solventum

Solventum™ Clinical Risk Groups

Measuring risk, managing care

Overview

The Solventum Clinical Risk Groups (CRGs) are a population classification system that uses inpatient and ambulatory diagnosis and procedure codes, pharmaceutical data and functional health status to assign each individual to a single, severity-adjusted group.

Each Solventum CRG represents a clinically meaningful group of individuals who require similar amounts and types of resources. Solventum CRGs can be used both to predict future healthcare utilization and cost (prospective) and explain past healthcare utilization and cost (retrospective).

The Solventum™ Clinical Risk Groups (CRGs) Classification System is the tool that applies expert clinical logic to assign each individual to that single risk group. Depending on how granular you want your data, the grouping results can be aggregated into predefined or user-defined Solventum CRGs that maintain clinical significance and severity adjustment.

Solventum CRGs use abstracted data from standard claims, can cover a longitudinal period of time (typically a year), and provide a comprehensive and clinically specific classification for a full range of populations: low income, elderly, pediatric, commercially insured and employer-sponsored populations, as well as those with disabilities, mental illness and chronic diseases.

Solventum CRGs describe the health status and burden of illness of individuals in a population and can help identify medically complex individuals within a population. Because Solventum CRGs are patient-centric, they do not focus on specific diseases or services; rather, they account for co-morbidities and measure the health status of an individual over time. The Solventum CRG classification system assigns less significance to time-limited acute diseases and can better represent how chronic disease affects post-acute resource use.

Finally, Solventum CRGs create a bridge between the clinical and financial aspects of health care. An organization can assign appropriate relative payment weights to Solventum CRGs by severity level, corresponding to the expected level of resources the condition requires. Although the payment weights correspond to the severity level, they are calculated separately from the clinical model.

Thus, any changes to the relative weights—brought on by healthcare reform initiatives, practice pattern shifts or technology changes—do not impact the clinical model. Regardless of reimbursement changes, Solventum CRGs remain a consistent clinical model.

Solventum CRGs create a bridge between the clinical and financial aspects of health care. However much the financial side of health care may change, Solventum CRGs remain a stable and consistent clinical model.
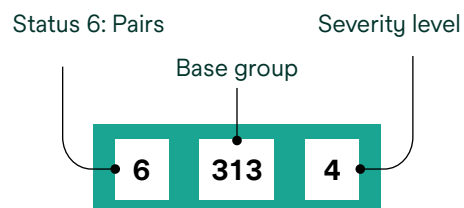
Status 6: Pairs   Base group   Severity level

6   313   4

Figure 1. Sample of the Solventum CRG for diabetes and hypertension and its component parts

Risk groups and severity-of-illness levels

With Solventum CRGs, an individual is assigned to both a retrospective and a prospective severity risk group. The five-digit classification code (see Figure 1 for an example) contains numeric representations of these concepts:

- The first digit represents the core health status group, which ranges from one, healthy, to nine, catastrophic

- The second through the fourth digits represent the base Solventum CRG

- The fifth digit identifies the severity-of-illness (SOI) level

Typically, there are four SOI levels, but in some instances, there may be more than four. The levels are numbered sequentially from one to four, indicating minor (1), moderate (2), major (3) and extreme (4) SOI.

With Solventum CRGs, high SOI is primarily determined by the interaction of multiple chronic diseases. Individuals with multiple chronic conditions that involve multiple organ systems are the difficult-to-treat individuals who tend to have poor outcomes and require high resource use. The underlying clinical principles of Solventum

CRGs indicate that an individual's SOI depends on the number and severity of the individual's underlying chronic diagnoses.

Individuals with high SOI usually have multiple serious chronic diseases or illnesses, and as the number and types of serious chronic diagnoses increase, his or her SOI may increase. For example, if asthma, congestive heart disease and diabetes are all present, the individual may be considered in the "extreme" SOI level.

