

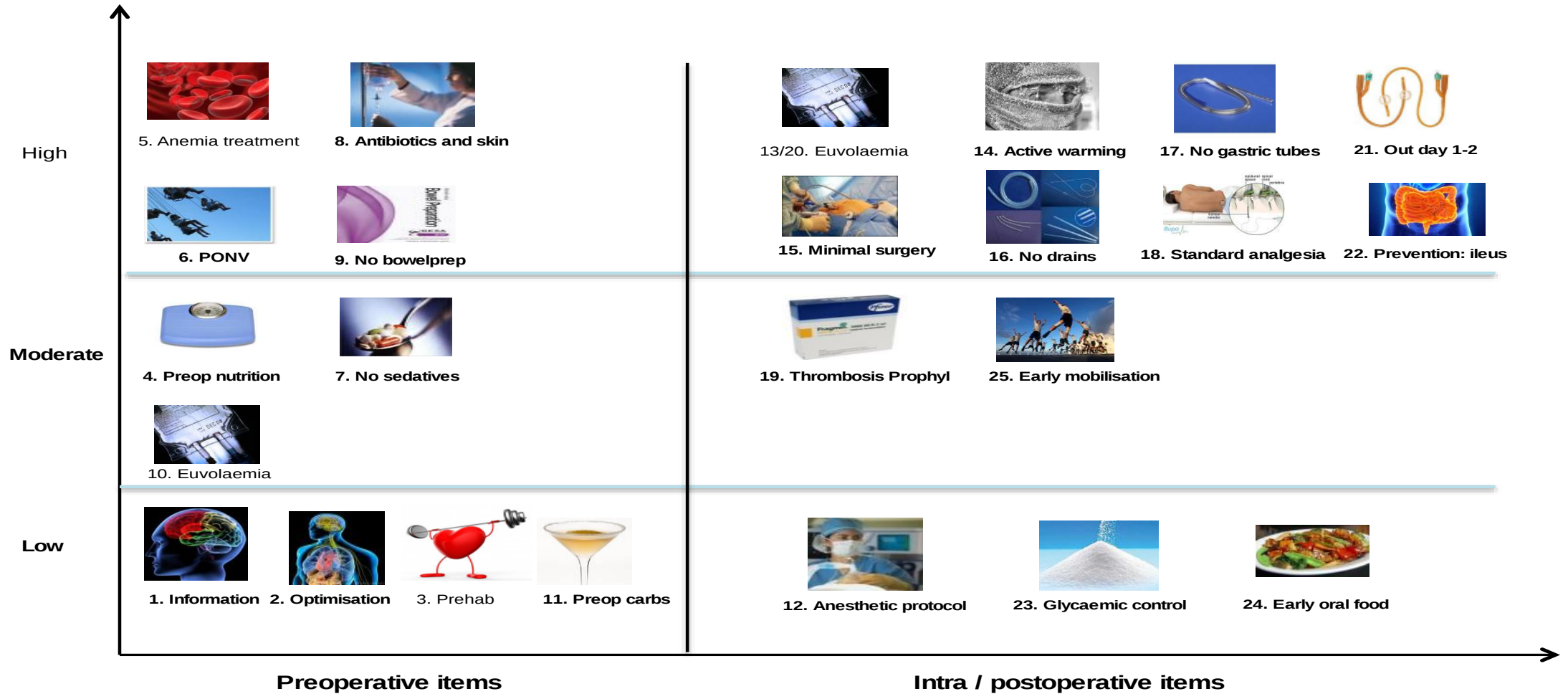
THE ERAS REGISTER AS A TOOL FOR IMPROVEMENT



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Karolinska

ERAS-ITEMS AND EVIDENCE LEVEL

Grading of Recommendations, Assessment, Development and Evaluation (GRADE) system



ETAS DATABASE



PATIENT REGISTRATION (10)

Age, Gender, ASA, possum etc

PREOPERATIVE DATA (35)

BMI, Weight, nutrition, Smoking, Alcohol, Comorbidity, Preop cancer treatment, Medication etc

BEFORE SURGERY (8)

Thrombo prophylaxis, OBP, Preop carbs, Antibiotics

SURGERY (40)

Type of surgery, type of anastomosis, Surgical techniques, drains, GT, etc

ANAESTHESIA (24)

PONV, Anaesthesia, warming Fluids, opioids, etc

- 350 PERIOPERATIVE VARIABLES
- INSTANT FEEDBACK
- BENCHMARKING TO OTHER HOSPITALS
- RESEARCH

FLUID BALANCE (21)

Total IV volume of fluids and weight day zero to discharge

GI AND STOMA FUNCTION (13)

Time for solid food, stools, flatus Stimulation of gut motility, etc

MOBILISATION (11)

Rate of mobilization, day 0-discharge Withdrawal of urinary drains, etc

PAIN AND NAUSEA CONTROL (29)

VAS, Epidurals, TAP, NSAID, Blocks, Opioids, etc

DISCHARGE (10)

