PATIENT RISK STRATIFICATION

Predict, Prioritize and Prevent Risk

A Scalable Health White Paper

SCALABLE HEALTH

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EXECUTIVE SUMMARY

The healthcare industry is undergoing a significant paradigm shift from a fee-based model to a Value-Based Care (VBC) model to encourage innovation, quality, and efficiency. In addition, hospitals and other healthcare environments are producing volumes of data beyond the current processing capabilities of existing legacy systems. Locked in this data are correlations to improve care outcomes and better manage scarce resources.

Artificial Intelligence (AI) and machine learning can support the changing healthcare landscape by offering insights that will improve care outcomes, reduce inefficiencies, and drive down costs to meet the demands of value-based care contracts. These insights allow doctors to quickly assess patient populations, meet their care needs, and align resources through risk stratification.

It is widely accepted that it is best for patients to avoid emergency admissions to hospitals and to care for these patients at home when possible. To help identify those patients at high risk of emergency admission, Risk Stratification Models have been developed. General Practitioners (GPs) and their staff can use these tools to identify high-risk patients and provide extra care to keep them safely at home.

Risk stratification tools use predictive models to forecast future health events, both clinically and administratively. These tools categorize populations based on a chosen metric, like readmission probability.

Generally, these predictive models employ algorithms (e.g., statistical or machine learning) to analyze the relationship between various parameters (age, gender, clinical data, diagnosis, living situation, location, etc.) and a predicted outcome (readmission, mortality, healthcare costs, length of stay, etc.).

Data Analytics and AI are essential for improving patient risk stratification models by integrating clinically relevant data into health IT platforms offering actionable information to providers to better manage population health concerns and care coordination. These tools ensure providers are operating with real-time data offering the latest intervention strategies and treatment protocols given the patient´s risk factors. The resulting insights will be used to guide safe, appropriate, and effective care to the patient.

The future of risk stratification needs to integrate data from whatever sources are available (EHRs, IoT devices, population health data sets) in real-time to accurately access an individual patient's risk factor and to assist the provider in determining the most appropriate proven treatment protocol for the best care outcome. Further, risk stratification tools will help healthcare organizations access their patient populations to understand their risks to assist providers in managing their resources to meet the needs of all their patients.

INTRODUCTION

Risk stratification accesses patient populations to determine the likelihood that an individual will experience a particular outcome. A risk score may indicate the likelihood of a single event, such as hospital readmission within the next six months, while a risk stratification considers multiple risk factors to create a complete patient profile to better meet his ongoing healthcare needs.

To support value-based care, providers need to stratify patients by risk to identify and address high-priority issues that impact larger groups of patients. This permits healthcare organizations to intervene or mitigate these risk factors to forestall or avoid costly events, and ensure that the individual needs are met in a timely and efficient manner.

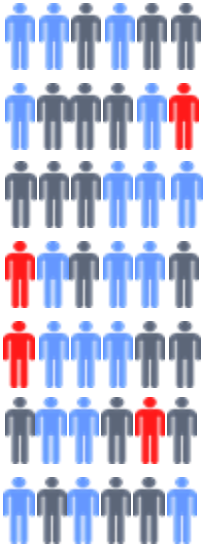
Two emergency room patients illustrate different readmission risks. A child treated for a sprained wrist, with no other symptoms, was low-risk. Conversely, a man in his sixties with chest pain, a history of heart disease, type 2 diabetes, and obesity was at high-risk. This patient needs more extensive follow-up care, including medication management, dietary guidance, and primary care visits, to minimize the chance of readmission.

Beyond understanding an individual´s risk, healthcare organizations need to understand population risk to help manage their resources and personnel. Sorting patients into risk tiers (high risk, rising risk, and low risk) increases a healthcare provider´s understanding of their patient population allowing them to design interventions to proactively address the needs of at-risk patients. Risk stratification models heavily weigh comorbidity factors, as studies have shown their presence significantly increases the risk of readmission along with the patient´s ongoing cost of care.

Risk stratification models are used for population health management. Based on the risk assessment, healthcare organizations can design intervention protocols and treatment options to best meet the needs of the patient based on proven predictive data.

