Healthcare Provider Improves Patient Outcomes Through Preventative Care with Progress Semaphore

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CASE STUDY

INDUSTRY
Healthcare

PRODUCT
Progress Semaphore

SUMMARY
When a U.S. healthcare provider agency launched a campaign to prevent fall accidents among seniors, they leaned on the Progress Semaphore semantic AI platform to identify individuals at risk of falling in order to improve patient care and reduce healthcare costs.

Challenge

As medical technology evolves and medical care improves, life expectancy rises. In 2019, the overall life expectancy in the United States was 78.8, up from 77.9 in 2007.

Each year, one in three individuals over the age of 75 will experience a fall. In four out of ten incidents the result will lead to hospitalization, a long period of immobilization and recovery, surgery or in some cases death. As the population ages, this problem becomes more acute and more expensive.

In the US, health care providers are moving toward a value-based care model, which emphasizes preventative care to improve outcomes and lower overall costs. An individual is considered to be at-risk if they are over 75 years of age and they have at least two risk factors associated with falls.

When the risk factors are combined with drugs and drug families known to affect balance, the risk of falling increases. How can health care providers identify the at-risk population and reach out to them to mitigate the risk and at the same time reduce medical costs?

One senior care agency wanted to leverage predictive analytics to identify individuals at risk of falling in order to improve patient care and reduce overall costs. Their challenge was that the available information—patient medical records, at home caregiver and visiting nurse's notes and social worker observations—were housed in different systems within different organizations and varied in structure, type and nomenclature.

Solution

The senior care agency applied the power of semantics to their disparate data sources. With the help of Progress® Semaphore™ semantic AI platform, they were able to automate the process of extracting relevant facts from the individual data stores and associate them to identify patients at risk. Using next-generation graph-based search tools, they could explore the content, identify patterns, look for relationships and arrange preventive intervention before damaging incidents occurred.

The organization leveraged the U.S. National Library of Medicine's Medical Subject Headings (MeSH) public ontology as a starting point. Using Semaphore's Knowledge Model Management (KMM) tools, they built out additional detail for their area of interest, adding terms that corresponded to potential incidents and environmental hazards. They built associations between drugs and drug families and the risk of someone falling using a specific "risk increasing drugs" relationship. Similarly, they associated environmental hazards such as loose carpet, steep stairs and missing handrails with the risk of falling.

This detailed model of the problem space enabled Semaphore's Classification and Language Services (CLS) to extract facts from unstructured, semi-structured and structured content including doctors' records, social worker reports and comments from care givers and visiting nurses. Sophisticated Natural Language Processing techniques within Semaphore ensured a high degree of accuracy in the created metadata, which was expressed as RDF triples; the semantic web standard for expressing facts and relationships.

The resultant model and triples were ingested into a graph database, and data analysts created queries to analyze the data, discover the content and identify patterns and connections between risk factors and individual patients. The healthcare provider could integrate the information into line of business applications so that risk factors could be viewed by physicians and other providers' routine reviews of the patient record.