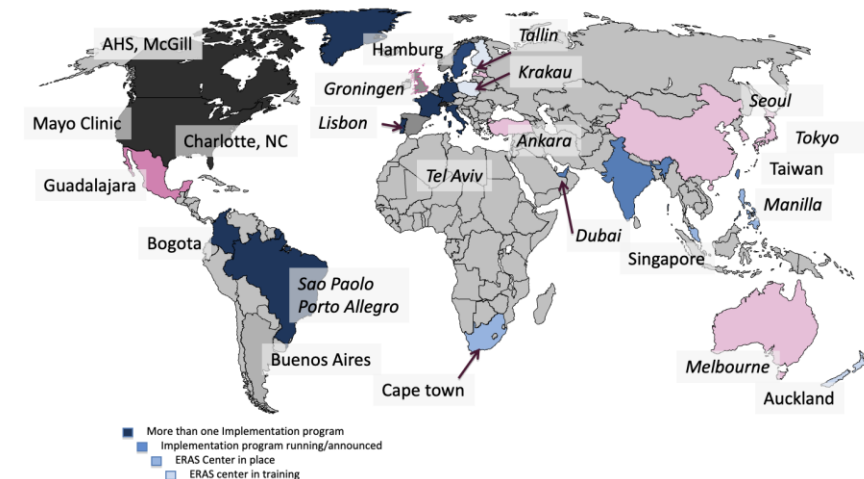
LOS, Ready for discharge, etc

REOPERATIONS, READMISSIONS, CONVERSIONS (10)

COMPLICATIONS -30 D (150)

Clavien

ERAS® SOCIETY 2020 250+ UNITS IN 25+ COUNTRIES





Validity of Routinely Collected Swedish Data in the International Enhanced Recovery After Surgery (ERAS) Database

Yin Xu¹ · Ruzan Udumyan¹ · Katja Fall^{1,4} · Olle Ljungqvist² · Scott Montgomery^{1,5,6} · Ulf O Gustafsson³

Accepted: 15 March 2021
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COVERAGE:

MEAN COVERAGE (A) > 96%: Excellent

Conclusion: centers do not refrain from registering patients who are not doing well

MISSING VALUES:

ELIAS: Mean missing rate: 2.8 %

RATE : Overall good, but not in termination of u-kad: 8.7% and intraop bloodloss: 5.8%, one hospital: intraop bloodloss 52.7%

Conclusion: some variables are more prone to be missing, especially in some hospitals

ACCURACY:

LOS

(A) 94% Excellent, (ck) 0.86 Perfect

COMPLICATIONS

(A) 91% Excellent, (ck) 0.80 Substantial

REOP

(A) 99% Excellent, (ck) 0.94 Perfect

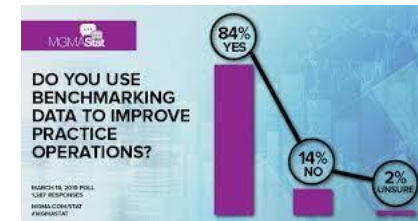
ALL OTHER (N=9)

(A) Excellent, (ck) Fair-perfect

Conclusion: "data in" can be trusted

WHY DO WE WANT TO MEASURE OUTCOME FROM SURGERY (EIAS)?

1. As feedback in the clinical work (regular meetings at the hospital)
2. Benchmarking vs other institutions (nationally and internationally)
3. Clinical research



I. AS FEEDBACK IN THE CLINICAL WORK



Mortality

- before 2021-08:
0.6 %
- after 2021-08:
0.7 %

Reoperations

- before 2021-08:
8.3 %
- after 2021-08:
9.5 %

Adverse events

- before 2021-08:
43.5 %
- after 2021-08:
35.8 %

Serious complications

- before 2021-08:
10.1 %
- after 2021-08:
10.1 %

Anastomotic leaks

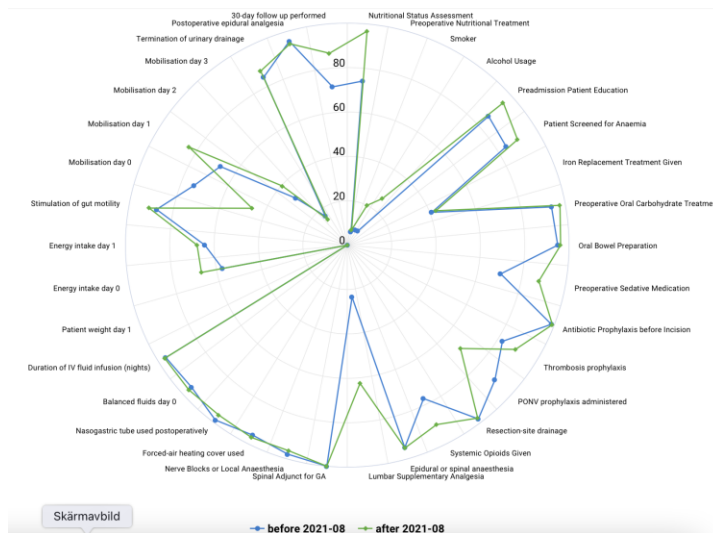
- before 2021-08:
6.5 %
- after 2021-08:
2.7 %

ICU

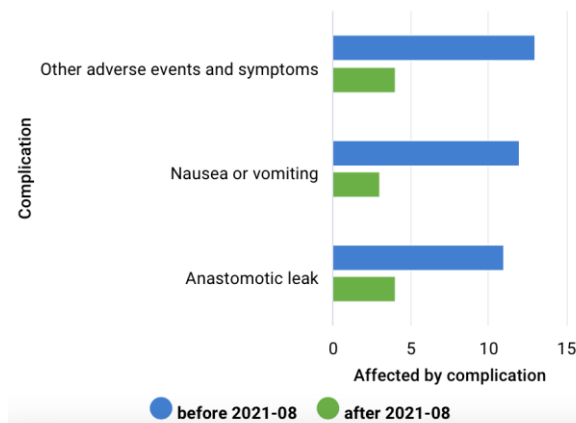
- before 2021-08:
3.0 %
- after 2021-08:
0.7 %

