

# An introduction to risk assessment and risk adjustment models

## Introduction

At the height of managed care, health insurers and other payers attempted to control the medical expenses of their high-cost members by establishing cost “triggers.” If a member exceeded a certain dollar amount in claim costs within a certain period, the member automatically became a candidate for case management. The case management process, which focuses on patients with acute conditions, attempted to capture savings by facilitating the transfer of patients from high-cost acute care facilities to lower-cost settings or negotiating lower rates for services with health care vendors. However, in many cases, by the time the payers identified the high-cost members, their catastrophic events had resolved, and the associated high-cost health care services had concluded.

Another managed care method of cost control is utilization review—the approval or denial of medical services based on the health insurer’s interpretation of “medical necessity.” Both case management and utilization review primarily focus on patients with acute conditions; however, not all high-cost members sustain acute health care events.

In contrast to programs that focus on acute conditions, disease management focuses on patients with chronic illness, while wellness programs aim to prevent these conditions. Disease management programs rely on prospectively identifying individuals who are likely to incur high medical costs because of chronic illness and are amenable to interventions designed to prevent exacerbations and complications of the disease, or avoid acute care episodes, thus lowering the costs of care. Some employers have developed wellness programs in an effort to educate their employees on common chronic diseases and offer incentives to encourage healthy behaviors.

In order to control the health care costs associated with the treatment of chronic diseases, health insurers and other payers have searched for new methods to identify both members with chronic diseases and members who are at risk for developing chronic diseases. Even though most chronic diseases have an insidious onset, there are herald signs and risk factors that may predict the eventual diagnosis of a chronic disease. For example, preceding the diagnosis of coronary artery disease, a patient may display signs and symptoms of shortness of breath, chest pressure and heartburn. The risk factors for developing coronary artery disease may include elevated cholesterol levels, smoking, high blood pressure, and diabetes.

In addition to finding a methodology to identify potentially high-cost members, payers of health care services are seeking ways to target physicians and other health care professionals who, the payers claim, have costs of care that exceed those of their peers. Many health insurers are now using risk assessment and risk adjustment models to not only identify patients who are at risk for incurring high-cost health care services but also profile and rate physicians on their patients’ costs of care.

## Risk assessment and risk adjustment

**Risk assessment** is the method payers use to evaluate the predicted overall health care claim dollars for each member relative to the average members in a given patient population. Payers commonly refer to a particular risk assessment method as a “risk adjuster.” There are two types of risk assessment models: (1) prospective or predictive models, which use data on a member from a previous year to estimate the member’s future expenses and to set health insurance premium rates for a given patient population; and (2) concurrent models, which draw on member data collected in the current year to explain expenses in the same period. Typically, health insurers use concurrent models to profile physicians and other health care professionals because these models capture more of the costs of actual utilization during a year, while prospective models only make predictions of future utilization.

The risk assessment process entails feeding claims data submitted by physicians and other health care professionals, which may be supplemented by data from pharmacies, laboratories and member-reported information, into risk-modeling computer programs. The methodology that these models use to predict risk and/or determine costs of care varies, but all modeling software produces a relative risk score for each member in a population when data of that population are run through the software. The relative risk score demonstrates what the population’s predicted risk or predicted cost of care will be to the payer. The relative risk score might also be used to predict the relative health risk of a particular physician practice’s patient population.

A relative risk score of 1.0 means the member is predicted to incur average health care costs for the next year. A score above 1.0 means the member is at risk for incurring higher-than-average costs, and a score lower than 1.0 means the member has a lower-than-average risk. The risk score may be based on the age and gender of the patient, the burden of illness (the type and number of illnesses), and indirect and trend factors, such as how many times the member was seen in the emergency room, the number of times the member was admitted to the hospital or the number of physicians treating the member. In a 2007 Milliman report, actuaries contend that risk assessment methods that rely solely on demographic risk factors are easy to administer.<sup>1</sup> However, these methods have relatively poor predictive value at an individual level and for risk-skewed groups.

**Risk adjustment** is the process of adjusting payments to health insurers or physicians and other health care professionals in order to reflect the differences in risk, as measured by the risk assessment step. Predictive modeling systems analyze data from one or more sources to predict which members will incur the highest costs during the next 12 months. Predictive models can be population-based or medical condition-based. For underwriting purposes, health insurers typically use a model that is population-based, while disease management companies might use a diagnosis-based model in targeting specific diseases.