As every fall matters, the healthcare agency believed there was still an opportunity for additional improvement. After some research, they identified a missed opportunity to leverage what relatives may spot during a visit or hear over the phone. They developed a mobile feedback app where relatives could leave messages such as "Mom mentioned she was feeling dizzy yesterday" for nursing staff. These messages are incorporated into the analytics system and provide a new dimension to the prevention campaign.
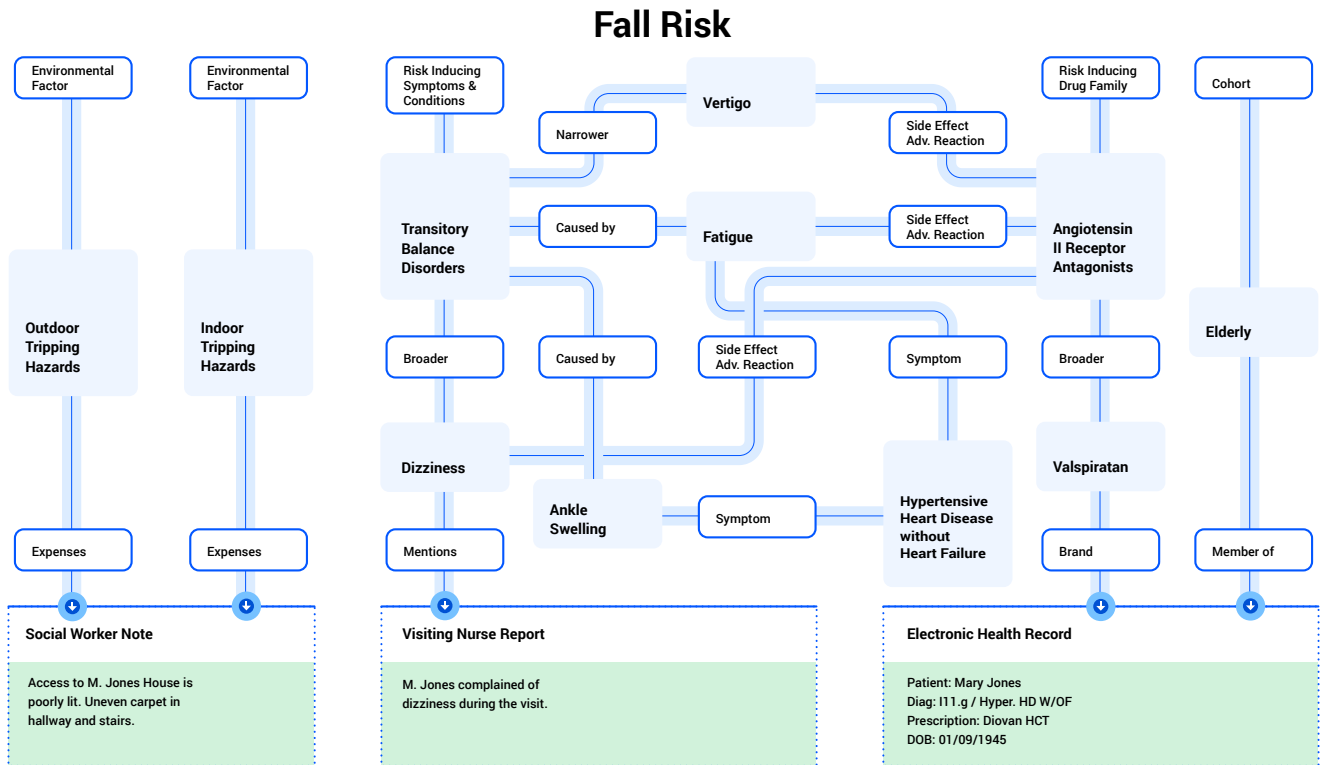
Results

With a list of patients at risk, the healthcare provider could take a proactive approach to managing care. They could reach out and talk with doctors about alternative medications, suggest home improvements and repairs, work with local authorities to improve access points and provide pre-screening by at home caregivers and social workers.

The ability to quickly identify patients at risk and take action to eliminate hazards reduced the rate of falls from 13 per 1000 to 1.67 per thousand—an 87% decrease and approximately $18 million dollars in savings. With the introduction of the mobile app, the rate of falls further decreased from 1.67 to .81 per 1000, resulting in additional savings and improved care.

Healthcare organizations worldwide can leverage the Progress Semantic AI platform to improve care outcomes and quality by using predicative analytics to other situations such as:

- Identify patients at risk of readmission so that remedial protocols can be activated
- Detect infectious disease outbreaks and epidemics early
- Ensure proper diagnosis of devastating diseases (such as Ebola) by ensuring that disparate source information is brought together for a complete view of the patient

Fall Risk

Environmental Factor	**Environmental Factor**

Risk Inducing Symptoms & Conditions — Narrower — **Vertigo** — Side Effect Adv. Reaction — **Risk Inducing Drug Family** — Cohort

Transitory Balance Disorders — Caused by — **Fatigue** — Side Effect Adv. Reaction — **Angiotensin II Receptor Antagonists**

Outdoor Tripping Hazards — **Indoor Tripping Hazards**

Broader — Caused by — Side Effect Adv. Reaction — Symptom — Broader — **Elderly**

Dizziness — **Valspiratan**

Ankle Swelling — Symptom — **Hypertensive Heart Disease without Heart Failure**

Expenses — Expenses — Mentions — Brand — Member of

Social Worker Note

Access to M. Jones House is poorly lit. Uneven carpet in hallway and stairs.

Visiting Nurse Report

M. Jones complained of dizziness during the visit.

Electronic Health Record

Patient: Mary Jones
Diag: I11.g / Hyper. HD W/OF
Prescription: Diovan HCT
DOB: 01/09/1945

Using semantics and the Semaphore platform to extract the human intelligence buried in enterprise information and make it available to the existing analytics infrastructure, healthcare providers are empowered to make data driven business decisions that improve quality of care and patient outcomes while reducing cost.

Contact us to learn how you can drive better patient outcomes