Readmission

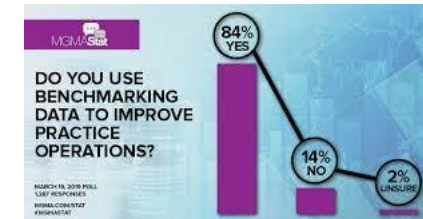
- before 2021-08:
11.3 %
- after 2021-08:
8.8 %

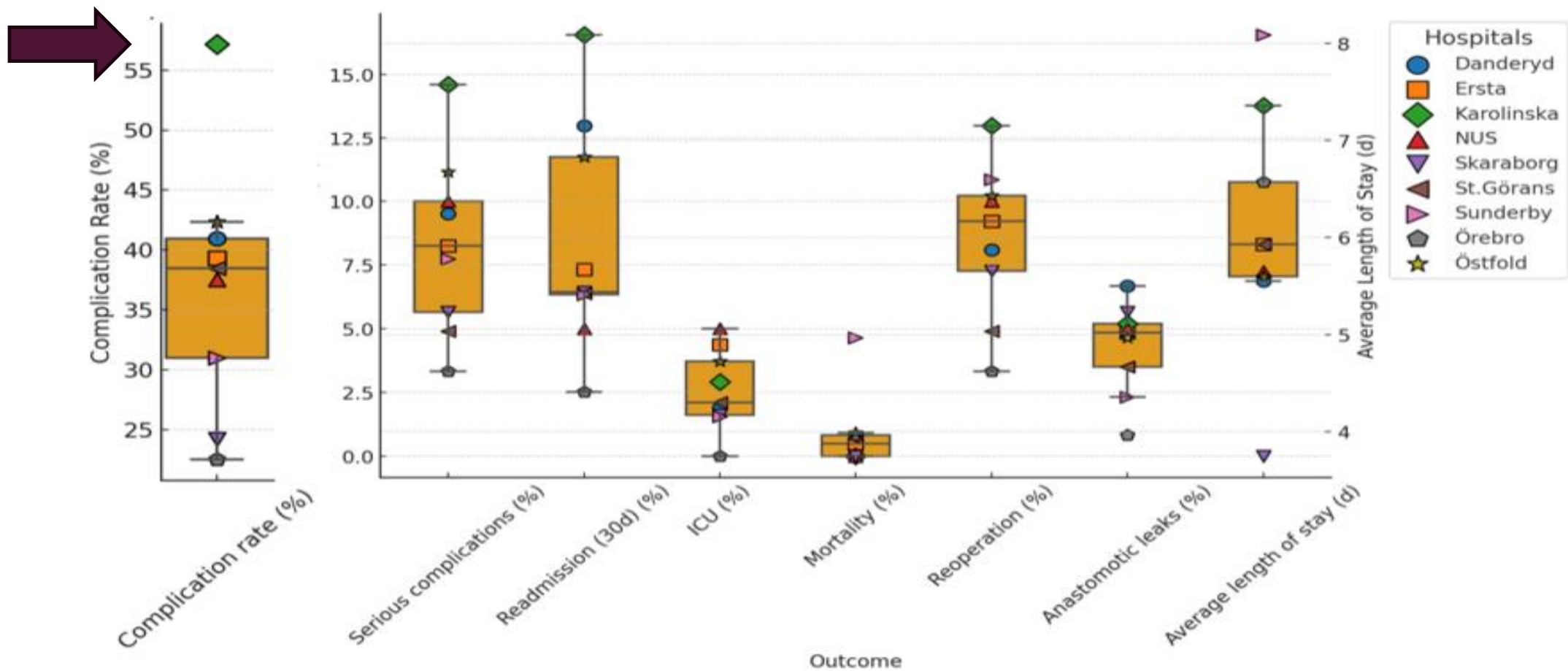


Complications (Primary and followup)



