Video Based Analysis (VBA) of Variability in Surgical Technique in Minimally Invasive Roux-En-Y Gastric Bypass

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Introduction

- Video Based Analysis (VBA) can quantify surgeon operative technique
  - » Previous studies of technique variability limited to surveys and highly subjective performance assessments
- This study designed and applied a classification system of RYGB steps to a cohort of surgeons' recordings to statistically quantify variability
- Specifically, we aimed to objectify individual surgeons' preferred step sequence and quantify the intra and inter surgeon procedure variability from this preferred sequence

Methods

- Videos: De-identified of PHI and PII, labeled by trained surgeon annotators with internally developed definitions
  - » Annotated steps categorized as Required, Quality, Optional, Complications or Complexity
  - » Any videos without all required RYGB steps were removed
  - » Videos segmented by type of gastrojejunal (GJ) anastomosis technique (handsewn, linear stapled, circular stapled)
- **Step time** calculated using time points labeled in video
- **Step sequence and variability** measured using Modified Levenshtein Distance (MLD), which measures differences between two strings of characters (in this case, steps)
  - » For each surgeon, sequence with minimum MLD was chosen as preferred sequence. Surgeon variability was then computed by comparing procedure sequence against preferred sequence.

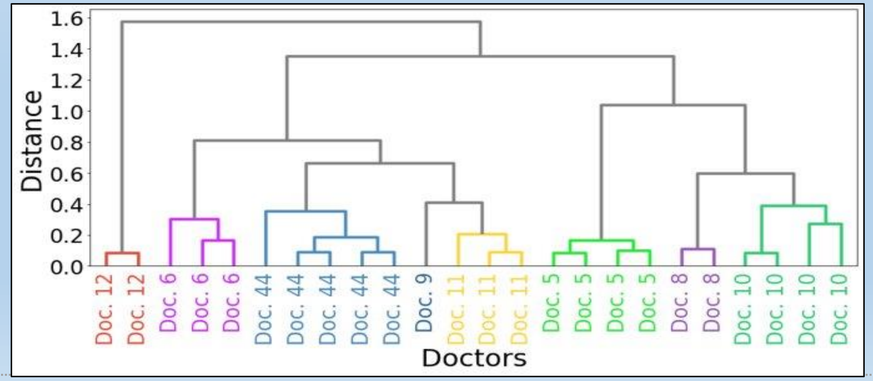
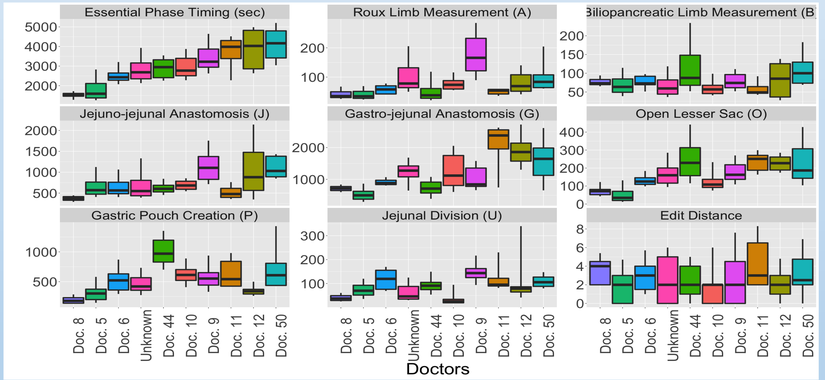


Figure 1: Step Sequence Variability Among and Between Surgeons

Results

- 328 Roux-en-Y Gastric Bypass video recordings from 9 different bariatric surgeons met criteria
- **No surgeon's preferred sequence was the same as another surgeon**, and sequence alone enabled identification of particular surgeons, i.e. a "surgeon fingerprint" (fig 1)
- Each surgeon varied among their own videos, with 2-4 deviations from their preferred sequence per case
- The presence of Complications or Complexity steps did not have a statistically significant effect on step sequence variability (p-value = 0.4)
- Inter and intra surgeon step time varied dramatically among surgeons (fig 2)

Figure 2: Step Time Variability Between Surgeons



Conclusions

- VBA can be used to identify an individual surgeon's preferred sequence or "fingerprint" and the consistency of their operative steps
- This method provides a novel framework for understanding distinct technical approaches in performing RYGB and may better direct training for both trainees and practicing surgeons