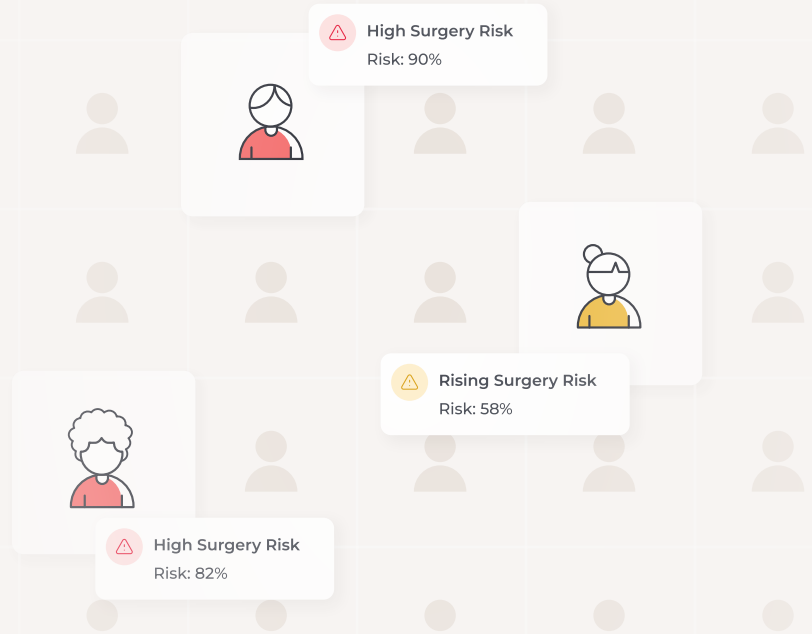




# Sword Predict

## Predict and Prevent Unnecessary Surgeries



### OVERVIEW

Sword Predict is the first AI engine to use advanced machine learning to identify members who are up to 40x more likely to have surgery, more than 8 months before a decision to operate is made. With Predict, Sword can utilize healthcare and sociodemographic data to identify and engage members to avoid unnecessary and costly hip, knee, and back surgeries, then treat them

with digital physical therapy. Since physical therapy has been proven to reduce surgery intent by 60%, Predict will dramatically help many companies – including health plans, employers and labor unions – avoid costly surgeries and related impacts, such as time off work. Predict will enable more people to live healthy, pain-free lives without invasive surgeries and resulting opioid usage.

## Why

We are living in an epidemic of unnecessary surgeries. 20% to 40% of back surgery patients report having the same or increased levels of pain one to two years after their procedure<sup>1</sup>. For lumbar fusion, the rates range from 30% to 46%<sup>2</sup>.

Over 750,000 arthroscopic knee surgeries are performed in the U.S. each year, at a cost of \$3 billion<sup>3</sup>. Yet, multiple studies have shown that arthroscopic knee surgery is not any more effective than non-operative treatments for conditions like arthritis, torn cartilage, and knee pain<sup>4</sup>.

Most patients don't know that their pain can be treated through physical therapy instead of surgery. **Studies suggest that 80% of patients don't seek PT care first, going instead to orthopedic or spine specialists.<sup>5</sup> More than half of spine surgeries and one-third of joint replacements may be unnecessary.<sup>6,7</sup>**

When patients see a PT first, they often receive more conservative approaches to care and are 55% less likely to receive surgery vs a physician or surgeon.<sup>8</sup>

This is because 32% of care for low back pain does not follow evidence-based guidelines.<sup>9</sup> For knee osteoarthritis, studies found that 42% of people who see an orthopedic surgeon don't receive non-surgical treatment consistent with best practice guidelines.<sup>10</sup>

**1 in 2 surgeries may be unnecessary**

Surgery comes with significant consequences. Beyond the time away from work, **1 in 4 people who enter the hospital suffer from medical errors.**<sup>11</sup>