2. BENCHMARKING VS OTHER INSTITUTIONS (NATIONALLY AND INTERNATIONALLY)





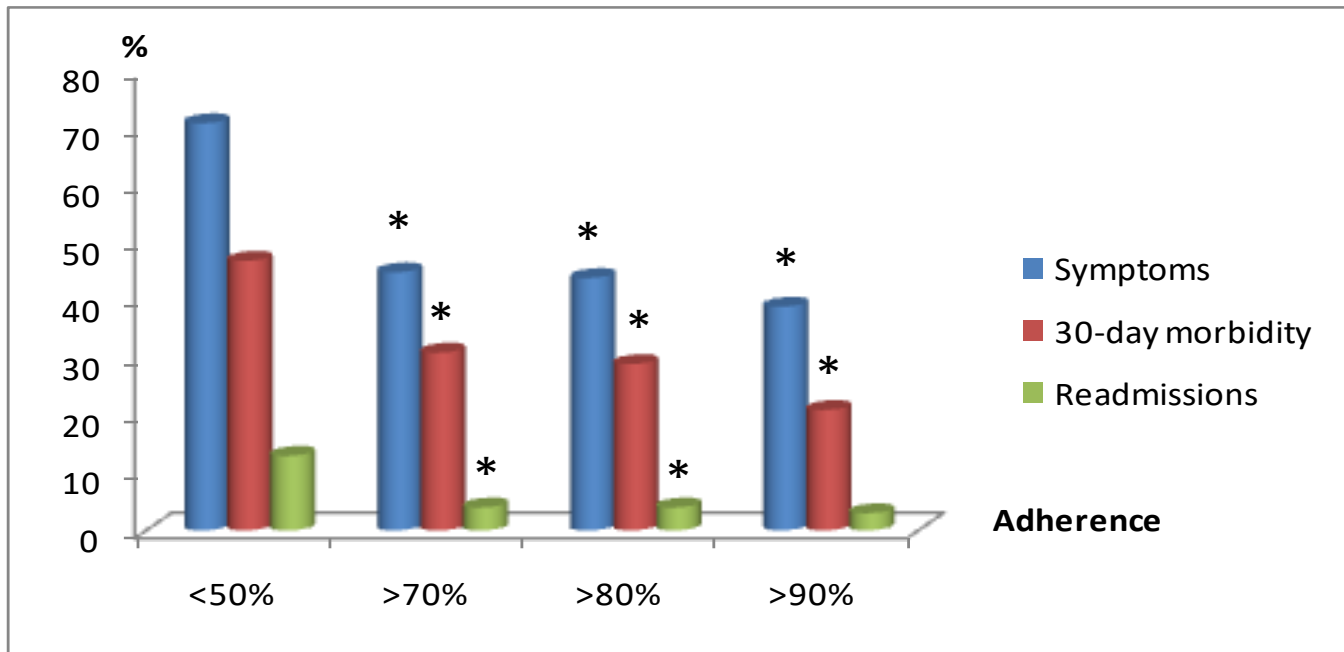
Patientdemografi SwERAS® benchmarking: 2023-09-30 till 2024-09-30



Namn på sjukhus	# patienter*	# patienter**	Ålder (Median)	ASA 1-2 (%)	ASA 3-4 (%)	Öppen kirurgi (%)	Anastomoser (%)	T4 (%)	Rektal (%)	Genomsnitt # komorbiditeter
Danderyd	210	2845	73	56,7	43,3	21,4	79,1	20	12	0,2
Ersta	206	2845	63	78,6	21,4	13,1	78,6	17	5	0,09
Karolinska	308	971	67	57,1	37,7	47,4	65,6	46	28	0,22
Umeå/ Skellefteå	40	1638	74	57,5	42,5	32,5	90	0	8	0,28
Skaraborg	124	1930	72	70,2	29,0	14,5	71,8	24	12	0,49
St. Göran	143	1601	72	67,8	32,2	33,6	81,1	17	15	0,16
Sunderby	129	376	74	68,2	31,0	27,1	64,3	29	12	0,21
Örebro	120	1764	73	64,8	31,7	35,8	75,8	7	7	0,25
Östfold	215	1528	71	62,3	37,7	31,2	66,1	14	11	0,14
Median	143	1638	72	66,6	32,2	31,2	75,8	12	17	0,21
Alla sjukhus	1495	15643	/	/	/	/	/	/	/	/

3. CLINICAL RESEARCH

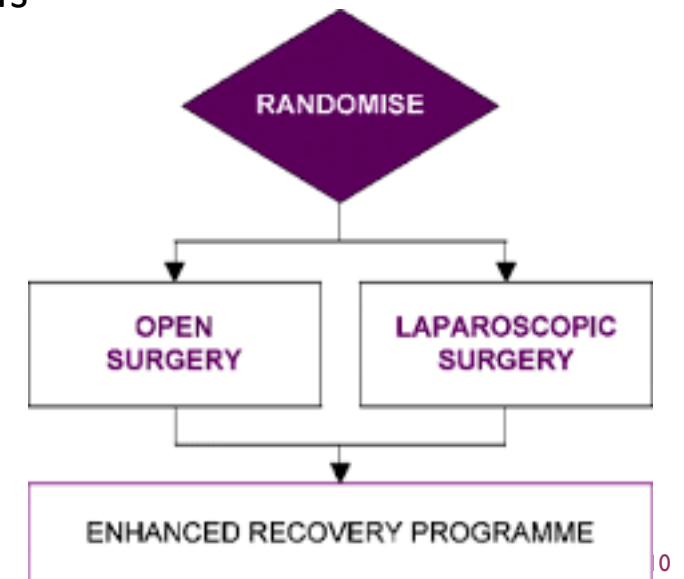
>4,500 studies related to Enhanced Recovery After Surgery (ERAS) have been published globally, spanning various surgical specialties and applications.



