SmartFire Surgeon Feedback Enables Reload Selection Optimization for SureForm Robotics Stapling During Robotic Sleeve Gastrectomy

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Background:

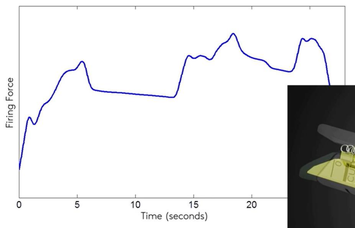
SmartFire technology for SureForm robotic stapling uses real-time measurements of force during staple firing to optimize staple line formation. When force reaches a threshold above optimal tissue compression, the stapler pauses and resumes firing when appropriate tissue compression is achieved. A higher number of pauses suggests that the staple height may be too low for the tissue thickness. Per recent modified Delphi consensus on robotic sleeve gastrectomy (RSG), the number of pauses can be interpreted as feedback regarding the match between tissue thickness and staple height: "2 or more pauses indicates staple height should be upsized for the next fire."

Methods:

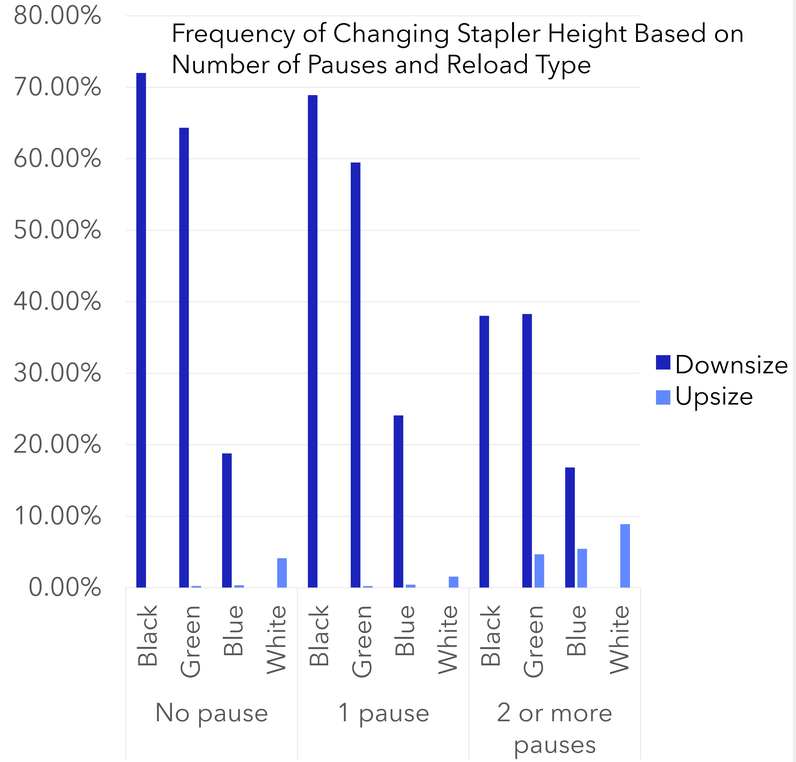
Using an internal manufacturer digital database of stapler performance, 198,528 RSG cases, with a total of 1,160,149 SureForm stapler fires from January 2019 to November 2024, were extracted from the robotic system log data. The data from SureForm stapler fires included the color of staple reloads, the sequence of reload fires, the number of pauses during each stapler fire, and the duration of each pause. To investigate the relationship between number of pauses and choice of next stapler height (same, downsizing, or upsizing), frequency of each of these events was calculated for each stapler height (from order of lowest to tallest is white, blue, green, black).

Results

Staple Height	Black (4.6mm)	Green (4.3mm)	Blue (3.5mm)	White (2.5mm)
Average number of pauses per fire	1.87	0.79	0.49	1.37
Average duration of pauses per fire (sec)	17.2	4.43	7.13	12.9







Conclusions:

SmartFire pauses offer feedback for SureForm stapler reload selection. Absence of pauses is associated with higher likelihood of downsizing, 2 or more pauses is associated with increased likelihood of upsizing. Future studies linking this to clinical outcomes is warranted.