There are notable differences between predictive risk assessment models and risk adjustment models: predictive risk assessment models are used to predict claim dollars, whereas risk adjustment models are designed to predict health status. The models have different data requirements: predictive risk assessment models do not have any restrictions on the type of information fed them, while risk adjustment models require detailed diagnosis and pharmacy data and generally exclude utilization, claim dollars and procedure code information. In AcademyHealth’s risk assessment publication, researchers claim that the quality of a risk assessment model is measured by its ability to accurately explain variation in the expenditures of a given individual or population.<sup>2</sup> There are no scientific studies to validate the accuracy of risk adjustment methodologies for physician profiling.

## Risk model types

Risk assessment models can be divided into four categories based on the data they use: demographic information (age, sex and geographic location); self-reported health status (obtained through health risk assessments and patient surveys); administrative data (prior expenditures, diagnosis data and prescription drug data); and a combination of any of the listed data sources.

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<sup>1</sup> Winkleman R, et.al, *A Comparative Analysis of Claims-based Tools for Health Risk Assessment*, Society of Actuaries, April 20, 2007.

<sup>2</sup> Martin K, et.al, *Health-Based Risk Assessment: Risk Adjustment Payments and Beyond*, AcademyHealth, January 2004.

## Prominent risk models

Many software vendors have developed and are marketing their risk models. The following is a list of the prominent models and a brief explanation of each product:

- Diagnostic Cost Groups (DCGs), from DxCG Inc., use age, sex and diagnoses generated from patient encounters with the entire medical delivery system to infer which medical problems are present and their likely effect on health care costs for a given population. Some versions of the DCG models focus on diagnoses that form the principal reason for an inpatient admission (PIP/DCG). Other versions, such as the all-encounter hierarchical model (DCG/HCC), use data on age, sex and all valid diagnoses to predict patients' health care expenditures, both for the period under study and the immediately following period.
- Episode Risk Groups (ERGs), from Symmetry Health Data Systems Inc., are episode-based. The episodes underlying ERGs are created using Symmetry's Episode Treatment Groups (ETG™) methodology, a basic illness classification system that uses a series of clinical and statistical algorithms to combine related services into more than 600 mutually exclusive and exhaustive categories. For a given patient, episodes experienced during a set timeframe are mapped into 119 episode risk groups, and a risk score is determined based on age, gender and mix of ERGs.
- Medstat Episode Groups (MEGs), from Thomson Healthcare, classifies disease-specific episodes of care based on organ system, etiology and severity of illness. There are 593 homogeneous MEGs. An episode of care is composed of one or more encounters, visits, procedures or inpatient admissions and is built by linking sets of health care services provided to a patient over time to treat a specific disease or health status. An episode of care continues as long as there is relatively continuous contact with the health care system for the same basic diagnosis, disease or health status. The cost of an episode includes all allowed charges for all services provided by all physicians and other health care professionals, ancillary providers and facilities related to that episode of care.
- Adjusted Clinical Groups (ACGs), from Johns Hopkins University, cluster health plan members, having similar comorbidities, into groups that have similar resource requirements and clinical characteristics. The ACG case-mix system uses a branching algorithm to place each patient into one of 84 discrete, mutually exclusive categories based on the mix of clinical groups experienced during the period under study.
- Impact Pro, designed by Integrated Healthcare Information Services (an Ingenix subsidiary), is a multi-dimensional, episode-based predictive model that uses a series of clinical algorithms to identify markers of risk (health care services and prescription drugs) to predict future medical costs and utilization.
- Multiple Intelligence Tasking Computer Heuristics (MITCH), designed by Medical Artificial Intelligence Inc. (MEDai), is a prediction engine that analyzes claims, laboratory results, health risk assessments, clinical factors, diagnoses, ETGs, pharmaceutical use and other risk markers, such as timing and frequency of procedures, insurance type, etc., to assign risk scores to individual members. The results of data analyses are packaged into a Web interface that provides payers, physicians and employers access to member-level detail for use in care and case management programs, underwriting processes and physician profiling efforts.

## Use of risk models

For years, financial institutions have used risk assessment models to determine the risk of a borrower defaulting on a loan. Business has used the process to adjust inventory and tailor products based on expected spending patterns. The health care industry uses risk assessment models not only to assess risk but also uses the models for the following operations:

- complement the processes for actuarial and underwriting functions
- identify opportunities for disease management
- profile physicians and other health care professionals

- develop tiered and narrow physician and hospital networks
- negotiate health-based payments
- evaluate managed care programs
- establish payment rates in the Medicare and Medicaid programs
- set budget and premium rates by payers

Some health insurers have extended risk-modeling capabilities to members to help them understand: (1) how much risk they should take in terms of deductible levels; and (2) their selection of physicians and other health care professionals based on their specific circumstances.