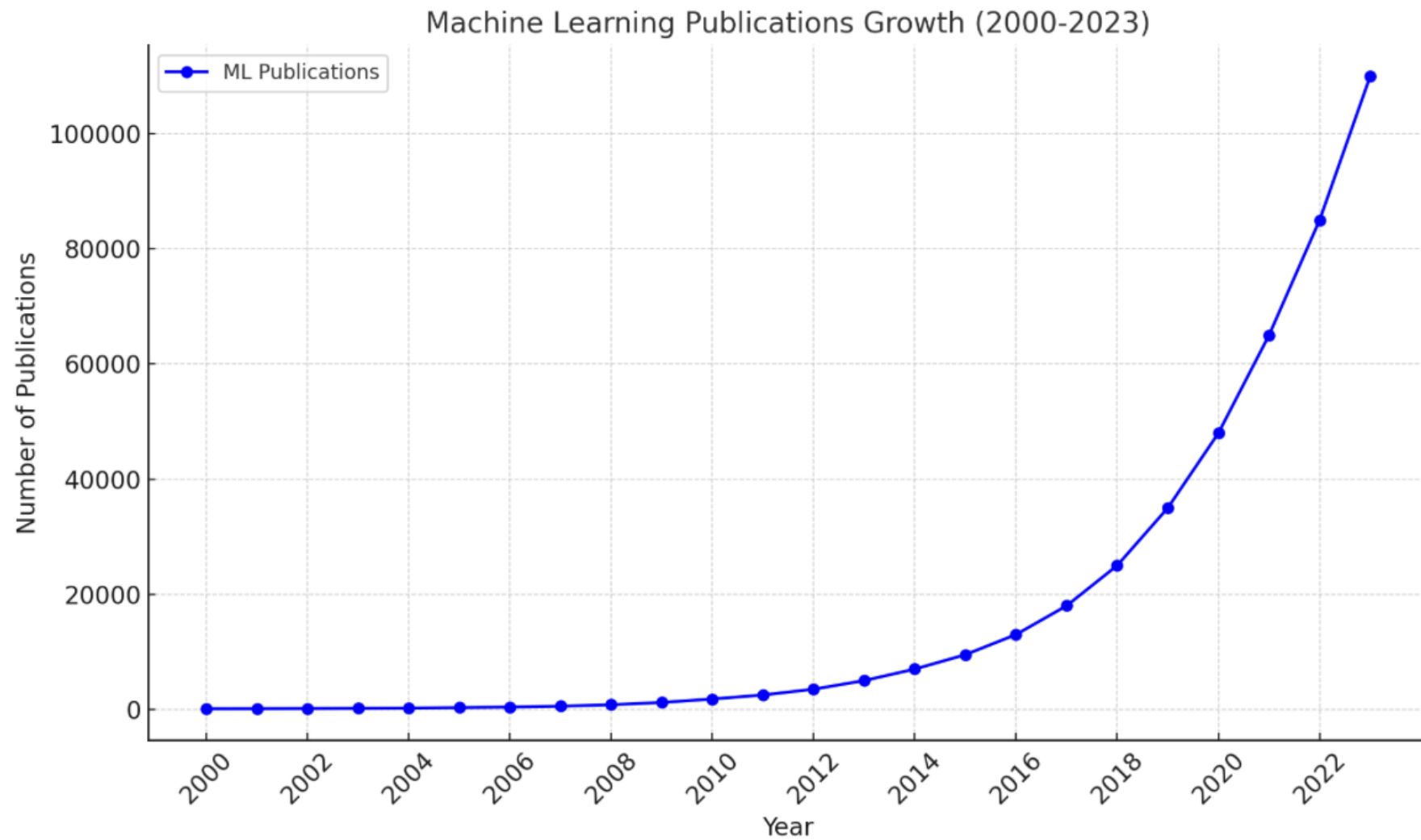
*SIGNIFICANT DIFFERENCE. GUSTAFSSON ET AL, JAMA SURGERY 2011

Most of them: “Before and after cohorts”

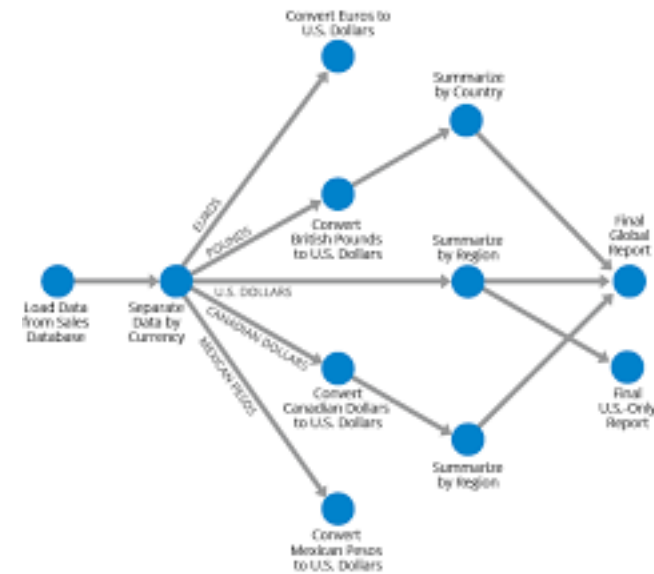
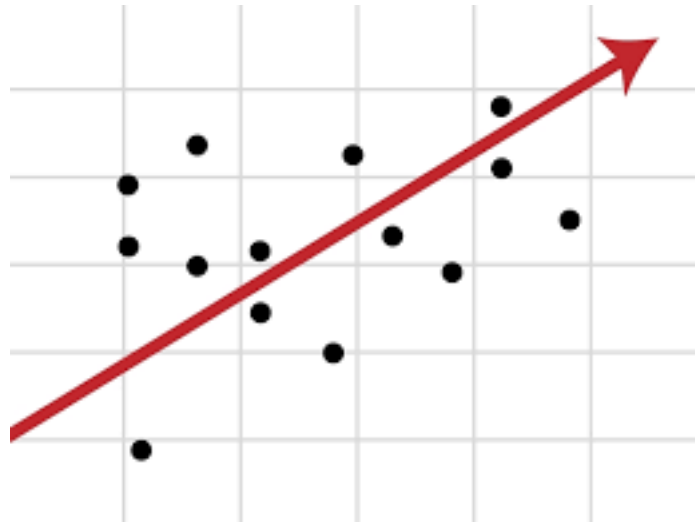
Few RCTs



