Health Risk Analysis:

The Need for a Model that Tracks Disease Progression

By Raymond Gavery, M.D.
Clinical Professor, College of Health Sciences, UWM
Chief Executive Officer, US HealthCenter, Inc.
Executive Director, Healthcoaches of America

As we analyze the success to date of wellness initiatives to lower health care spending, the consensus is that our progress has been moderately effective at best, both in terms of health risk reduction and cost savings.

Currently, the majority of programs use health-risk analysis, lifestyle modification and telephonic disease management. While this can be a successful formula for health promotion and cost reduction, most vendors lack the necessary tools to optimize its effect. Current programs use mortality-based assessment approach that lacks the accuracy of multivariable health-risk predictive modeling, and, in many cases, fail to provide a meaningful accountability for wellness activities and/or reach the full potential of cost reduction. It is apparent the current mortality-based approach needs to transition to the next level of predictive methodology, one that provides greater disease-specific risk accuracy and evidence based return on investment (ROI).

Assessing Mortality-Based Programs

The perceived benefits of mortality-based programs is the notion of their low cost, "ease-of-use" and cost effectiveness.

However, this approach has numerous disadvantages: The mortality model is based on a 10-year period, which is not actuarially significant and does not generate a sense of urgency. Ask a person what their plans are for the next 10 years and most people could not give a definitive answer because they do not seriously plan that far ahead. But, if we ask them what they are going to be doing in the next one to three years, most individuals will have some well-defined plan of action.

Compiling risk factors into a linear predictive model that predicts health risks by odds of acquiring a disease in 10 years compromises the model's effectiveness. It also yields poor outcome results because it relies on a debit/credit methodology for tracking risk-resolution progress. Therefore, the ROI in the mortality-based model is rarely justified.

A methodology that uses a linear progression of risk factors fails to address all the thresholds of pathogenesis and appropriate points of intervention. A mortality model typically uses a simple compilation of risks determining risk levels for a medical condition by "stacking" risk factors on top of each other, to determine their risks' levels:

- One risk factor = some exposure
- Two risk factors = low exposure
- Three risk factors = moderate exposure
- Four risk factors = high exposure.

The mortality model is more organ system oriented than it is disease specific. It may address the probability of developing a digestive, cardiovascular or malignancy problem, but it does not specifically identify which particular digestive, cardiovascular or cancer disease is present, what stage it is in, or how should it be individually addressed.

The methodology is too simplistic to determine disease thresholds, best evidenced points-of-intervention, especially in the pre-disease stage. It lacks the capability to discover the high risk in the pre-disease (preclinical) stage, which provides the greatest opportunities to avert the costs of a catastrophic medical occurrence before the disease strikes. It is difficult to quantify or accurately calculate ROI using the mortality model.

The Morbidity Disease Progression Model

The alternative to the mortality predictive model is the Morbidity Disease Progression Model™, which is the next generation of predictive modeling. It is based on a disease development process that identifies various pathogenic stages and their points-of-intervention, to deliver just-in-time, cost-effective intervention.

The driving factor behind predicting disease incidence in the morbidity progression model is understanding the behavior of various aggregated risk factors and their interaction with other medical conditions. The Morbidity Disease Progression Model™ uses complex algorithms that include a multitude of subjective and objective variables, which influence the diseases pathogenic development.

Identifying the disease progression stages is a necessary tool in

appropriate and cost-effective treatment of all chronic diseases. If we can predict the risk, predisease, disease and end-stage of a disease, we can intervene in time to either eliminate or attenuate the pathogenic process of disease progression. Therefore, at every stage of disease, we can apply a preventative or preemptive intervention to avoid the most expensive outcomes.

The risk factors and their weight are determined by meta-analysis, multivariable regression formulas and exponential morbidity progression analysis. Risk factors are also aggregated and analyzed to address the interaction of risk variables.

The Predisease Morbidity Progression Model™ is designed to discover the threshold of each pathogenic stage of both, the preclinical and clinical disease progression, identify effective points-of-intervention and assess their potential costs and outcomes. Health outcomes are determined by objective measures of disease-specific parameters to which are attached cost associated with preventive/ preemptive medical and lifestyle interventions.

This health evaluation model can be applied across the entire spectrum of chronic disease management. It accurately predicts attack thresholds and appropriate best-evidenced risk intervention protocols by determining principal risk endpoints and the duration of disease progression.

Focusing on the Pre-Disease Phase

Disease morbidity (the process of disease development) is a natural progression of predisposed and acquired risk factors for a specific disease over a determined period of time. The rate of progression depends on the weight of individual risk factors, their aggregation, duration and the targeted organ.

Each disease has a pathogenic pathway with a specific period of development before the onset of signs and symptoms. It follows an exponential curve that begins slowly, then accelerates rapidly as the disease reaches its critical point-of-attack and coverts into disease. This asymptomatic pre-disease phase depends on reversible and irreversible risk variants and the morphology (composition) of the organ.

The morbidity process typically starts between 10 and 30 years of age. A group of risk factors have to reach a density threshold level to begin the morbidity process. Each additional risk level will intensify the morbidity rate and decrease the disease attack time.

Identifying risks in the pre-disease phase is important because it impacts the cost and type of intervention needed. Pathogenic progression in the pre-disease phase is managed by prevention and pre-emptive intervention. Once symptoms are present and the disease enters its clinical phase, protocols must shift to ongoing disease management to stop or slowdown its progression to the end-stage.

Categorizing Risk Factors

The morbidity model makes it possible to assess disease onset in a one to three-year window, rather than the ten-year period associated with the mortality approach. Risk factors that contribute to the morbidity process are grouped into reversible and irreversible risk factors and comorbidities. Next, health risks are organized into categories: lifestyle, pre-disease and disease, after which they are placed into different buckets of intervention according to their priority. A flexible, menu-driven report enables coaches, providers, actuaries and employers to assess specific segments of individual or aggregate health risks. These include:

1. Lifestyle health-risk analysis

2. The probability of disease onset in a three to five year window

3. Specific disease progression thresholds with points-of-intervention, costs and predicted outcomes for each stage of the disease

4. Appropriate drug therapies and the cost-effectiveness of their utilization

5. Origins of generated cost and network cost and quality of care analysis

6. The comparison of cohort health risk incidence with the national statistics layered by demographics

7. Absenteeism and presenteesim analysis

8. Patient trend segmentation, including health awareness, health quotients, compliance, barriers, patient advocacy, provider accessibility and satisfaction.

The mortality-based assessment approach has served the community well by making employers, employees and health plans aware of the benefits of reducing health risks.

However, the inherent limitation of the mortality-based model must give way to the new generation of risk analysis based on the relationship and the impact of health risks, predicated on individual disease morbidity progression time.

The Predisease Morbidity Progression Model™ predicts all stages of disease progression including the risk aggression, predisease, disease and end stage of the disease. It is the preclinical or pre-disease stage (the stage before symptoms occur) that has the greatest impact on the medical cost reduction. Attacking disease during the pre-disease phase will achieve the ultimate goal of wellness programs: preventing disease and related treatment costs by keeping people healthy.