Solventum CRGs: Hierarchy and characteristics

Solventum CRGs are conceptually simple, and the process of assigning a Solventum CRG uses a clinically precise hierarchical model. Each individual is assigned to single, mutually exclusive severity risk groups, both a retrospective group and a prospective group. Drawing from standard demographic, diagnostic and procedural data, the Solventum CRG classification system assigns all individuals to one of nine core health status groups, ranging from catastrophic (e.g., history of a heart transplant) to healthy (e.g., no chronic health problems or other indication of risk). Table 1 (below) shows the statuses and how each is subdivided into Solventum CRGs. For chronic illnesses and conditions, a Solventum CRG is further subdivided into explicit SOI levels.

Table 1. The nine core health status groups described by Solventum CRGs and their characteristics

Solventum CRG core health status groups (1-9)	Base Solventum CRGs (Total = 330)	Description/example of base Solventum CRG	Severity levels	Number of Solventum CRGs (Total = 1,408)
9 - Catastrophic condition status	10	History of major organ transplant	4	40
8 - Dominant and metastatic malignancies	30	Colon malignancy - under active treatment	4	120
7 - Dominant chronic disease in three or more organ systems (triplets)	28	Diabetes mellitus, congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD)	6	168
6 - Significant chronic disease in multiple organ systems (pairs)	78	Diabetes mellitus and CHF	6	468
5 - Single dominant or moderate chronic disease	125	Diabetes mellitus	4	500
4 - Minor chronic disease in multiple organ systems	1	Migraine and benign prostatic hyperplasia (BPH)	4	4
3 - Single minor chronic disease	50	Migraine	2	100
2 - History of significant acute disease	6	Chest pains	None	6
1 - Healthy/non-users	2	Healthy (no chronic health problems)	None	2

Transparent logic and a categorical model approach

The logic of Solventum CRGs is totally transparent, thanks to the Solventum CRG definitions manual, which every licensed Solventum CRG user receives. For example, this detailed reference describes exactly which conditions relating to diabetes increase the SOI level of diabetes. Such risk stratification transparency contrasts sharply to the "black box approach" taken by other systems on the market.

Solventum CRGs also use a categorical model rather than a regression (i.e., a statistical or mathematically based) approach. With Solventum CRGs, an individual may be assigned to one, and only one, category in the classification process. Solventum researchers primarily chose this approach for the following reasons:

- **Specificity of the model:** A categorical model allows highly conditional and complex clinical relationships to be specified at a level of detail that is not possible in statistical models.

- **Consistency of the model:** A categorical model allows a stable clinical model to be established independent of the resource weights an organization may choose to use for cost prediction. When reimbursement models change, the clinical model in the Solventum CRGs remains unchanged and stable. By contrast, in statistical or mathematically driven models, the resource weights are intertwined with the clinical model, requiring complete reformulation when practice patterns or reimbursement models change.

- **Clinical foundation of the model:** Solventum CRGs are clinically meaningful, so clinicians can understand why and how the methodology is stratifying risk and use the data to change practice patterns and improve patient care. Solventum CRGs are patient-centric, focusing on the total burden of illness and not on a specific disease or service. With Solventum CRGs, physicians and researchers can drill down into patient data to see what is really going on with any given patient's health status.

Unlocking the power of a categorical model

As indicated above, a categorical model like Solventum CRGs can be expressed in the form of a definitions manual that can be reviewed and understood by clinicians.

A statistical or regression model is written in the language of mathematical equations and cannot be easily understood by non-statisticians.

Both physicians and researchers appreciate the fact that because Solventum CRGs are categorical, every patient can be placed in a clear hierarchy.

As a categorical model, the Solventum CRGs are analogous to the Centers for Medicare & Medicaid Services (CMS) Medicare-Severity DRGs (MS-DRGs). The sustained success of the CMS MS-DRGs is the clearest demonstration of the power and effectiveness of a categorical model.

Table 2 (below) summarizes the differences between categorical and mathematically driven—or statistical models.