RISK STRATIFICATION

Traditional Transactional Care



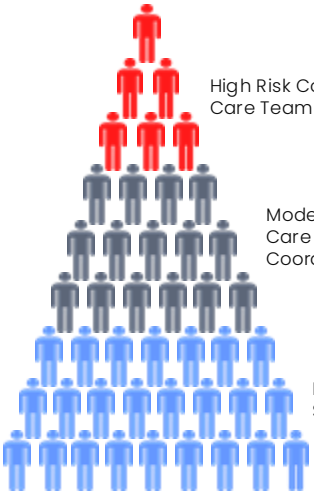
- Proactive member outreach and engagement for preventative services

Required Competencies

- Define and prioritize patient populations(e.g. risk stratifications).
- Identify and enable optimal interventions(e.g. decision support).
- Engage patients and caregivers(e.g. outreach and education).
- Monitor patient compliance and provider adherence to care plans.
- Assess outcomes(e.g. clinical, experience, financial, utilization, variance).

- Transitions in care
- Chronic disease management
- Address gaps in care

Population Driven Care



- Active case & disease management
- Transition in care
- Address gap in care
- Pharmacy Interventions

WHY RISK STRATIFY FOR YOUR PATIENTS

The value-care approach to health seeks to improve care outcomes while eliminating inefficiencies and reducing costs. Risk stratification is a tool to efficiently identify the best care options based on proven care outcomes in patients with similar risk factors. Through predictive analytics, providers can develop interventions based on population health data to mitigate these risks and improve outcomes. To be effective, predictive analytics must be timely, role-specific, and actionable.

Improved Outcomes

Combining data from various sources (EHRs, population health data, current vitals) with established risk stratification methods helps practitioners assess a patient's readmission risk. This comprehensive patient profile, including proven treatment options for similar risk profiles, helps fill any knowledge gaps and allows doctors to prescribe optimal care protocols to minimize hospitalization risk. Early agreement between provider and patient on a care plan and necessary support increases the likelihood of a successful outcome.

Reduced inefficiencies

The risk stratifications will assist healthcare organizations to predict readmission rates allowing them to manage hospital utilization and the supporting resources needed based on the stratification. As risk profiles are developed in the model, proven care options will be associated with each risk profile improving care outcomes. Predictive risk scoring will allow care providers to prioritize high-risk cases, and develop supporting workflows and staffing plans to preemptively monitor medication adherence, lifestyle factors, and follow-up appointments.

Lower Costs

Risk assessments will result in earlier interventions, precision treatment options, and greater patient engagement resulting in fewer readmissions and healthier patients. This will reduce the frequency of acute care scenarios thus driving down overall costs. Prioritizing our patient´s needs will further enhance the patient experience for greater member retention for providers.

BENEFITS OF USING STRATIFICATION

The use of risk stratification tools in combination with a care management plan can improve patient outcomes.

- Offers insights to provide levels of care that are tailored to an entire population and individual patients
- Maximize population/patient benefit at a given level of resources
- Permit providers to cope with versatility in care delivery by addressing patients across all acuity levels (health risks), accounting for prevalence and progression of different long-term medical conditions and accounting for regional differences in patient case-mix
- A means to inform policymakers, healthcare commissioners and medical specialists on expected outcome and expected (direct) costs on healthcare resource utilization for various intervention programs for an entire population or an individual patient.

BETTER STRATIFICATION WITH BETTER DATA QUALITY

Today´s hospitals are overwhelmed with data from disparate sources.

- Most healthcare data is unstructured. Data exists in patient files, lab results, doctor´s notes – rather than a standard format.
- Data quality is not reliable or available in real-time.
- There is not a universal patient identifier.
- Data often resides in legacy systems that do not communicate with other legacy systems.

Data that is not actionable is not useful. Therefore, healthcare organizations need seamless and patient-specific ways to integrate the data into platforms easily accessed by providers, care managers, and healthcare administrators.

HEALTHCARE DATA GROWTH

DATA AVAILABILITY

Operations must run and data be in a state of CONTINUOUS AVAILABILITY

20%
OF THE BUDGET

HEALTHCARE IT BUDGET

Data storage constitutes more than

365
DAYS A YEAR

24/7
DATA GROWTH

Healthcare data is growing at rate of

24/7
EACH YEAR

Electronic health data in the healthcare industry by 2020 is expected to grow to

25,000
PETABYTES

The average hospital has

800,000
PATIENT RECORDS

In 2015 it will generate over

600 TB+
OF DATA

CURRENT RISK STRATIFICATION MODELS

Risk stratification models have traditionally used medical and pharmacy claims data combined with other sources, such as electronic health records (EHRs) to identify patients at risk. Unfortunately, providers do not always have access to all claims for their attributed populations within an actionable timeframe.

