected results. Volatility analysis can show the impact of risk factors separately and in conjunction with other factors. Financial models can be simple or complicated, and the additional work to create complicated models usually permits more sophisticated evaluations, which include more factors that influence program costs.

As an example, a financial model for a cancer disease management program could reflect the following factors:

- Distribution of covered members or patients by age, gender, geography, or other factors important to the disease in question (e.g., smoker/nonsmoker for lung cancer).
- Prevalence of cancer in each population cell.
- Distribution of newly diagnosed cancers by tumor/node/metastasis (TNM) stage.
- Survival rates by stage and population cell.
- Treatment protocols and frequencies of service by cancer stage.
- Provider delivery system composition.
- Reimbursement methodology (e.g., discounted fees, fee schedule, relative value units and conversion factor).
- Presence of complications and their treatment costs.
- Baseline benchmarks for utilization and costs.
- Technology shifts and evolution of treatment protocols.
- Changes in treatment duration.

Such a model could estimate the potential volatility caused by secular changes (e.g., cost inflation, population aging, etc.), specific combinations of adverse assumptions, or random fluctuations.

Reinsurance

Another mechanism for managing risk is reinsurance, which can limit the potential adverse financial impact of the risks associated with a disease management contract. The disease management company may negotiate a reinsurance contract with the health plan or a reinsurance company that limits the impact of a single patient, or a contract that limits the impact of all patients combined. Either approach can help a disease management company manage the amount of risk it assumes, keeping the level of potential losses within manageable levels. Note that the presence of a disease management contract should reduce the health plan's potential need for (and cost of) reinsurance, since the volatility associated with these patients transfers to the disease management company.

Information technology

Information technology (IT) is a key requirement for risk evaluation. Both the health plan and disease management company should build the capability to assess both clinical measures of success (e.g., percent of diabetics receiving annual retinal exams) and financial measures of success (e.g., costs per patient by risk level). The analysis systems should be developed with clinical as well as actuarial support. The evaluation of results also should involve clinicians, since the payback for some preventive services, such as retinal exams for people with diabetes, may be deferred beyond the observation period.



ESTIMATING THE REVENUE REQUIRED BY THE RISK CONTRACT

General Formula

Evaluating the revenue requirements (excluding administrative costs) of health risk contracts in general can be summarized by the formula below:

$$\text{Estimated Revenue Requirement} = \text{Frequency} \times \text{Intensity} \times \text{Cost}$$

In the above formula, frequency describes the number of times an event will occur per unit of population, usually expressed as an annual frequency per thousand. For hospital inpatient, frequency can be the number of hospitalizations per thousand persons per year. Intensity refers to the complexity or volume of services per episode. For hospital inpatient, intensity can be the length of stay (LOS). Cost refers to the per-unit cost for the healthcare service. For hospital inpatient, this can be the per-diem charge.

The disease management company should ensure that its prices reflect not only the historical costs associated with providing care, but also trends in the expected cost for current treatment, and margin to cover unexpected increases described above. Margin for administrative and overhead expenses should also be included.

General Considerations

The process of estimating revenue requirements to support the negotiations for a particular contract requires that the disease management company develop assumptions for each component of the revenue formula. Those assumptions quantify the projected levels of prevalence of each type of patient, and the frequency, intensity and unit cost for providing healthcare services to those patients. These assumptions generally are made separately for each pricing factor (e.g., hospital admits and lengths of stay) and for each service category of care (e.g., hospital inpatient, physician office visits, pharmacy). They are then summed across service categories and patient types to determine the total cost.

The price that emerges from the process described above may or may not be acceptable to the potential client. If the negotiated price required to “close the deal” is less than the rate based on the experience-based rate, the disease management company needs to reevaluate the assumptions that led to its development, including:

- Scope of contract.
- Impact of protocols.
- Levels of and trends in costs and utilization.
- Changes in treatment protocols over time.
- Utilization of services.
- Administration and profit charges.

Case Rate Contracts

The above formula works well for developing case rates for many disease management contracts. In estimating the revenue requirements of a disease management contract, the elements of the calculation should reflect the specifics of the disease, the delivery system, and the population covered. For example, the formula used to estimate the costs associated with a case rate cancer risk contract should be specific to cancer patients for the frequency, intensity, and cost per service assumptions in the pricing formula.



