

Exploring metrics of resident autonomy in the era of robotic surgery

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Introduction

- Operative autonomy is an essential element of surgical residency training.
- Objective measurement of factors influencing autonomy remains difficult.
- Increasing integration of robotic platforms introduces another new, easily measurable variable.
- This study aims to identify patient, case, and operative factors associated with resident autonomy during inguinal hernia repair.

Methods and Procedures

- Resident operative participation (% of case performed) was used as a surrogate for operative autonomy.
- 64 inguinal hernia repairs (20 laparoscopic, 44 robotic) were directly observed and resident-attending interactions, participation, and operative handoffs were documented
- Variables assessed included:
 - Patient demographics
 - Operative time
 - Attending ratings (performance, case difficulty, prompting, specific procedural domains) and resident self-assessments (performance, confidence)
 - Resident experience (number of prior laparoscopic and robotic cases)
- Statistical analysis:
 - Beta regression was used to assess factors associated with resident participation.
 - Univariate models were used to screen individual variable significance
 - Seven variables were chosen for a multivariate model based on effect direction, significance, and educational relevance

Predictors of Resident Operative Autonomy

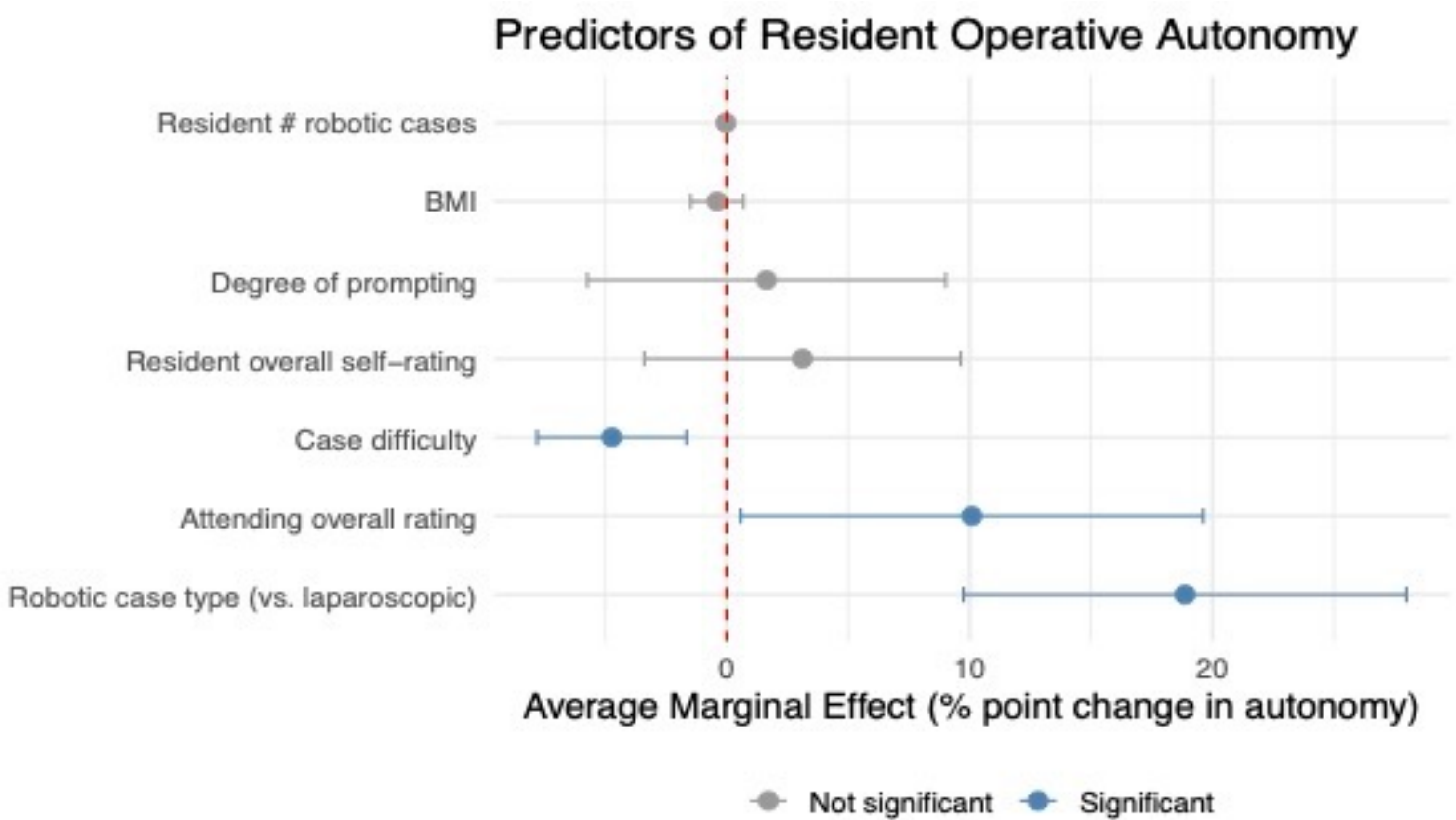


Figure 1. Forest plot of predictors of resident operative autonomy. Significant factors are highlighted.

Results

- Mean resident operative participation across 64 cases was 57% $\pm$ 23
- Robotic cases were associated with an 18.9 percentage point increase in autonomy compared to laparoscopic cases ($p < 0.001$).
- Higher attending ratings of resident performance correlated with a 10.1-point increase in resident participation ($p = 0.04$)
- Greater perceived case difficulty associated with a 4.7-point decrease in participation ($p = 0.003$).
- Robotic case number, resident self-rating, BMI, and attending prompting were not significantly associated with resident participation.

Conclusions

- Robotic platform was the strongest independent predictor of resident autonomy
- Robotic platforms may enhance entrustability and facilitate greater resident independence
- Higher overall resident performance as rated by the attending was also associated with increased autonomy, but the impact was smaller than that of the robotic platform
- Case difficulty as perceived by the attending surgeon was associated with reduced resident autonomy.
- Robotic technology may be a valuable tool in surgical education for promoting trainee independence.
- Further research is needed to understand how robotic systems influence trainee–trainer dynamics and the development of operative independence.