Table 2. Summary of the differences between categorical Solventum CRGs and statistical models

Issue	Categorical Solventum CRGs	Statistical model
Development method	Clinical model developed by clinicians	Statistical model developed with regression analysis
Structure of model	Clinically meaningful categories of enrollees subdivided into explicit SOI levels	Additive mathematical formula that computes a score for a beneficiary
Data used to compute output	Longitudinal claims data linked at the individual level	Longitudinal claims data linked at the individual level
Use for rate setting	Each clinical category has a payment weight that is converted into a payment amount: "Product with a price"	Numeric score is converted to a payment amount
Calculation and replication of payment amounts	Arithmetic average that is easily calculated for each Solventum CRG independent of developers	Requires regression analysis, which can be difficult to perform independent of developers
Communication value to providers	Creates a language understood by physicians because each Solventum CRG has an explicit clinical definition	Numeric score with minimal meaning or communication value
Update process	Selected clinical areas can be refined without affecting entire clinical model	Requires re-specification of statistical model
Response to changing practice patterns or technology	Clinical model is stable but payment weights can change	Requires re-specification of statistical model
Use with pharmacy and/or health status information	Clinical model is stable	Requires re-specification of statistical model
Carve outs	Clinical model is stable but payment weights can change	Requires re-specification of statistical model

Model resource use and payment rates with Solventum CRGs

Solventum CRGs were explicitly designed for clinical management, but they can also establish managed care payment rates. The Solventum CRG classification system can simultaneously explain variation in care costs and provide the clinical detail needed to design effective cost-control incentives in a value-based payment environment. They offer two other advantages:

Independent relative weights: When you license Solventum CRGs, you can associate appropriate relative payment weights with each Solventum CRG and these payment weights are calculated separately from the clinical model. Organizations derive their relative weights from actual historical expenditures archived by real payers, so they more accurately reflect actual practice patterns. Best of all, changes to these weights/payment or reimbursement models do not impact the Solventum CRG clinical model.

Outlier identification: Outliers are individuals whose resource use substantially exceeds expected levels; they can distort profiles or cause large payment losses. For each Solventum CRG clinical category, outlier thresholds are established, so outliers can be capped within the Solventum CRG Classification System. Some risk calculation models are based on a projected cost, exclude members with high outlier costs and utilization and don't consider individuals with chronic disease who are not using enough services. By contrast, with Solventum CRGs, risk is calculated based on projected cost and gaps in care, and the risk calculation includes those with high outlier levels of cost and utilization and those with chronic diseases who are under-utilizing services.

Comparing Solventum CRGs with CMS's HCCs

Beginning in 2004, CMS began using hierarchical condition categories (HCCs) to risk adjust Medicare capitation payments for Medicare Advantage plans (Part C). The HCCs are based on the health expenditure risk of the enrollees and use a risk-adjusted score that includes patient diagnosis and demographic information.

HCCs were next developed for the commercial payer market using the CMS HCC methodology, with modifications added to account for the different age ranges of a commercial patient population. HCCs are also used as a factor in calculating the total performance score under the Hospital Value-Based Purchasing (HVBP) program.

In contrast, Solventum CRGs are a categorical model, whereas the HCC algorithm is derived from a regression —or statistical— equation. Members assigned to a Solventum CRG are clinically similar; members assigned to an HCC are statistically similar, but do not necessarily share clinical characteristics.

So how do Solventum CRGs stack up against the HCCs in risk adjustment and predictive ability? In 2011, CMS asked Solventum researchers to compare the two methodologies, and the researchers published a report* that concluded:

1	When it came to predicting costs after patient discharge, Solventum CRGs predicted charges substantially better than HCCs
2	Solventum CRGs can also predict payments much better for post-acute care bundles with hospital outpatient, physician and other Part B, durable medical equipment and home health expenses
3	Although HCCs use surrogate variables in addition to clinical variables, HCCs do not perform better than Solventum CRGs

(This report also delves deeper into how each methodology works.)

* Eisenhandler, J; Averill, R.; Vertrees, J; et alia. "A Comparison of the Explanatory Power of Two Approaches to the Prediction of Post Acute Care Resources Use." Special research report published by 3M Health Information Systems in 2011 and funded by the Center for Medicare & Medicaid Services. Available online as of July 2016 at **http://go.cms.gov/1NXsVeX and at http://go.cms.gov/1rlpdHd**.

Solventum CRGs have found validation in the real world

Solventum CRGs have undergone extensive independent validation and are used in population health initiatives by several state data commissions, health departments and commercial payers. They are currently deployed in Colorado, New York, Texas and Quebec.