Each specific disease presents unique challenges. Cancer case rate contracts are guarantees that the disease management company will provide required healthcare to cancer patients for a specific price. This type of contract transfers the risk of increases in treatment costs from the health plan to the disease management company. This risk transfer deserves careful analysis, since cancer care costs have tended to increase faster than costs for healthcare in general, for a variety of reasons:

- Improvements in survival, since people who live longer have additional opportunities to get sick and consume health services.
- New treatments tend to be more expensive than older treatments.
- Advances in treatment protocols (e.g., new drugs that reduce the side effects of chemotherapy permit more patients to take more aggressive, more expensive treatments than they otherwise would have).

Capitation Contracts

Capitation contracts guarantee not only the price per patient but also the prevalence of the disease in the covered population. Even common diseases covered by disease management contracts can be expected to produce varying levels of prevalence, caused only by chance statistical fluctuations. Relatively uncommon diseases will produce greater fluctuations.

For capitation contracts, where the required revenue is calculated per member per month (PMPM) rather than per patient, it is helpful to express the formula as:

$$\text{Estimated Revenue Requirement} = \text{Prevalence} \times \text{Frequency} \times \text{Intensity} \times \text{Cost}$$

As used above, prevalence refers to the proportion of the membership receiving treatment for a particular condition.

In developing a capitation rate for a cancer disease management contract, it is important to recognize some factors that will affect the assumptions used in calculating the capitation rates:

- Prevalence (people having the disease and being treated for it) and incidence (people diagnosed with the disease) are not interchangeable, because of the time required to provide treatment. For example, consider a cancer that requires six months of treatment. The patients treated under a contract spanning a calendar year will include not only those diagnosed during the year (i.e., 100% of those who are counted to determine the incidence rate), but also those diagnosed during the last six months of the prior year (approximately half of those counted to determine the prior year's incidence rate, recognizing mortality and migrations in and out of plan). Thus, the prevalence rate would be approximately 150% of the incidence rate, if treatments require six months and the population were stable.
- Any statistics used to serve as the basis for the calculation should be reviewed for appropriateness for the contract under negotiation. For example, some published statistics omit recurrences from their counts. In the case of cancer, common issues are: inclusion/exclusion of carcinomas in situ, counting of cases of cancer rather than individuals with cancer, and being restricted to a geographic area or population that may not be representative of the population covered by the contract.

Shared Savings Contracts

For shared savings contracts, estimating revenue and projecting costs becomes more difficult, and should be tailored to the specifics of the contract. First, the performance criteria and other key features of the contract should be negotiated. Once these are agreed upon, they are the basis for measuring “savings.”

Shared savings contracts present additional challenges. The very name implies a belief that savings will occur. If the disease management company can deliver care of equal quality more efficiently than the health plan, there will



be savings, compared with what the health plan could achieve. The risks associated with disease management contracts (prevalence, utilization, cost, et al.) still exist, and are borne by one or both entities.

Practical Considerations

Some disease management companies find it helpful to organize their own experience into databases to facilitate this analysis. This has the advantage of reflecting the provider network, treatment protocols, and cost structure of the disease management company. It could be advantageous to include data from outside the network, however. Such an analysis can identify structural differences in costs and delivery of treatment between the disease management company and other delivery systems, including the potential client. In addition, some manifestations of the disease may be rare in the general population, making it difficult to generalize from the relatively small number of cases treated by the disease management company.

Other disease management companies, particularly new companies, find that their own data are too sparse to permit generalizations. Such companies will conduct their own analysis on other sources of data. Others may choose to retain actuarial consulting firms to construct pricing structures to facilitate their analysis.

Evaluating the revenue required to support a disease management contract frequently reflects the historical clinical and financial results of both the health plan and the disease management company. Evaluating the prior financial experience of the health plan will help quantify the impact of the population on the utilization and cost per service (e.g., geographic and behavioral factors, such as smoking, diet, and exercise). Evaluating prior clinical experience provides a baseline for practice patterns of the providers currently providing care. For the health plan, the historical financial experience represents one benchmark against which it can evaluate the profitability of the proposed contract, and the clinical experience is a benchmark for evaluating the completeness of care and efficiency gains of the disease management contract.