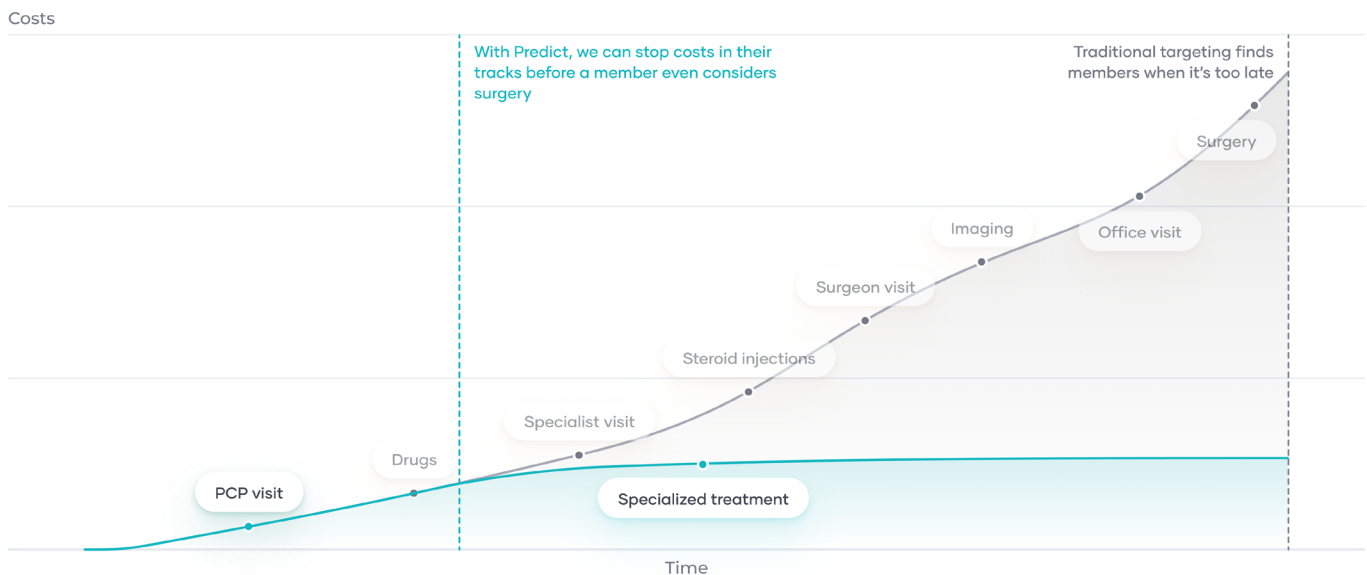
Up to 20% of patients are dissatisfied with their outcomes after a knee replacement<sup>12</sup> and 22% of patients are dissatisfied after back surgery.<sup>13</sup> After experiencing months of pain that brings a member to an orthopedic surgeon to have an MRI scan, the window of opportunity to influence and change member behavior may have already closed.

By identifying and engaging these members in more holistic solutions through Sword Health's products, there is an opportunity to reduce costs and improve patient outcomes.

Using data science and machine learning, we can identify candidates for surgery months in advance when alternatives to surgery are better.

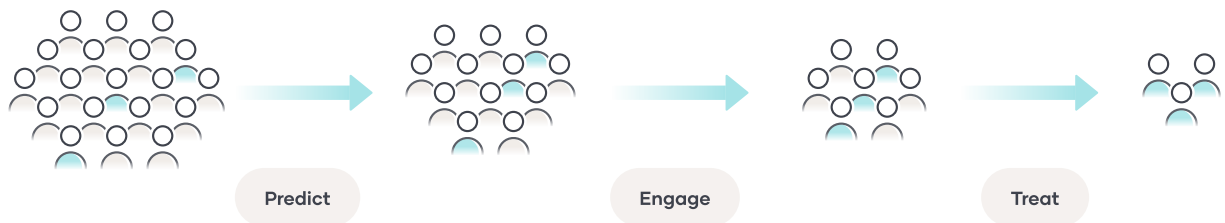
Engagement with Sword's solutions is oftentimes limited by populations who may not be aware of our solutions or may stick to status quo behaviors when seeking care, such as going directly to an orthopedic or spine surgeon. Other times, potential members may not even know they have an issue, such as with pelvic health.

Traditional claims-based marketing approaches tend to be reactive based on events that are 45-60 days old.



## How Predict Works:

- **DETECTS:** Proprietary technology assigns individual risk scores, classifying members based on the probability of an orthopedic surgery. Innovating on traditional claims analysis, Predict uses more data points, especially those focused on early signals of a future potential surgery.
- **ENGAGES:** Once identified, Sword's clinical team reaches out to members and offers opportunities for less invasive, more effective means of therapy. Sword's personalized programming and support provides individuals a chance to recover when and where it's most convenient to them.
- **SUPPORTS:** Sword's "At Risk" member program includes on-demand access to digital therapists and clinicians. Additionally, the program leverages behavioral science techniques, including positive psychology, intrinsic motivation, loss aversion, and planning prompts to boost member outcomes and performance when tailored to member insights.



## Benefits

- Proactively identifying and engaging members at high risk for surgery earlier, which reduces costs for healthcare.
- Faster pathways to treatment through real-time data triggers that connect to members when they are having an episode of pain instead of waiting 45-60 days when a claim is processed.
- Improving patient outcomes by preventing unnecessary or inappropriate surgeries.

