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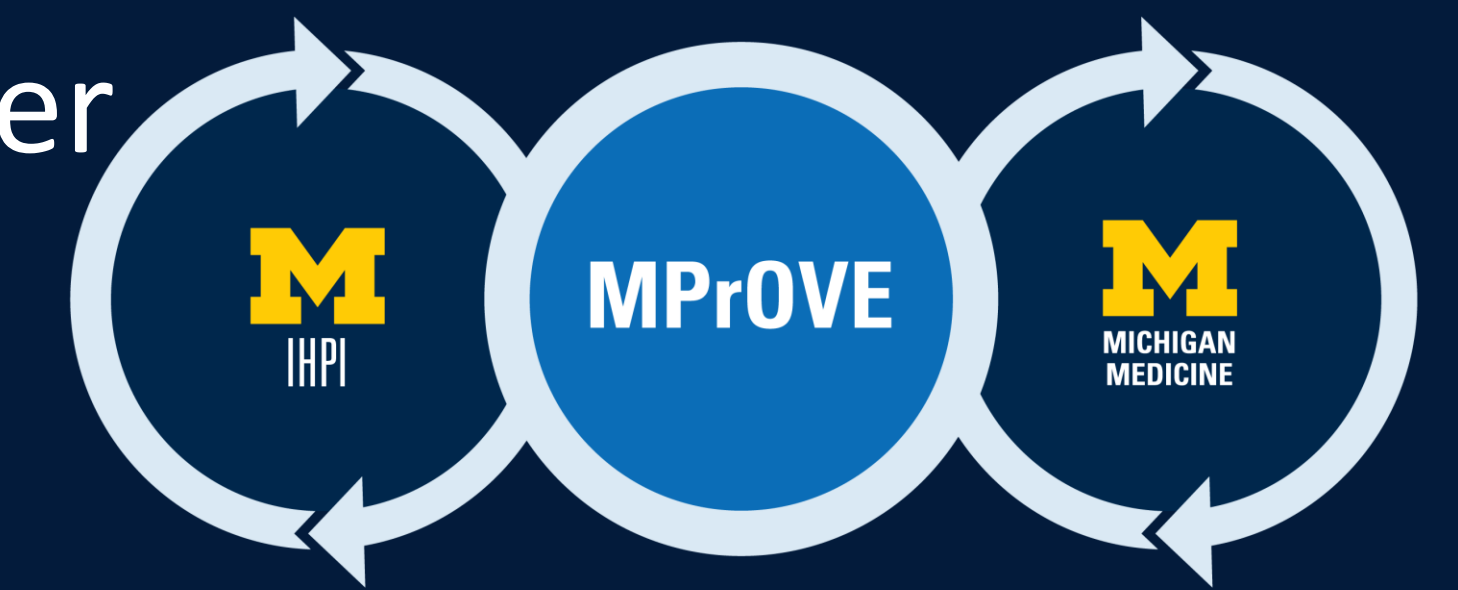
Background

For appropriate patients, surgery at an ambulatory surgical center (ASC) rather than a hospital-based outpatient department (HOPD) is safe, cost effective, and associated with increase patient satisfaction. We

Research Question

Is it feasible to reduce manual clinical reviews for ASC suitability while providing non-inferior outcomes by stratifying patients using machine learning?

Population Studied

N = 985 Surgical Oncology patients requested for surgery January 26 – November 1, 2023, at two freestanding ASCs within an academic health system.

Methods

- Feasibility study using a difference-in-difference (DID) design.
- Intervention: Surgical cases classified by model as "Schedule @ASC w/o Review" do not require clinical review prior to scheduling.
- Intervention arm: 2 surgeons &1 scheduler
- Control arm: 3 surgeons & 1 scheduler
- Pre period: January 26-June 28, 2023
- Post period: June 29-November 1, 2023
- Statistical comparisons are average marginal effects from a DID regression design.
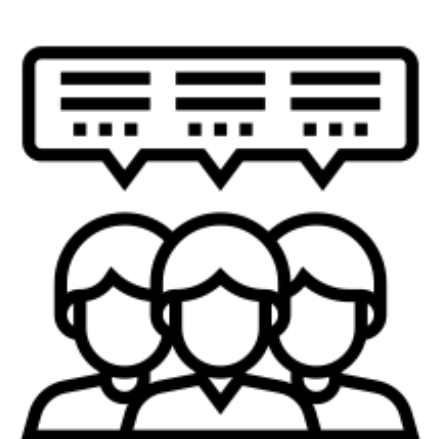
Machine Learning Model

- Predicts two outcomes: (1) Outcome of initial clinical review (order logit) and (2) Location (ASC vs HOPD) of completed surgery (logit).
- Random effects for surgical procedure.