Evaluating the historical, financial and clinical experience of the disease management company is important if the protocols, reimbursement basis, or provider network differs from the health plan. The disease management company should estimate the impact of changes in protocols, provider panels, reimbursement and incentive methodology, and other factors, on the experience of the health plan.



CASE STUDY: CANCER DISEASE MANAGEMENT

Issue 1: Estimating a Case Rate for a Disease Management Contract

Consider a proposed cancer carveout contract between a health plan and a cancer disease management company. For simplicity, we will restrict this example to the following:

- Medicare population only (over age 65), 25,000 members.
- Colorectal cancer only.
- Calendar year case rate basis (one year renewable), with no incentive provisions.
- One location only (New Haven/Bridgeport, Connecticut).
- Effective date January 1, 2000.
- Cancer care only (i.e., excluding care for non-cancer treatment).
- Covered services based on a typical Medicare risk contract.
- Charges based on Medicare allowed reimbursement levels.

As described above, the calculation for a case rate includes:

- Frequency (F): the utilization of each type of service per thousand patients.
- Intensity (I): the relative cost for each type of service.
- Cost (\$): the absolute unit cost.

For simplicity, this analysis ignores administrative and profit charges. It is important in estimating costs to reflect the expected utilization and cost per service of the contract. In this example, the unit costs for services should be revised to reflect Medicare reimbursement levels for the providers in the network, in the New Haven/Bridgeport area, for calendar year 2000. Other contracts will have different reimbursement and incentive methodologies, and the unit costs and utilization of services should reflect the characteristics of those delivery systems.

The prevalence of patients actively treated for colorectal cancer in the Medicare population is approximately six per thousand members. Therefore, the expected value for the number of colorectal cancer patients in our population is 150 (25,000 members x 6/1000). If the group of recent colorectal cancer patients were a homogeneous population, this would be a large enough sample size to evaluate the revenue requirements of this contract. However, differences in stage at diagnosis, treatment protocols, survival, duration since diagnosis, underlying comorbidities, and other factors will cause fluctuations and uncertainties in actual experience and in projections based on that experience. As a consequence, supplemental data should be considered.

The development of the projected case rate for this contract was based on data from the Health Care Financing Administration (HCFA) 5% sample of Medicare claims. The following process was used:

1. Identify patients in the sample with colorectal cancer, based on diagnosis codes and procedure codes.
2. Analyze the care provided to those patients to identify cancer treatment.
3. Evaluate the completeness and accuracy of the care and cost data against external sources.
4. Assign the care to service category (e.g., hospital inpatient).
5. Summarize the care by service category and patient.
6. Adjust the utilization and unit costs to reflect changes in treatment protocols (such as new radiation therapy techniques or chemotherapeutic agents), changes in duration of treatment, changes in distribution of diagnosed cases by TNM stage, or other secular trends or differences between the source data and the intended population.



- 7. Calculate utilization, resource-based relative value units (RBRVS) and per-unit costs by service category, based on the number of patients.
- 8. Adjust the case rates for the New Haven/Bridgeport area, using the appropriate conversion factors.
- 9. Adjust the case rates to reflect the specifics of the contract and the population covered.

For this contract, the following actuarial cost model reflects the best estimate of the utilization and average cost per service, and the per patient per year (PPPY) claim costs.

Table 1

PER PATIENT PER CALENDAR YEAR CASE RATE COLORECTAL CANCER PATIENTS IN MEDICARE (OVER AGE 65) POPULATION NEW HAVEN/BRIDGEPORT, CT CENTER DATE: 7/1/2000			
SERVICE TYPE	ANNUAL UTILIZATION PER PATIENT	COST PER SERVICE	CASE RATE PER PATIENT PER CALENDAR YEAR
Hospital Inpatient	0.7	\$16,650	\$10,842
Hospital Outpatient	2.5	\$263	\$646
Physician: Surgery	4.3	\$360	\$1,554
Office Visits	7.0	\$38	\$268
Chemotherapy	8.5	\$118	\$998
Radiation Therapy	1.7	\$154	\$263
Miscellaneous	17.3	\$56	\$969
Pathology	18.4	\$30	\$552
Prescription Drugs	25.6	\$16	\$419
Other (Hospice, Home Health, Ambulance, DME, etc.)	2.0	\$377	\$752
Total	88.0	\$196	\$17,263

