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

Haaris Kadri, BA[a], Kathryn L. Colborn, PhD, MSPH[a,b,c,d], James Winslow, MPH[b], Adam R. Dyas, MD[a] , William G. Henderson, PhD, MPH[a,b,d], Michael R. Bronsert, PhD, MS[a,b], Yaxu Zhuang, PhD[b,d], Yizhou Fei, PhD[d], Helen J. Madsen, MD[a,e], Anne Lambert-Kerzner, PhD, MSPH[a,b], Benjamin S. Brooke, MD, PhD, FACS[f], Robert A. Meguid, MD, MPH, FACS[a,b*]

[a] Surgical Outcomes and Applied Research Program, Department of Surgery, University of Colorado School of Medicine, Aurora, CO, USA

[b] Adult and Child Center for Health Outcomes Research and Delivery Science, University of Colorado School of Medicine, Aurora, CO, USA

[c] Department of Medicine, University of Colorado School of Medicine, Aurora, CO 80045

[d] Department of Biostatistics and Informatics, Colorado School of Public Health, Aurora, CO, USA

[e] Department of Anesthesiology, University of Colorado School of Medicine, Aurora, CO 80045

[f] Department of Surgery, University of Utah School of Medicine, Salt Lake City, UT, USA

Background: The Surgical Risk Preoperative Assessment System (SURPAS) is a parsimonious clinical decision support tool with a surgical risk calculator using 7 preoperative variables for the prediction of 15 common postoperative complications for >3000 operations across 10 surgical specialties. It is currently available in the electronic health record of our local health system. This study reports on the development of a SURPAS web application for widespread use.

Methods: Developed as an R Shiny App, the SURPAS web application uses prediction models developed using the ACS-NSQIP participant use file of >8,000,000 operations from >800 participating hospitals,2011-2020.

Results: The SURPAS web application uses 7 patient characteristics and surgical variables (procedure name, surgical specialty, outpatient/inpatient, emergency/non-emergency, patient age, ASA class, and functional health status) to calculate complication risks. It also requests variables to characterize the application's use: the user's role and institution, the patient's gender and race/ethnicity, and the purpose of using the application. After submitting this, the user is presented a graph and table of the patient's complication risks vs. national averages for patients undergoing the same operation (Figure). Outputs can be printed. The inputs, time stamp, information about the user's browser, device, and location (if they agree to share them), and the outputted risk profile are stored in a Google Sheet maintained by the research group for application enhancement.

Conclusion: Dissemination of the SURPAS web application will hopefully increase SURPAS use both inside and outside of the local health system, with the potential to improve communication of postoperative complication risk between providers and patients.