



## Laparoscopic skills assessment: an additional modality for pediatric surgery fellowship selection<sup>☆</sup>



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### ABSTRACT

**Aim:** The Pediatric Surgery fellow selection is a multi-layered process which has not included assessment of surgical dexterity.

**Materials and methods:** Data was collected prospectively as part of the 2016 Pediatric Surgery Match interview process. Applicants completed a questionnaire to document laparoscopic experience and fine motor skills activities. Actual laparoscopic skills were assessed using a simulator. Time to complete an intracorporeal knot was tabulated. An initial rank list was formulated based only on the ERAS application and interview scores. The rank list was re-formulated following the laparoscopic assessment. Un-paired T-test and regression were utilized to analyze the data.

**Results:** Forty applicants were interviewed with 18 matched (45%). The mean knot tying time was 201.31 s for matched and 202.35 s for unmatched applicants. Playing a musical instrument correlated with faster knot tying ( $p = 0.03$ ). No correlation was identified between knot tying time and either video game experience ( $p = 0.4$ ) or passing the FLS exam ( $p = 0.78$ ). Laparoscopic skills assessment lead to significant reordering of rank list ( $p = 0.01$ ).

**Conclusions:** Laparoscopic skills performance significantly impacted ranking. Playing a musical instrument correlated with faster knot tying. No correlation was identified between laparoscopic performance and passing the FLS exam or other activities traditionally believed to improve technical ability.

**Type of study:** Prospective study.

**Level of evidence:** Level II.

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The Pediatric Surgery Fellowship Match is competitive. The average successful match rate for the last 10 years has been 54.5%, compared to 85.8% for Thoracic Surgery, 88.8% for Vascular Surgery, 72.9% for Colorectal Surgery and 62.2% for Abdominal and Transplant Surgery [1]. Most recently the NRMP reported that for the 2016 match, 45 certified positions were filled with an applicant match success rate of 45.8% [1].

Fellow selection is a complex process, during which multiple aspects of each application are examined. Previous literature has documented the effect of the applicants' various credentials on their propensity to match, such as ABSITE (American Board of Surgery in Training Exam) scores and the strength of their publication record [2,3]. Our institution has recently added non-traditional evaluation techniques to our

pediatric surgery fellowship match process. Our evaluations included (1) demographic data collection via a questionnaire and (2) an assessment of technical dexterity with a laparoscopic simulator. We conducted this study to review the results of those non-traditional evaluations, to better understand their impact on the creation of our institutional match list, and to see if they correlated with a successful Pediatric Surgery match.

### 1. Methods

#### 1.1. Cohort

The 2016 Pediatric Surgery Match applicants for a 2017 position were screen based on their academic achievements. Factors considered included ABSITE score, publication record and letters of reference. Forty-six personal interview invitations were sent out and 40 residents accepted and completed the personal interview process at our academic university-based program. The interview process consisted of four 15-min interviews with three pediatric surgery faculty and the current

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pediatric surgery fellow. In addition, the applicants completed an institution-specific resident evaluation questionnaire.

Finally, each applicant underwent a simulator-based assessment of laparoscopic intracorporeal knot tying. The applicants were given adequate time to familiarize themselves with the laparoscopic simulator and equipment, and then they were timed and assessed by an impartial observer as they completed one intracorporeal knot. The impartial observer was a physician chosen from the general surgery department, who was not otherwise involved in the applicant selection process. The observer commented on the applicant's skills, technique, accuracy and attitude. The observer's comments were stratified into positive (whenever the observer commended the applicant on skill), neutral (whenever the observer labeled the applicant's skills as being average) and negative (whenever the observer criticized the applicant's skill). A different impartial physician stratified the comments following the completion of the Match process.

Success in the match was defined as the acquisition of a 2017 ACGME-approved fellowship position by the applicant through the 2016 Match. The Match data were obtained through the NRMP. This is an IRB approved study (IRB# 5160285).

### 1.2. Variables

Data were collected prospectively. Variables collected from the completed questionnaires included the applicant's clinical year, participation in activities that promote fine motor skills such as playing video games or musical instruments, and a self-assessment of the applicants' laparoscopic and robotic experience. Scores assigned to each applicant during the personal interviews were tabulated. The time to tie one intracorporeal knot, and the observer's comments, were also tabulated. Finally each applicant's performance in the 2016 NRMP Pediatric Surgery Fellowship Match for a 2017 position was attained from our institution's program director.