The following are a few examples of how Solventum CRGs have been put to work:

Quality outcomes and total cost-of-care management for managed care and accountable care organizations (ACOs) in state Medicaid programs, such as Texas and New York

Outcomes-based payment programs used by commercial payers and regional/national health plans, including many Blue Cross® Blue Shield® organizations

Public performance reporting and all payer claims database analysis by state agencies, including the Utah Department of Health and the Texas Health and Human Services Commission

Population health and episodes-of-care analyses for the Medicare Payment Advisory Commission (MedPAC)

Comparisons of quality and utilization in special needs delivery programs, such as HIV, mental health and substance abuse

Solventum CRGs are an integral component of the Solventum™ Patient-focused Episodes (PFEs) Classification System and Solventum™ Population-focused Preventables (PFPs) Classification System, and they also form the risk-adjustment foundation for numerous Solventum analytics products.

Getting started with Solventum CRGs

Solventum CRGs were designed to run on readily available data—no special "fuel" required—so healthcare payers, providers and researchers can apply them more easily and cost-effectively to their projects and data analysis.

All the data elements that Solventum CRGs require to determine individual risk factors are available in standard claims forms for both inpatient and outpatient care. The data does need to be linkable over time to a single individual who has a unique identifier. Specifically, the data elements used by the Solventum CRGs are:

- Principal diagnosis and secondary diagnoses coded in ICD-9-CM, ICD-10-CM, and ICD-10-CA (Canadian diagnoses)

- Procedures coded in ICD-9-CM, ICD-10-CM, HCPCS (including CPT®), CCI (Canadian Classification of Health Interventions), CCP (Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures) and Alberta Health System Codes

- Age

- Sex

If pharmaceutical data (NDC, DIN, ATC codes from retail pharmacies) and functional health status data elements are also available, Solventum CRGs can use them to stratify SOI. This is especially important for illnesses in which a diagnosis code is not overly informative (e.g., stroke patients). These data elements from all sites of care over a defined longitudinal time frame are combined together on an individual basis to determine the base Solventum CRG and individual SOI level.

Solventum CRGs are proprietary to Solventum, but once your organization licenses the methodology and the Solventum CRG Classification System, you receive the current edition of the Solventum CRG definitions manual and regular software updates in October to incorporate ICD code modifications. Originally released in 2000, Solventum CRGs periodically undergo major clinical updates, including Version 2.0 in April 2016.

Additional insights into Solventum CRGs

Solventum CRGs were originally developed in the late 1990s as a proprietary product by the Solventum Clinical and Economic Research (CER) team in Wallingford, Connecticut. The first formal release of the methodology occurred in October 2000, followed by multiple updates over the years; another major update, Version 2.0, was released in April 2016.

From the start—and continuing today—the Solventum CER team develops the Solventum CRGs through an iterative process of formulating clinical hypotheses and then testing the hypotheses with historical data. First, separate clinical models are developed for each base Solventum CRG, and the risk factors that impact the SOI are identified. Next, historical data is used to review each clinical hypothesis. Individuals with a high SOI are generally expected to incur higher costs. However, if discrepancies are detected between clinical expectations and data results, the clinical expectations are always used as the basis of the Solventum CRGs.

Finally, an expert panel of clinicians from various specialties reviews all logic for clinical accuracy. Customer feedback and the results of constant clinician review and validation are embedded in the Solventum CRG development process, so the methodology exists as a constantly evolving clinical model that is also extensively reviewed and updated against historical data.

The Solventum CER team also understands the importance of including pediatric content in the Solventum CRGs (or any other SOI system), since non-Medicare data is included in provider comparisons. For the pediatric content contained in early Solventum CRGs, Solventum partnered with an organization then called the National Association of Children's Hospitals and Related Institutions (NACHRI).

Today, the Children's Hospital Association (CHA) uses Solventum CRGs as its measurement of choice and also collaborates with Solventum to further develop and refine the Solventum CRG Classification System. As a result, Solventum CRGs still have the most comprehensive and complete pediatric logic of any chronic-disease-based SOI system.

Contact Solventum today

For more information on how our software and services can assist your organization, contact your Solventum sales representative, call us at 800-367-2447, or visit us online at **Solventum.com**.

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