Some of the more well-known and utilized models to analyze and predict risk include:

- Hierarchical Condition Categories (HCCs) — developed by the CMS Medicare Advantage program to classify patient risk by grouping health conditions that use comparable resources into 70 categories. Each HCC receives a weight that impacts the patient's risk score.
- Johns Hopkins Adjusted Clinical Groups (ACGs) — predict a person's health over time with existing claims, EHR, and demographic data, and help understand the health needs of a population or subgroup.
- Elder Risk Assessment — assigns a risk score to people 60 years and older using demographic data.
- Chronic Co-morbidity Count (CCC) — using public data from the Agency for Healthcare Research and Quality (AHRQ), this model measures select comorbid conditions in six categories

Current risk models, designed for actuarial risk quantification, are inadequate for managing care delivery and resource allocation. They struggle to incorporate the massive amounts of data now available in healthcare. Moreover, research indicates these traditional models only explain about 10% of a patient's overall health outcome.

Social determinants of health (SDOH), the conditions in which people live, significantly impact health outcomes, accounting for an estimated 70% of them. Including broader datasets that capture SDOH allows providers to identify more care gaps than traditional risk models. This also gives healthcare organizations valuable insights into what drives patient engagement, enabling providers to connect patients with the most effective interventions, services, and resources for improved outcomes.


Prioritize Interventions
Patient Engagement
Predict Risks
Preventive Care
Communicate
Exercise
Nutrition

SOCIAL DETERMINANTS INCLUDE

- Safe Housing
- Clean Water
- Healthy Food Options
- Access to Healthcare
- Educational, Economic, and Job Opportunities
- Transportation Options

To accurately assess patient risk, we must build a comprehensive profile that goes beyond clinical data. This includes considering environmental factors like social determinants, lifestyle, and mental health. Understanding financial and logistical barriers to care is also crucial. By integrating these diverse factors into risk scores, providers can gain a complete picture of a patient's risk and develop tailored care plans.

STRATEGIES FOR RISK STRATIFICATION MODEL DEVELOPMENT

Risk stratification is a screening tool using prognostic predictors to assist providers in making informed decisions relative to treatment options.

Risk prediction models are used in clinical decision making to assist healthcare teams and patients make informed choices about treatment options. Statistical models are used to predict how a patient with a given set of risk factors (current health event, comorbidity factors, and patient history) is likely to respond to various types of treatments and what care outcome is to be expected. Often, there may be existing evidence (from published risk models, meta-analysis, and expert opinion) that will guide the care team in prescribing certain courses of treatment.

When new predictors are introduced, or the condition variables are unique, the need for a new risk stratification model may exist.

The initial development of a risk model begins with a systematic review of historical data and studies pertaining to the outcome to assess. These historical data sets in conjunction with consultation with clinical experts begin to identify a set of candidate predictors.

Getting participating clinical stakeholders to agree on what is the right way to measure risk, classify patients into a risk category, and identify which predictable variables are appropriate can be a challenge. Providers will often differ on how to weigh risk factors, the best course of treatment, or the level of patient engagement. Patients are encouraged to get a second opinion, and a third and a fourth - leading to further confusion and frustration. Risk stratification intends to correctly identify the risk potential and deliver the most appropriate response to mitigate said risk.

MODEL DEVELOPMENT

When developing risk stratification models, the first step is to define the patient population and the particular risk to be identified. For example, the risk of readmission of males over 60 following an angioplasty. This allows payers and providers to understand the potential risk factors from which to develop recommended treatment protocols and to define the benchmarks of success.

- Identify the outcome to be measured – for example, readmission from complications from surgery.
- Determine the predictor variables to be considered – sex, age, health history, and condition. Standard regression methods then calculate the individual´s risk of the occurrence of readmission.
- Healthcare practitioners were more likely to embrace new methods of case finding if they were consulted at every stage.
- If they could see a clear benefit to their patients, they were much more prepared to make some of the changes in practice required and less likely to see risk stratification tools as an attack on the clinical judgment.
- Adoption by clinicians is enhanced by user-friendly portals so that health practitioners and, where possible, patients can access useful information, often linked to decision aids relevant to the patient's risk.
- Data protection and privacy issues need to be addressed early in the development process.