## How

- **Eligibility, Rx, and Claims Data** are ingested into the Sword claims data warehouse while preserving privacy and security of information
- **Predictive Analytics** applied to stratify populations into risk based on potential for high cost events (hip, knee, back surgery) in the next 12 months
- **Targeted outreach campaigns** enabled by technology and driven by data science:
  - Optimized content tailored to a member's experience and propensity
  - High-risk enrollment to remove all friction and allow a member to move as quickly as possible to clinically-appropriate treatment (e.g. sending kits with a therapy loaded directly to members and offering real-time member support)

<sup>1</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5106227/>

<sup>2</sup> <https://www.ncbi.nlm.nih.gov/books/NBK539777/>

<sup>3</sup> <https://www.bmj.com/content/354/bmj.i3934>

<sup>4</sup> <https://pubmed.ncbi.nlm.nih.gov/26080045/>

<sup>5</sup> Frogner BK, Harwood K, Andrilla CHA, Schwartz M, Pines JM. Physical Therapy as the First Point of Care to Treat Low Back Pain: An Instrumental Variables Approach to Estimate Impact on Opioid Prescription, Health Care Utilization, and Costs. *Health Serv Res.* 2018;53(6):4629-4646. doi:10.1111/1475-6773.12984

<sup>6</sup> Yanamadala V, Kim Y, Buchlak QD, Wright AK, Babington J, Friedman A, Mecklenburg RS, Farrokhi F, Leveque JC, Sethi RK. Multidisciplinary Evaluation Leads to the Decreased Utilization of Lumbar Spine Fusion: An Observational Cohort Pilot Study. *Spine (Phila Pa 1976).* 2017 Sep 1;42(17):E1016-E1023. doi: 10.1097/BRS.0000000000002065. PMID: 28067696.

<sup>7</sup> Riddle DL, Jiranek WA, Hayes CW. Use of a validated algorithm to judge the appropriateness of total knee arthroplasty in the United States: a multicenter longitudinal cohort study. *Arthritis Rheumatol.* 2014;66(8):2134-2143. doi:10.1002/art.38685.

<sup>8</sup> Fritz JM, Childs JD, Wainner RS, Flynn TW. Primary care referral of patients with low back pain to physical therapy: impact on future health care utilization and costs. *Spine (Phila Pa 1976).* 2012 Dec 1;37(25):2114-21. doi: 10.1097/BRS.0b013e31825d32f5. PMID: 22614792.

<sup>9</sup> McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, et al. The quality of health care delivered to adults in the United States. *N Engl J Med.* 2003. June 26;348(26):2635-45. 10.1056/NEJMsa022615.

<sup>10</sup> Mazzei DR, Whittaker JL, Kania-Richmond A, Faris P, Wasylak T, Robert J, Hawker G, Marshall DA. Do people with knee osteoarthritis use guideline-consistent treatments after an orthopaedic surgeon recommends nonsurgical care? A cross-sectional survey with long-term follow-up. *Osteoarthr Cartil Open.* 2022 Mar 28;4(2):100256. doi: 10.1016/j.ocoart.2022.100256. PMID: 36475282; PMCID: PMC9718222.

<sup>11</sup> Bates DW, Levine DM, Salmasian H, Syrowatka A, Shahian DM, Lipsitz S, Zebrowski JP, Myers LC, Logan MS, Roy CG, Iannaccone C, Frits ML, Volk LA, Dulgarian S, Amato MG, Edrees HH, Sato L, Folcarelli P, Einbinder JS, Reynolds ME, Mort E. The Safety of Inpatient Health Care. *N Engl J Med.* 2023 Jan 12;388(2):142-153. doi: 10.1056/NEJMsa2206117. PMID: 36630622.

<sup>12</sup> Scott CE, Howie CR, MacDonald D, Biant LC. Predicting dissatisfaction following total knee replacement: a prospective study of 1217 patients. *J Bone Joint Surg Br.* 2010 Sep;92(9):1253-8. doi: 10.1302/0301-620X.92B9.24394. PMID: 20798443.

<sup>13</sup> Macki, M., Alvi, M. A., Kerezoudis, P., Xiao, S., Schultz, L., Bazydlo, M., Bydon, M., Park, P., Chang, V., & for the MSSIC Investigators. (2020). Predictors of patient dissatisfaction at 1 and 2 years after lumbar surgery, *Journal of Neurosurgery: Spine* SPI, 32(3), 373-382. Retrieved Jan 13, 2023, from <https://thejns.org/spine/view/journals/j-neurosurg-spine/32/3/article-p373.xml>