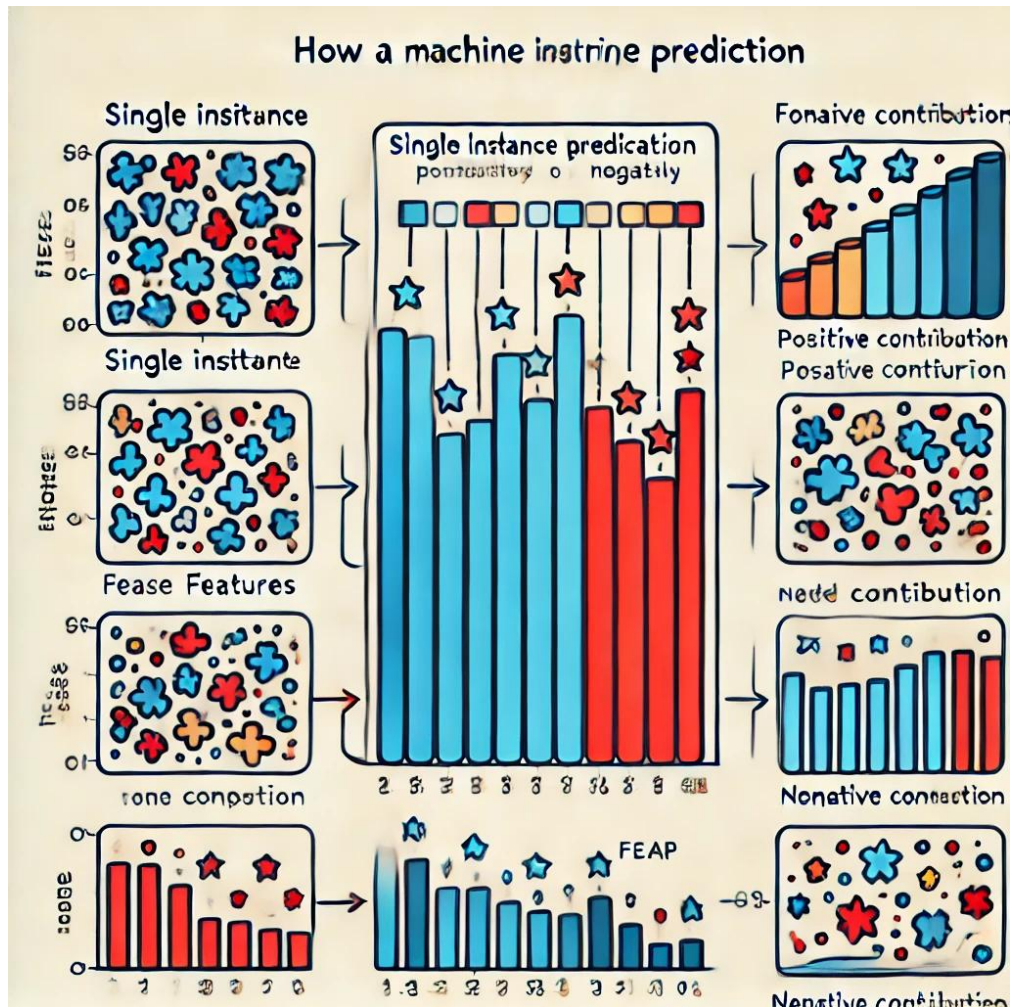
LAFA study group



Regression models and DAGs



Machine learning to find predictors for outcome



SHAP values work by assigning an importance value to each feature for a specific prediction

Positive SHAP values mean the feature increased the prediction

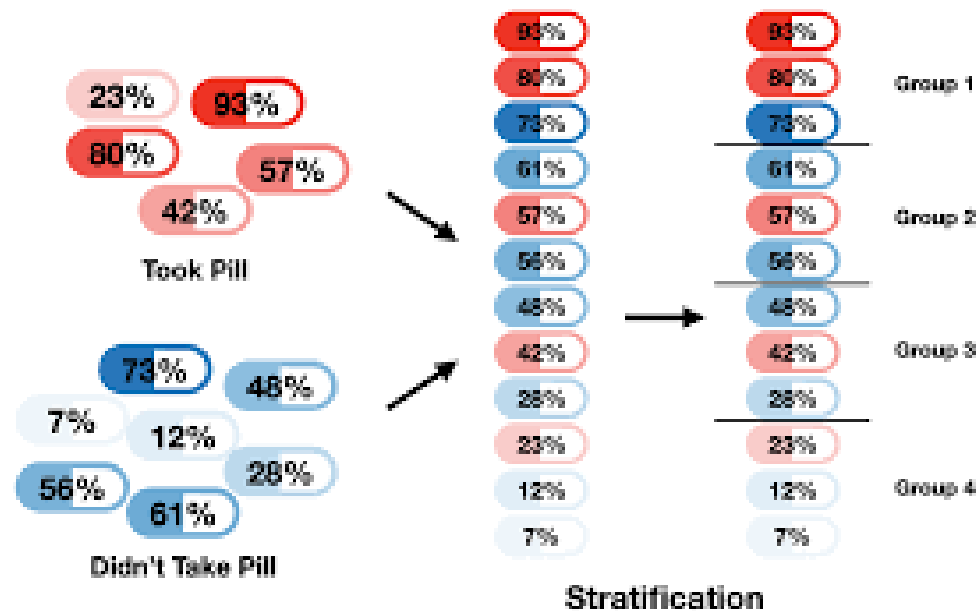
Local explanations:

SHAP values for a single prediction show which features drove that specific result.