The applicants' position on our initial rank list was determined by the faculty, using a combination of the ERAS information and the personal interview scores, as in previous years. This initial ranking was created prior to the faculty's exposure to the results of the laparoscopic skills assessment. The rank list was then reformulated after results of the laparoscopic skills assessment were made known. The applicant's change in rank between the initial list and the reformulated one was calculated and tabulated.

### 1.3. Statistics

Linear regression was used to analyze possible associations between individual's change in rank list and either knot tying times or evaluator comments. Logistic regression was used to analyze possible associations between matching and either knot tying times or evaluator comments. The Kruskal-Wallis rank sum test and Spearman's correlation coefficient were utilized to analyze the relationship between the observer's comments and knot tying time. Grubbs' test, also known as the maximum normed residual test, was used to test for outliers [4]. A p value of <0.05 was considered as statistically significant. For post hoc Kruskal-Wallis rank sum test analysis of the observer's comments, Bonferroni-adjusted alpha levels of 0.017 were used to denote statistical significance.

## 2. Results

Nationally 97 applicants participated in the 2016 Pediatric Surgery Match for a 2017 appointment, and one applicant withdrew from the Match. Forty-four applicants (45.8%) successfully matched. Successful match rate for applicants interviewed at our institution was 18/40 (45%). The mean applicant intracorporeal knot tying time was 202.15 s. Applicants who subsequently matched had an average intracorporeal knot tying time of 201.31 s while unmatched applicants averaged 202.35 s. Demographic data is summarized in Table 1.

Our population sample included one resident applicant that had a knot-tying time that was much longer than the mean of the group. The result for the aforementioned applicant was excluded in the analysis as an outlier that would skew the data. This decision was further supported by a Grubbs test ( $p < 0.05$ ).

Subjects with positive comments were associated with faster knot tying times than those with neutral and negative comments but those with neutral comments were not significantly different in knot tying times from those with negative comments (Table 2).

Univariable results for the linear regression models show that knot tying time was significantly associated with change in rank and a relatively high r-squared value of 0.38 (Fig. 1), whereas the observer's comments were not significantly associated with change in rank. When utilizing the multivariable model knot tying time remained significant and observer's comments were still not significant (Table 3). The results show that for every 16.7 s increase in time, a one-unit drop in the rank is expected.

There was no significant correlation noted between knot tying time and matching. Furthermore, no significant correlation was found be-

**Table 1**  
Demographics and relevant variables of sample population by matched status.

Variable	Total population	Matched	Not matched
	N (%)	N (%)	N (%)
No. of subjects	39	17	22
Knot time (mean, sec)	202.15 ( $\pm$ 84.1)	201.31 ( $\pm$ 102.4)	202.35 ( $\pm$ 71.8)
Total interview score (mean, score)	26.49 ( $\pm$ 5.9)	29.44 ( $\pm$ 4.1)	24.91 ( $\pm$ 5)
Gender			
Male	19 (48.7)	8 (47.1)	11 (50)
Female	20 (51.3)	9 (52.9)	11 (50)
Clinical year			
Fourth	27 (69.2)	15 (88.2)	12 (54.6)
Fifth	6 (15.4)	1 (5.9)	5 (22.7)
Sixth	4 (10.3)	0 (0)	4 (18.2)
Seventh	2 (5.1)	1 (5.9)	1 (4.6)
Evaluator comments			
Positive	16 (41)	6 (35.3)	10 (45.5)
Negative	6 (15.4)	3 (17.7)	3 (13.6)
Neutral	17 (43.6)	8 (47.1)	9 (40.9)
Played a musical instrument	26 (66.7)	8 (47.1)	18 (81.8)
Plays video games	13 (33.3)	6 (35.3)	7 (31.8)
Perceived complex laparoscopic experience	35 (89.7)	14 (82.4)	21 (95.5)
Passed the FLS exam	24 (61.5)	11 (64.7)	13 (59.1)

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