Many large employers use integrated databases to perform refined analyses of their total costs and high-cost health conditions. Information management technology allows these employers to collect information from diverse sources and perform sophisticated analyses of health care costs and usage patterns to target opportunities for behavior change. Some of these large self-payers use predictive risk assessment models to take a proactive approach with anticipated future costs rather than relying solely on cost history. Predictive modeling systems allow these payers to compare prevalent diseases at a specific company location to public health benchmarks for a specific region so the payers can intervene early through care management and disease management programs.

## Observations and concerns

In two independent research studies, numerous risk adjustment models failed to predict valid practice efficiency rankings and/or health care expenditures.<sup>3</sup>

Risk models do not incorporate all factors that may contribute to patients' health outcomes or costs of care, such as socio-economic disparities, benefit plan design, patient non-compliance with treatment plans or unresponsiveness to treatment. Therefore, the results that these models produce do not always accurately assess risk.

Unless physicians are convinced that risk adjustment is accurate, they could decide that the easiest way to achieve high scores is to simply avoid sick or challenging patients. Until models consistently perform accurate risk adjustment, their use to establish physician ranking, especially to determine payment, is ill advised.<sup>4</sup>

Some health insurers are operating under the premise that health care cost "transparency" will result in a more efficient health care system. Health insurers use risk adjustment models to profile physicians on their costs of care and then make these ratings publicly available. New York State publicly reports coronary bypass graft surgery and coronary angioplasty statistics. In a recent survey of New York State interventional cardiologists, 85 percent reported lack of faith in the risk adjustment model used, and 83 percent agreed that high-risk patients were denied PCI because of fear of public reporting. "In fact, the models used for risk adjustment have significant potential for inaccuracy and misrepresentation."<sup>5</sup>

## Conclusions

The definition of "risk" is the uncertainty of loss. However, risk is not a knob that you can turn to adjust. **All** of the patient's risk factors (e.g., age, diagnoses, comorbidities, socio-economic factors and compliance with treatment) should be considered when using risk adjustment to determine costs of care. Methodologies that use claims data and a sufficient number of cases to assign risk and severity scores to patient populations, as opposed

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<sup>3</sup> Thomas JW, Et.al, *Economic Profiling of Primary Care Physicians: Consistency among Risk-Adjusted Measures*, Health Services Research 36:4, August 2004.

<sup>4</sup> Maciejewski ML, et.al, *The Performance of Administrative and Self-Reported Measures for Risk Adjustment of Veterans Affairs Expenditures*; Health Services Research 40:3, June 2005.

<sup>5</sup> Turi ZG, *The Big Chill*, Journal of the American College of Cardiology, 2005; 45:1766-1768.

to individual patients, are generally sound. However, the rating process health insurers use to assign responsibility for costs of care to physicians relies on untested techniques that to date have not been externally and objectively validated.

Risk adjustment models used in physician profiling arbitrarily penalize physicians for costs over which they have little or no control. Moreover, when more than one physician is involved in the care of a complicated patient with multiple comorbidities, it often becomes virtually impossible to appropriately assign the costs of care to a single physician.<sup>6</sup> These cost-assignment systems are opaque to both patients and physicians.

Additionally, faulty risk adjustment methodologies used to factor costs of care impact both physicians and the patients they treat. Focusing on health care costs without appropriate adjustment for health risk may promote an inappropriate underuse of health care services, which could have a profound impact on patients' health outcomes. Long-standing patient-physician relationships may also be severed, and patients who require a large number of health care services or are otherwise disadvantaged may have difficulty accessing necessary care. Finally, risk adjustment systems that fail to accurately account for differences in the patient's health status and the related costs of care should not be used to profile individual physicians.

#### **Questions or concerns about practice management issues?**

The AMA has developed various resources and tools to aid physicians and their practice staff in developing strategies for influencing payers to make policies fair and clinically appropriate. Visit the AMA's Web site at [www.ama-assn.org/go/pfp](http://www.ama-assn.org/go/pfp) to access these resources. AMA members and their practice staff may e-mail the AMA Practice Management Center at [practicemanagementcenter@ama-assn.org](mailto:practicemanagementcenter@ama-assn.org) for assistance.

For additional information and resources, there are three easy ways to contact the AMA Practice Management Center:

- Call **(800) 262-3211** and ask for the AMA Practice Management Center.
- Fax information to **(312) 464-5541**.
- Visit [www.ama-assn.org/go/pmc](http://www.ama-assn.org/go/pmc) to access the AMA Practice Management Center Web site.

The Practice Management Center is a resource of the AMA Private Sector Advocacy unit.

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<sup>6</sup> Pham HH, et al., *Care Patterns in Medicare and their Implications for Pay for Performance*, New England Journal of Medicine, March 2007.  
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