Validated, prognostic stratification tools, enhanced by AI, enable personalized care plans that address comorbidities and complex patient contexts beyond single-disease pathways.

ENGAGING PATIENTS FOR BETTER HEALTH MANAGEMENT

AI has demonstrated the ability to identify early risk indicators in advance of traditional means. These indicators allow healthcare providers to deploy predictive interventions for better outcomes. Once a risk has been identified, patient engagement is essential for better health management.

It is proven that poor lifestyle choices, such as an unhealthy diet, drinking, or not exercising, are key contributors to the progression of

preventable chronic diseases including obesity, diabetes, hypertension, heart disease, and several types of cancer.

The benefits of lifestyle changes are readily understood by most patients but can be difficult to adhere to. Healthcare organizations need to develop wellness programs that encourage and support healthy behaviors such as nutritional counseling, exercise training, and stress management techniques.

Ensuring the right patient receives the right intervention at the right time is the end goal of patient engagement. The power of identifying patients at risk and the capacity of the health system to proactively deal with these patients is a powerful combination to improve quality and efficiency at the health system level.

BIG DATA AND AI IN PATIENT RISK STRATIFICATION AND CARE COORDINATION

Big Data Analytics coupled with machine learning can analyze large data sets to better understand primary risk factors and the impact of comorbidity conditions to develop intervention strategies to delay or prevent disease progression.

Big Data offers the opportunity to develop even greater precision of risk stratification. Disparate data sets from various institutions can be loaded into a data lake to create even larger data sets to assess. The universe of data is no longer

limited to a single study or providing institution. The more data available to analyze results in more precise insights.

Artificial Intelligence will learn from these insights and begin to link care coordination with risk stratification. All clinical stakeholders from primary care to specialists will understand the patient´s needs and preferences resulting in a better patient experience and improved outcomes.

Enhanced care coordination will ensure providers are operating with real-time data offering the latest intervention strategies and treatment protocols given the patient´s risk factor. These insights will be used to provide safe, appropriate, and effective care to the patient.

RISK STRATIFICATION
BIG DATA & AI PLATFORM

RISK STRATIFICATION

Aggregate data From across the Enterprise.

Create registries to Identify patients with Risk factors.