Global explanations: Aggregating SHAP values across multiple predictions can show which features have the highest overall importance in a model.

SHAP (SHapley Additive exPlanations) values are a method used in machine learning to interpret complex model predictions.

Simulated RCTs (after propensity score matching)



SWERAS / ENCARE PROJECT

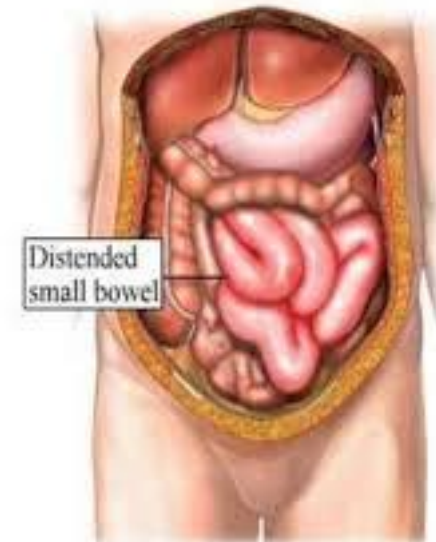
7 Nordic hospitals with data from **14,000 colorectal patients** (aggregated results).

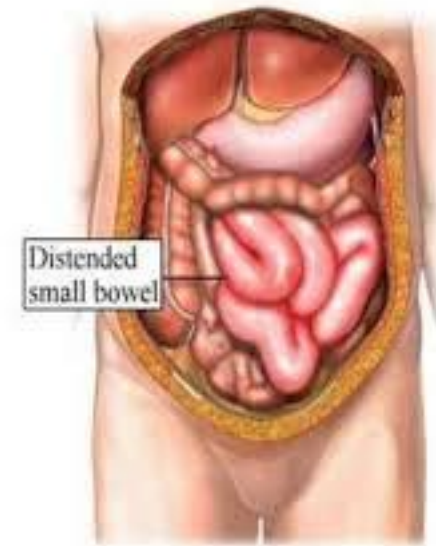
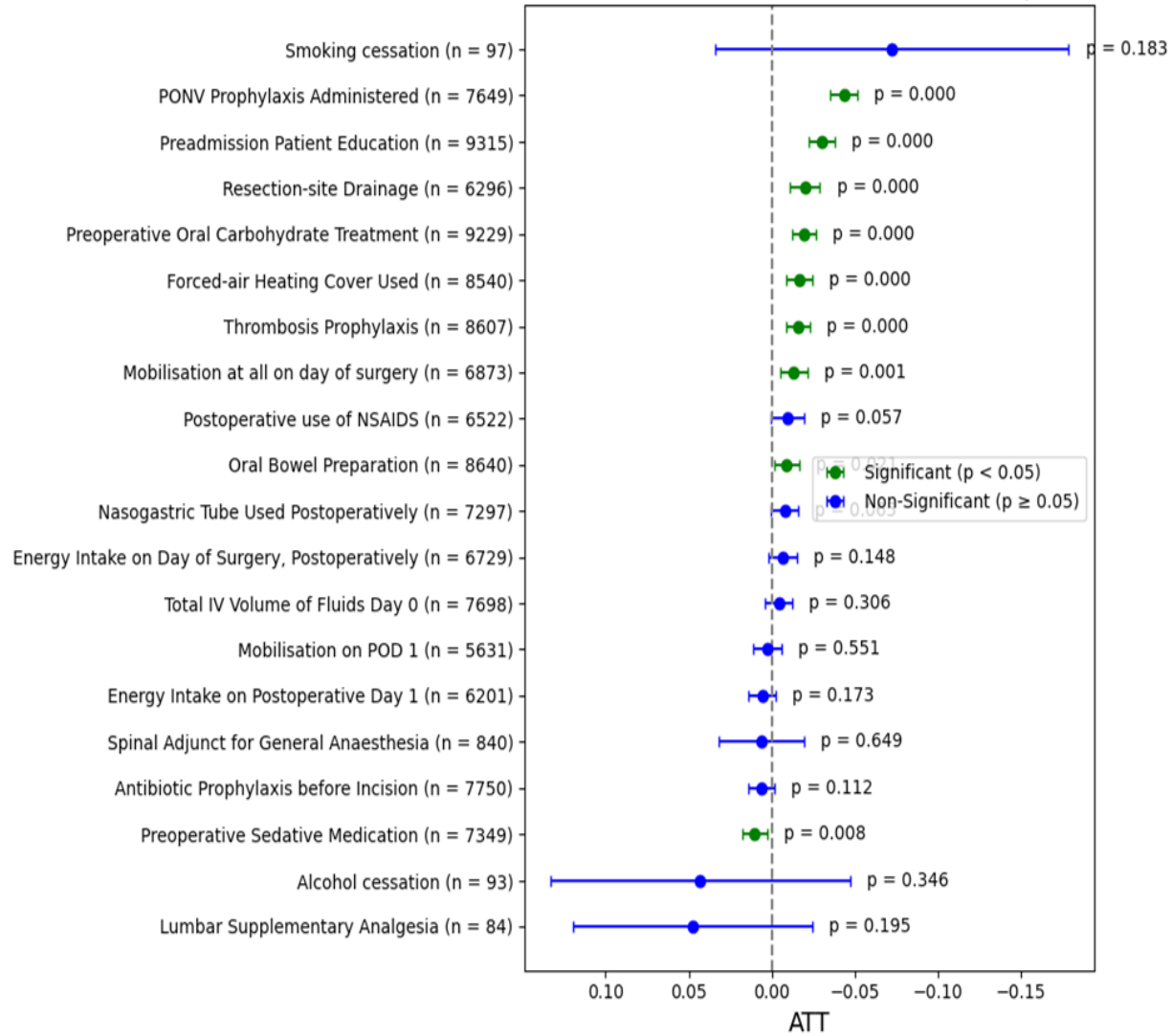
Machine learning infrastructure (2024) enables rapid study of outcomes, patient groups, surgeries, and hospitals, combining ERAS® with propensity score matching and historical data to move from correlation to causation. Results available in days instead of months/years.