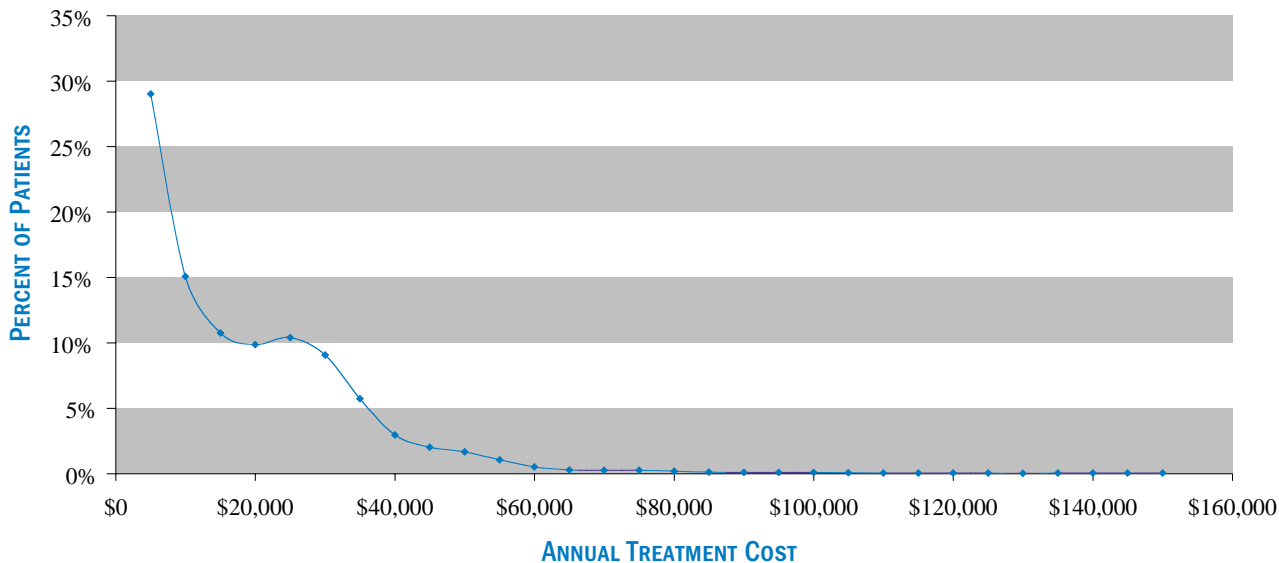
Issue 2: Projecting the range of potential outcomes

The cost model described above presents the expected costs associated with treating colorectal cancer in a Medicare population in the New Haven/Bridgeport area: \$17,263 per patient per year. However, there can be significant variations in the costs per patient. These can be evaluated by creating a financial model that reflects the important risk factors described earlier. This case study looks only at the contribution of random fluctuations.

As described above, the expected number of patients from the 25,000 members covered is approximately 150. The average calendar year cost per case is \$17,263, so the total expected cost is \$2,589,441 per year (150 cases per year x \$17,263 per case). A range of outcomes is possible for both the number of patients and the annual cost of treating those patients. Based on the prevalence of six patients per thousand members, for example, we can project that the number of patients from 25,000 members will fall between 130 and 170, 90% of the time, with the expected value being 150. This interval (130 patients to 170 patients) is referred to as the 90% confidence interval, because 90% of the results are expected to fall within it. This suggests that once in every 10 years the number of patients will fall outside this interval, either more than 170 or fewer than 130. Because this contract is on a case rate, rather than a capitation rate, the carve-out company is not at risk for fluctuations in the number of colorectal cancer cases. The HMO should recognize that the number of patients treated will directly affect its costs.