Rate setting

Patient profiling

Care management

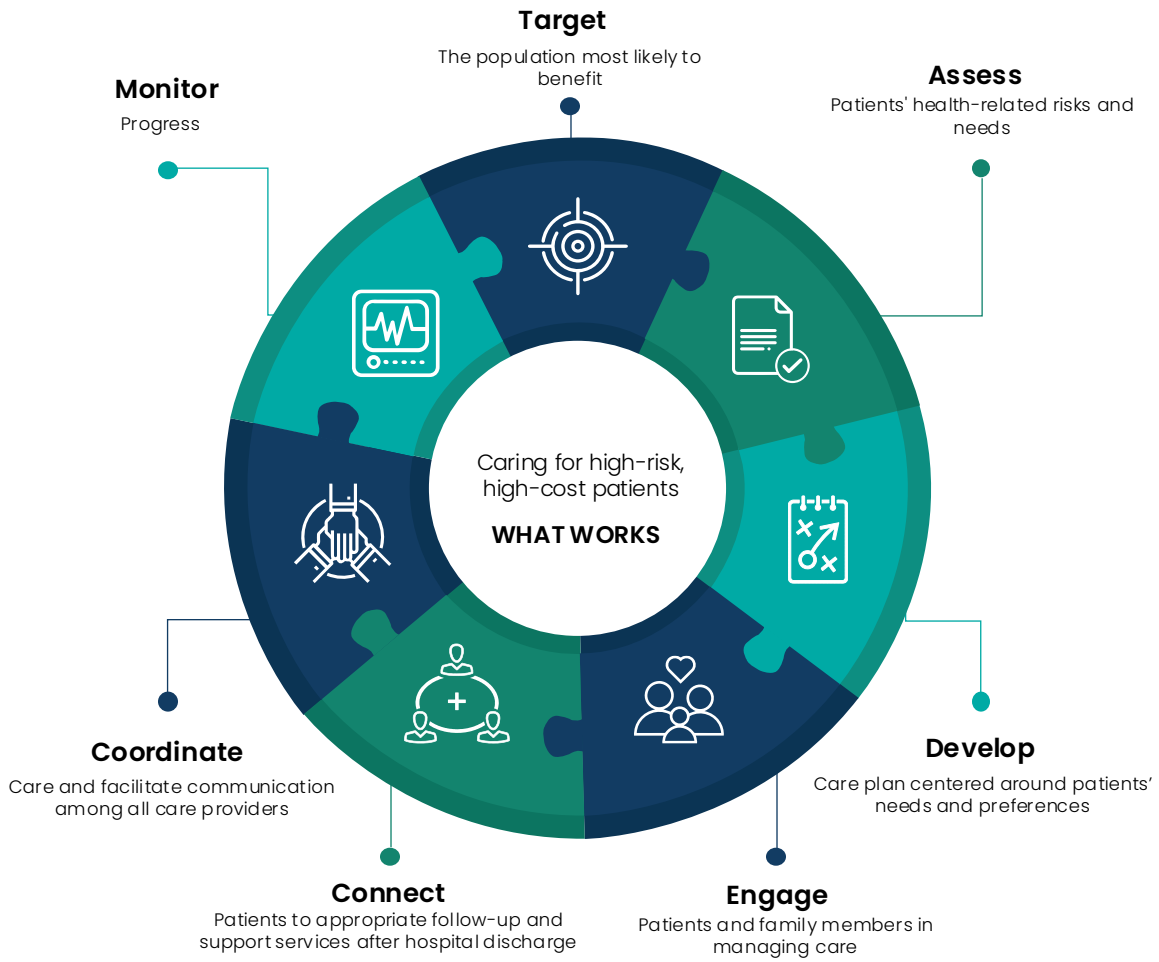
Negotiation of care contracts

Predict utilization

Predict cost

Decide case management program

IMPROVING PROACTIVE CARE WITH RISK STRATIFICATION



FUTURE OF RISK SEGMENTATION

Risk stratification tools are used to refer to all models, tools, and systems that use algorithms to predict future risk of mortality, morbidity, or health service usage (including hospitalization, re-hospitalization, and pre-hospital service usage) for a particular defined population. The challenge is to leverage machine learning, AI, and other analytics to create decision-support algorithms and data context that creates real value. AI will result in more precise risk stratifications to better understand the patient´s risk factors. The future of risk stratification will be about building even greater data sets incorporating more predictor factors. When a patient presents, regardless of individual history, providers will have a wider spectrum to consider when performing a risk assessment. This will lead to earlier interventions, improved outcomes, and a reduced need for acute care. Digital health solutions are changing how providers deliver health care. From machine learning to identify early disease indicators to telehealth solutions to expand access to treatment, healthcare providers are beginning to realize the benefits of technology. With a continued focus on value care, doctors are intervening earlier to address mental health concerns to avoid acute care scenarios whenever possible. Risk stratification offers screening tools to efficiently identify a patient´s risk factors.

AI ENHANCED RISK STRATIFICATION POWERS VALUE-BASED CARE

In treating patients, doctors look at an existing condition and seek a proven course of treatment. Finding the right treatment at the right time is essential for successful outcomes. This is further complicated when a patient suffers from multiple conditions. The additional conditions present multiple risk factors when considering treatment options. Risk stratification builds algorithmic models to better understand the impact on risk when comorbidity exists (the presence of one or more additional diseases or disorders co-occurring with the primary disease or disorder). These models assist healthcare teams in prescribing proven treatment options based on the risk factors present. The more data we can feed these models, theoretically the more accurate the risk assessment. In addition to comorbidity factors, these models should incorporate social determinates, as well. While hospitals and other organizations produce terabytes of data, they are unable to harness it to develop valuable insights. Predictive insights are still locked in the unstructured data residing in disparate legacy systems and other sources. Data Analytics can harness these data sources offering valuable data sets for risk stratification modeling. Machine learning can improve these models creating better risk assessment tools. With advanced risk stratification models, providers will be empowered to predict, prioritize, and prevent disease progression for better health outcomes.

About Scalable Health

Scalable Health is healthcare division of Scalable Systems focused on providing innovative products and solutions in healthcare and life sciences market.

www.scalablehealth.com

About Scalable Systems

Scalable Systems is a Data, Analytics & Digital Transformation Company focused on vertical specific innovative solutions. By providing next generation technology solutions and services, we help organizations to identify risks & opportunities, achieve sales and operational excellence to gain an innovative edge.

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