Project outcomes: Predicting outcomes after colorectal surgery.

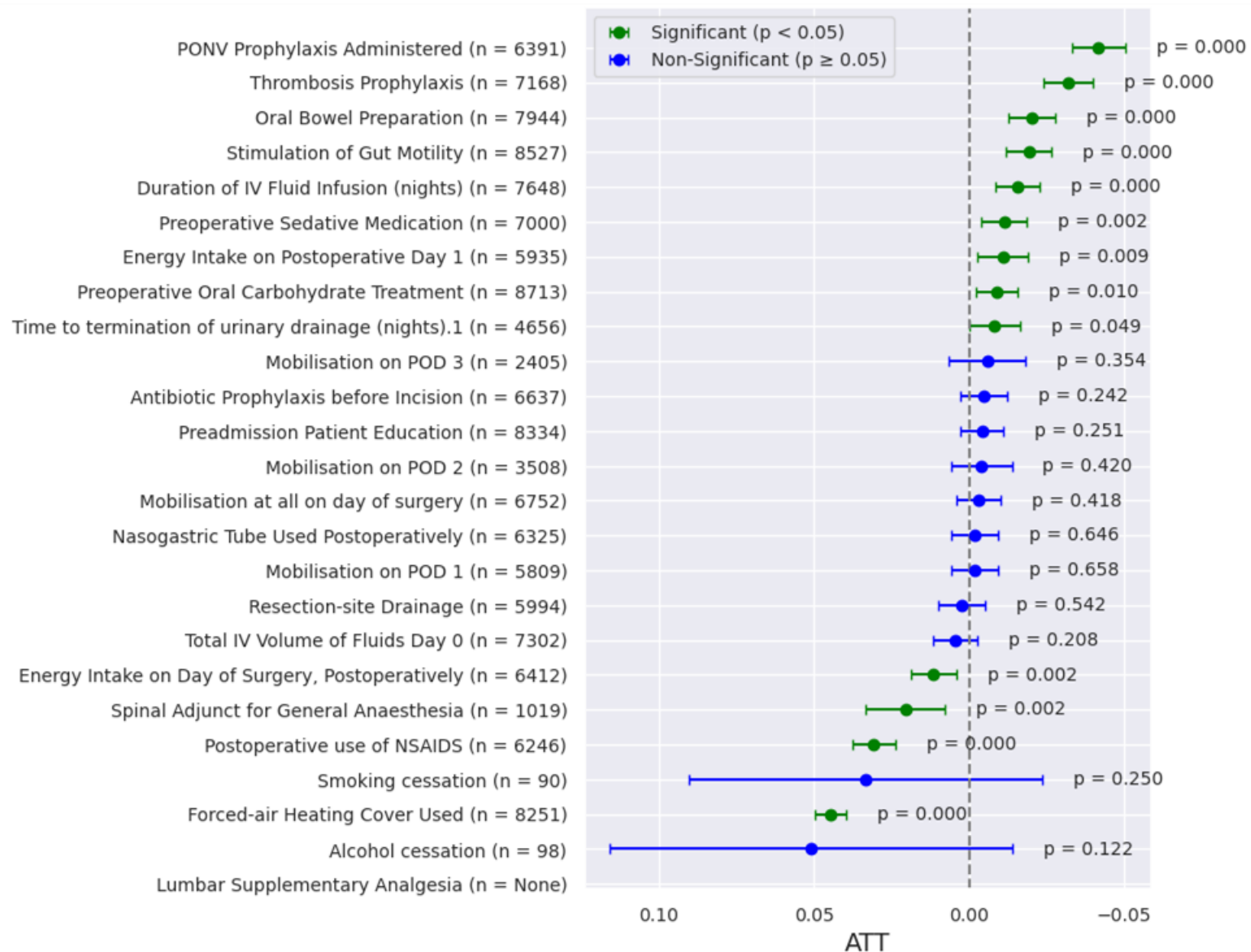
Outcome	Incidents cohort (%)	Accuracy*	AUROC*	Benchmark**
Postop Ileus	5,78	0.90	0.95	0.85 AUROC
AL day 2 post op	5,24	0.73	0.78	0.7-0.8 AUROC
Clavien IIIb-V day 2 post op	8,78	0.69	0.74	0.65-0.70 AUROC
Radmission	9	0.70	0.75	0.65-0.75 AUROC

In 90% of cases, the model was able to correctly predict immediately after surgery whether a patient would develop ileus or not.





← → Protect



VALIDATION NEEDED





FUTURE FEEDBACK FROM THE SYSTEM

“Your centre is the third best in the world”

“In order to improve outcome, you should focus on compliance to item X and Y”

“You should not operate these XY kind of patients”

“You probably should advise dr X to do these operations and dr Y simply to retire from surgery”

“ If you want do conduct a study, please contact the administration”