# Development of a Web Application for the Surgical Risk Preoperative Assessment System (SURPAS)

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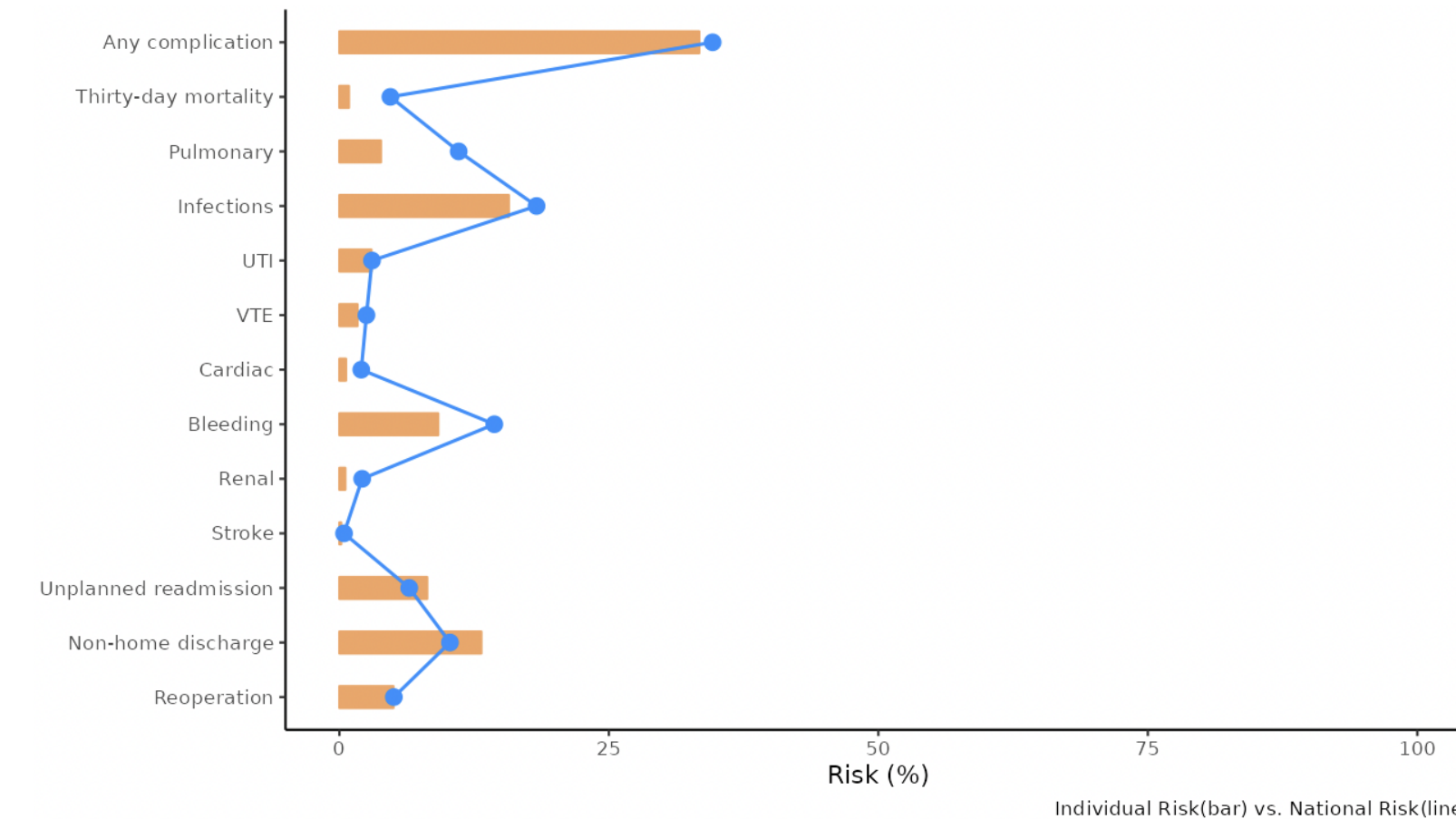ANSCHUTZ MEDICAL CAMPUS

## Results

## Background & Aim

- Accurate assessment of surgical risk is important in providing informed consent
- SURPAS is a patient-centered, patient-facing parsimonious preoperative surgical risk calculator requiring minimal necessary input available in the UCHealth EHR
- SURPAS has been shown to be well-favored by patients & physicians, but current usage is around 10% of all surgical patients

- **Aim:** Develop a website version of SURPAS that can be used anywhere & increase overall usage

## Methods

- SURPAS was developed using American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) data from >8 million surgeries from >800 surgical centers (2011-2020)
- Multivariable regression analysis were used to develop SURPAS models implemented in the web application
- SURPAS web application was developed in Shiny (R Foundation, Vienna, Austria)

- The SURPAS web application uses 14 user inputs:
  - 7 for risk assessment: surgeon specialty, CPT code of operation, patient age, ASA class, functional health status, emergency status, in/outpatient procedure
  - 6 for user & patient demographic assessment: user institution, user role, patient sex, patient race, patient ethnicity
  - 1 for future improvement of the application: whether or not CPT of interest was included in SURPAS

- The patient's risk profile consists of 15 postoperative outcomes within 30 days: any complication (morbidity), mortality, pulmonary, SSI/sepsis, UTI, VTE, cardiac, bleeding, renal, stroke, unplanned readmission, non-home discharge, unplanned reoperation, conversion to inpatient for outpatient operations, postoperative length of stay for inpatient operations

- Web application collects user inputs, risk outputs, user geolocation (if allowed by user), device, & browser

- SURPAS presents risk profile in tabular & graphical format (Figure 1), & allows user to download & print results



Individual Risk(bar) vs. National Risk(line)

| Complication | Individual Patient Risk | National Average Risk (N = 91138) |
|---|---|---|
| Any complication | 33.38% | 34.62% |
| Thirty-day mortality | 0.88% | 4.73% |
| Pulmonary | 3.85% | 11.07% |
| Infections | 15.72% | 18.29% |
| UTI | 2.97% | 3.02% |
| VTE | 1.68% | 2.51% |
| Cardiac | 0.61% | 2.03% |
| Bleeding | 9.16% | 14.37% |
| Renal | 0.55% | 2.11% |
| Stroke | 0.16% | 0.43% |
| Unplanned readmission | 8.14% | 6.48% |
| Non-home discharge | 13.17% | 10.26% |
| Reoperation | 5.01% | 5.05% |
| Postoperative length of stay | 7.66 days | 7.45 days |

**Figure 1:** Risk assessment from example case: 67-year-old patient who is partially dependent, has an ASA class of 2, and is undergoing an inpatient, non-emergency partial colectomy with primary anastomosis (CPT 44140)

## Conclusions & Implications

- The SURPAS web application has the same functionality & outputs as SURPAS within the UCHealth EHR
- The development of an online version of SURPAS could facilitate usage outside of UCHealth as well as lead to an increase in usage within UCHealth
- SURPAS is a useful tool in improving patient understanding of their own postoperative risks, as well as augmenting patient-physician communication

## Disclosures & Funding