Conclusion

In this feasibility study of surgical oncology patients, our machine learning model eliminated 1/3 of manual clinical reviews and was not associated with increased adverse events. A larger study (in progress) is needed to establish benefit and non-inferiority for adverse events in a broader population.
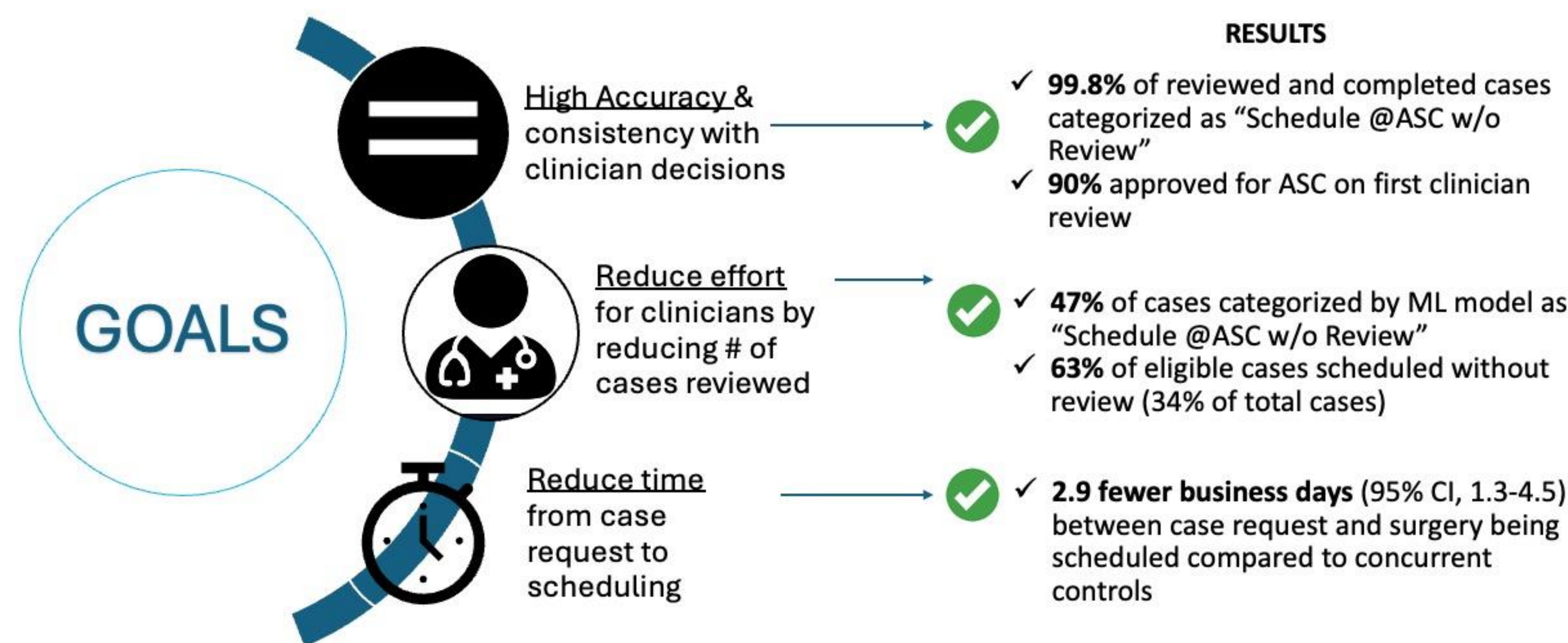
Implication

Machine learning can effectively screen for patients suitable for surgery at an ambulatory surgical center and may be useful for reducing manual clinical reviews.

We implemented a machine learning model to stratify patients by suitability for surgery at an ambulatory surgical center (ASC).

ASC Surgical Site Optimization Model

Results from feasibility study

GOALS

High Accuracy & consistency with clinician decisions
- 99.8% of reviewed and completed cases categorized as "Schedule @ASC w/o Review"
- 90% approved for ASC on first clinician review

Reduce effort for clinicians by reducing # of cases reviewed
- 47% of cases categorized by ML model as "Schedule @ASC w/o Review"
- 63% of eligible cases scheduled without review (34% of total cases)

