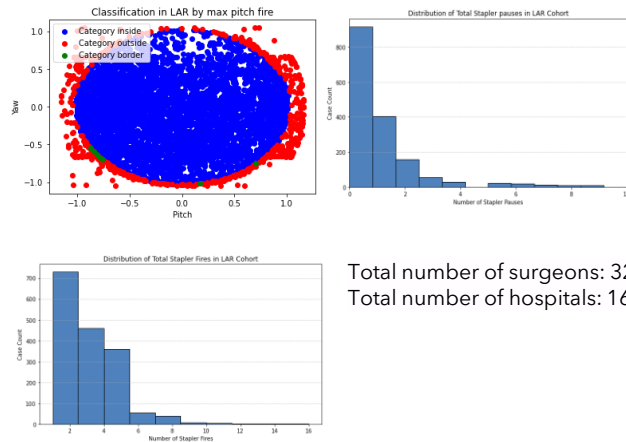


OBJECTIVES: Complications of low anterior resections (LAR), including anastomotic leak and bleeding, can be affected by staple line formation. Narrow pelvic spaces can necessitate overlapping staple lines and extreme stapler angulation. SmartFire technology in SureForm staplers captures data related to these factors. We aimed to investigate whether such stapler usage parameters are associated with differences in clinical outcomes and hospital resource utilization.

METHODS: Using an internal database of stapler performance parameters linked to clinical outcomes and hospital resource utilization data, 1,664 robotic LAR (total 5,016 SureForm stapler fires) from January 1, 2019 to June 30, 2024 were examined. Extreme angulation was defined as the greatest absolute angle encountered in 20% of all stapler fires (Figure 1). Multivariate logistic regression models adjusted for patient demographics, comorbidities, hospital volume in robotic colorectal procedures, and surgeon volume in robotic LAR were used.

A greater number of staple fires was associated with higher likelihood of ileus (OR 1.08 (1.07-1.30); $p < 0.001$), 30-day readmission (OR 1.22 (1.11-1.33); $p < 0.001$), greater LOS (OR 1.04 (1.03-1.05); $p < 0.001$) and ICU LOS (OR 1.05 (1.00-1.10); $p = 0.04$).

Figure 1. Distribution of stapler firing angle, total stapler fires, and total pauses



Total number of surgeons: 322
Total number of hospitals: 165

RESULTS: The average number of pauses per staple fire was 1.1. Average number of staple loads fired at an extreme angle per case was 0.35. Average number of staple fires per case was 3. A greater number of pauses was associated with higher likelihood of ileus (OR 1.10 (1.04-1.17); $p < 0.001$), 30-day readmission (OR 1.10 (1.04-1.16); $p = 0.001$), greater length of stay (LOS) (OR 1.03 (1.03-1.04); $p < 0.001$) and ICU LOS (OR 1.05 (1.02-1.08); $p < 0.001$). A greater number of fires at extreme angulation was associated with higher likelihood of bleeding (OR 1.31 (1.05-1.62); $p = 0.01$), surgical site infection (OR 1.49 (1.06-2.01); $p = 0.01$), greater LOS (OR 1.04 (1.01-1.07); $p = 0.01$) and ICU LOS (OR 1.32 (1.21-1.45); $p < 0.001$).

	Number of pauses	Number of fires with extreme angle	Number of total fires
Anastomotic Leak	1.07 (0.98 – 1.16)	1.17 (0.85 – 1.56)	1.07 (0.93 – 1.22)
Bleeding	1.03 (0.96 – 1.10)	1.31 (1.05 – 1.62)	1.04 (0.93 – 1.15)
Blood transfusion	1.03 (0.91 – 1.14)	1.13 (0.76 – 1.57)	1.09 (0.92 – 1.27)
SSI	0.90 (0.74 – 1.04)	1.49 (1.06 – 2.01)	0.97 (0.80 – 1.15)
Ileus	1.10 (1.04 – 1.17)	1.04 (0.79 – 1.32)	1.08 (1.07 – 1.30)
Readmission	1.10 (1.04 – 1.16)	1.00 (0.80 – 1.23)	1.22 (1.11 – 1.33)
Conversion	1.01 (0.88 – 1.11)	0.81 (0.45 – 1.26)	0.63 (0.47 – 0.81)
LOS	1.03 (1.03 – 1.04)	1.04 (1.01 – 1.07)	1.04 (1.03 – 1.05)
ICU LOS	1.05 (1.02 – 1.08)	1.32 (1.21 – 1.45)	1.05 (1.00 – 1.10)
OR time	1.00 (1.00 – 1.00)	1.00 (1.00 – 1.00)	1.00 (1.00 – 1.00)

■ Statistically significant p-value associated with outcomes

CONCLUSIONS: Stapler usage characteristics may be indicators of case complexity associated with differences in hospital resource utilization.