Association of manual and automated performance metrics with urinary continence recovery after robot-assisted radical prostatectomy

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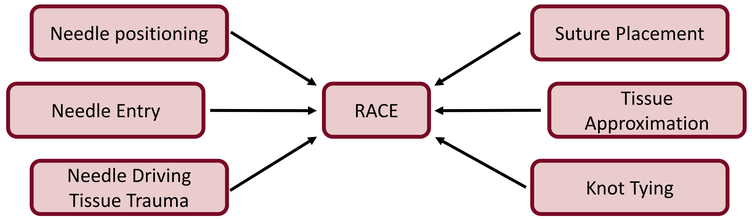
Introductions and objectives

- Assessment for surgeon performance currently exists in 3 modalities: manual measures, automated measures, and realized patient outcomes.
- Automated assessments exist as computer-generated motion-tracking recordings of surgeon efficiency as measured by **automated performance metrics (APMs).**
- Manual assessment tools, such as **Robotic Anastomosis Competency Evaluation (RACE)** which is specific for the vesico-urethral anastomosis (VUA), have been developed to evaluate surgeon psychomotor skills and are representative of surgeon skill.

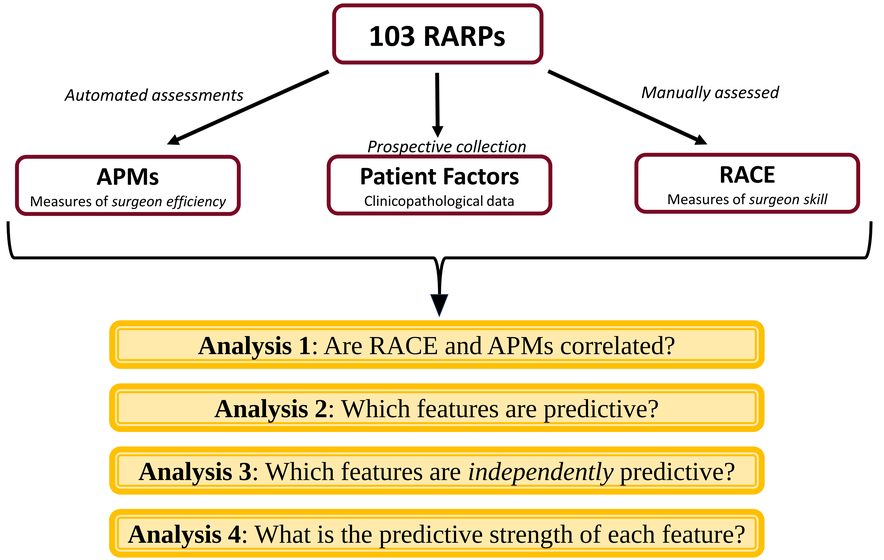


- This study evaluates the association between patient factors, APMs, and RACE score as they contribute to predicting urinary continence recovery after robot-assisted radical prostatectomy (RARP).

Methods

- 45 validated APMs of each RARP were collected by a da Vinci systems recorder as measures of surgeon efficiency.
- RARPs were manually assessed within each individual RACE domain and assigned a total score.
- After all features were collected, 4 primary analyses were performed to evaluate their association with continence recovery time after RARP.

Methods



Results

- **Analysis 1** found a significantly weak correlation between total RACE score and APMs ($-0.345<\rho<-0.357$; $p<0.05$).
- **Analysis 1** found a significantly weak correlation between all individual RACE domains and APMs, minus *tissue approximation* and *knot tying* which correlated with two APMs ($-0.604<\rho<-0.205$; $p<0.05$ and $-0.401<\rho<-0.393$; $p<0.05$)
- **Analysis 2** (univariate analysis): 3 of the individual RACE domains (*needle positioning*, *suture placement*, *tissue approximation*), 3 APMs (*dominant instrument moving time*, *dominant instrument articulation*, *dominant instrument linear velocity*), and 1 patient factor (*age*) were found to be predictive.

Results

- Total RACE score did not provide predictive value in univariate analysis
- **Analysis 3** (multivariate analysis): all predictive features revealed by previous analysis were confirmed as independently predictive.
- **Analysis 4** (likelihood-ratio test): determined the relative predictive value (table, predictors listed in descending predictive strength) of each independently predictive feature.

Predicters	LR p value
1. Age, years	0.0007
2. RACE - Tissue Approximation	0.0024
3. RACE - Suture Placement	0.0029
4. APM - Dominant instrument wrist articulation (pitch, rad)	0.0032
5. RACE - Needle Positioning	0.0035
6. APM - Linear velocity of dominant instrument (cm/s)	0.0236
7. APM - Moving time of dominant instrument (min)	0.0436

Continence predictors ordered by predictive strength
LR, likelihood ratio

Conclusions

- Surgeon performance during the VUA impacts time of urinary continence recovery for patients after RARP.
- Measures of surgeon efficiency (APMs) and surgeon skill (RACE) during the VUA do not highly correlate with each other.
- Measures of surgeon skill, although manually observed, are stronger independent predictors of urinary continence recovery after RARP.