Reduce time from case request to scheduling
- 2.9 fewer business days (95% CI, 1.3-4.5) between case request and surgery being scheduled compared to concurrent controls
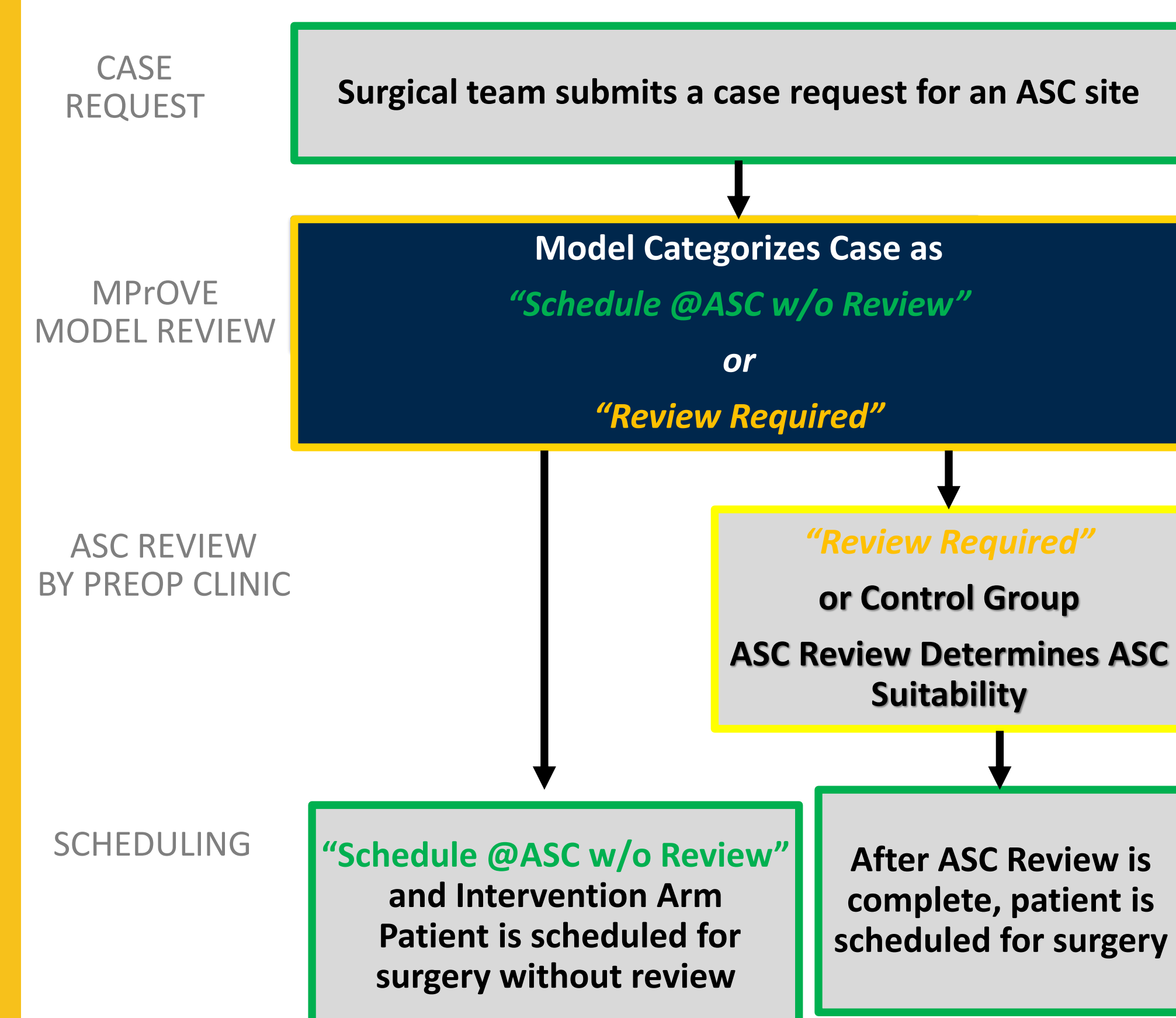
In a feasibility study, the model reduce manual clinical review by 30%, allowed surgeries to be scheduled 3 days sooner, and did not increase late cancellations or other adverse events.

Table 1. *Results.*

Measure	Intervention		Control		Difference in Differences
	Pre, N (%)	Post, N (%)	Pre, N (%)	Post, N (%)	DID (95% CI)
Total Cases	90 (100)	90 (100)	160 (100)	119 (100)	-
Scheduled w/o prior review	2 (2.2)	63 (70)	4 (2.5)	5 (4.2)	66.1% (55.2-76.9%)
Scheduled Cases	87 (100)	86 (100)	151 (100)	113 (100)	-
Days until scheduled, mean (SD)	3.4 (4.0)	2.2 (2.8)	4.3 (4.4)	6.1 (5.4)	-2.9 (-4.5 to -1.3)
7-day cancellations	0 (0.0)	1 (1.75)	3 (2.2)	5 (6.8)	-2.8% (-9.9 to -4.3%)
Rescheduled to HOPD	1 (1.5)	2 (3.5)	3 (2.2)	3 (4.1)	0.4% (-7.0 to 7.8%)

CI = Confidence Interval, DID = Difference in Differences, HOPD = Hospital Based Outpatient Department, SD = Standard Deviation

Figure 1. *Implementation Schematic*

CASE REQUEST
Surgical team submits a case request for an ASC site

MPrOVE MODEL REVIEW
Model Categorizes Case as "Schedule @ASC w/o Review" or "Review Required"

ASC REVIEW BY PREOP CLINIC
"Review Required" or Control Group ASC Review Determines ASC Suitability

SCHEDULING
"Schedule @ASC w/o Review" and Intervention Arm Patient is scheduled for surgery without review

After ASC Review is complete, patient is scheduled for surgery

SCAN ME

https://jbhender.github.io/research/hsr/Academy_Health_2024.pdf