The distribution of patients treated for colorectal cancer by their annual cost of treatment is shown in the following graph:

**COLORECTAL CANCER PATIENTS, MEDICARE (OVER AGE 65) POPULATION
PERCENTAGE DISTRIBUTION BY ANNUAL TREATMENT COST**



One aspect of the distribution that is not well documented by the graph is the “tail” of the distribution. Only 5% of patients had total annual charges in excess of \$45,000. Only 1% of patients had total annual charges in excess of \$80,000. However, many of these patients had charges in excess of \$100,000, with the highest annual charge being \$450,000.



Both the HMO and the cancer carveout company may use an “average” case rate to evaluate the contract, but they also should consider the fluctuations possible under the new contract. For the health plan, this should be a positive, since they are passing on the risk for high-cost treatment. For the disease management company, this is a source of financial risk. Table 1 shows an “average” rate of \$17,263. Based on this distribution of costs, it is possible to determine confidence intervals for the case rate. These confidence intervals are shown in Table 2.

Table 2

SCENARIOS FOR COLON CANCER TREATMENT CONFIDENCE INTERVALS BY NUMBER OF PATIENTS MEDICARE POPULATION, CENTER DATE: 7/1/2000						
NUMBER OF PATIENTS	EXPECTED ANNUAL CANCER TREATMENT COSTS (\$ THOUSANDS)	STANDARD DEVIATION IN ANNUAL CANCER TREATMENT COSTS (% OF EXPECTED)	90% CONFIDENCE INTERVAL (% OF EXPECTED)		90% CONFIDENCE INTERVAL (\$ THOUSANDS)	
			Low	High	Low	High
50	\$863	15%	75%	125%	\$649	\$1,077
100	\$1,726	11%	82%	118%	\$1,423	\$3,209
150	\$2,589	9%	86%	114%	\$2,218	\$2,029
500	\$8,631	5%	92%	108%	\$7,954	\$9,309
1,000	\$17,263	3%	94%	106%	\$16,305	\$18,221
2,500	\$43,157	2%	96%	104%	\$41,642	\$44,672

In Table 2, the expected annual cost for treating 150 cancer patients is \$2.6 million (150 patients x \$17,263 per patient per year). The 90% confidence interval for the annual cost is \$2.2 million (86% of \$2.6 million) to \$3.0 million (114% of \$2.6 million). That is, for a population of 150 patients whose claims’ distribution matches the distribution shown above, the average claims per member usually will fall between \$2.2 million and \$3.0 million. This will occur 90% of the time, or nine calendar years out of 10, on average. The other 10% of the time, costs will be below \$2.2 million or above \$3.0 million. Random variation in annual treatment costs per patient causes this fluctuation.



The disease management company may not have the capital to withstand fluctuations of this magnitude. This problem can be addressed by different approaches, including:

- Growth: Adding lives reduces the random fluctuation of risk, relative to revenue, as shown in Table 2. Note, however, that additional capital is required to fund growth in risk. The advantage of growth is that the required capital increases less rapidly than revenue should increase.
- Contracting: Some cost risk can be transferred from the disease management company to providers by case rate or similar arrangements.
- Reinsurance: Ceding the risk to another entity reduces the range of potential losses, but also the expected profits of the disease management company.

Note that there are additional sources of fluctuations in total annual costs. Some of the fluctuation is caused by patient characteristics (i.e., TNM stage at diagnosis); some is caused by treatment choices. Complications and outcomes also cause some of the differential (since treatment ends at death). Thus, while a calendar year case rate approach to cancer carveouts eliminates some financial risk for the disease management company, it does not eliminate all financial risk associated with the negotiated contracts. The carveout company may not be subject to financial risk caused by the number of patients, but fluctuations in the cost of treating each patient may still cause adverse financial results.



CONCLUSION

Disease management programs offer health plans the potential for improved return on invested assets by reducing required risk capital and by improving the efficiency of care delivery, while at the same time improving patient outcomes. In addition, a disease management contract provides health plans with the opportunity to link their company name to that of a regional center of excellence, recognized for their current expertise in treating the disease. The disease management company has the opportunity to increase its market exposure and patient base, ensuring a flow of patients. The contract also creates the opportunity to improve earnings for both parties, by allowing each to focus on providing care that each does best. As shown by this discussion, however, there are significant issues regarding the scope of the negotiated agreement, and both parties should conduct a thorough evaluation of the expected healthcare financial experience before entering into a disease management contract.



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