Modular Training for Robot-Assisted Radical Prostatectomy: Where to Begin? ☆, ☆☆

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OBJECTIVE: Effective training is paramount for patient safety. Modular training entails advancing through surgical steps of increasing difficulty. This study aimed to construct a modular training pathway for use in robot-assisted radical prostatectomy (RARP). It aims to identify the sequence of procedural steps that are learnt before surgeons are able to perform a full procedure without an intervention from mentor.

DESIGN: This is a multi-institutional, prospective, observational, longitudinal study. We used a validated training tool (RARP Score). Data regarding surgeons' stage of training and progress were collected for analysis. A modular training pathway was constructed with consensus on the level of difficulty and evaluation of individual steps. We identified and recorded the sequence of steps performed by fellows during their learning curves.

SETTING AND PARTICIPANTS: We included 15 urology fellows from UK, Europe, and Australia.

RESULTS: A total of 15 surgeons were assessed by mentors in 425 RARP cases over 8 months (range: 7-79) across 15 international centers. There were substantial differences in the sequence of RARP steps according to the chronology of the procedure, difficulty level, and the order in which surgeons actually learned steps.

Steps were not attempted in chronological order. The greater the difficulty, the later the cohort first undertook the step (p = 0.021). The cohort undertook steps of difficulty level I at median case number 1. Steps of difficulty levels II, III, and IV showed more variation in median case number of the first attempt.

We recommend that, in the operating theater, steps be learned in order of increasing difficulty. A new modular training route has been designed. This incorporates the steps of RARP with the following order of priority: difficulty level > median case number of first attempt > most frequently undertaken in surgical training.

CONCLUSIONS: An evidence-based modular training pathway has been developed that facilitates a safe introduction to RARP for novice surgeons. (J Surg Ed ▪:▪▪▪-▪▪▪. © 2016 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: modular training, RARP, safety, surgical training

ACGME COMPETENCIES: Patient Care, Medical Knowledge, Practice Based Learning and Improvement, Professionalism, Interpersonal Skills and Communication

INTRODUCTION

Increasing emphasis is placed on developing validated, feasible, and effective training and assessment methods to maximize patient safety while exploiting the benefits offered by robot-assisted surgery (RAS). Combined with reduced time available for training, the efficiency of training has become of increasing importance. This has resulted in the introduction

of simulation and of modular training.[1] Modular training refers to progression through surgical steps of increasing difficulty, moving onto more advanced steps once competence has been attained in more straightforward ones.[2]

At present, there is a lack of procedure-specific guidance adopting a modular approach. Robot-assisted radical prostatectomy (RARP) is an indexed procedure within the specialty, worthy of evidence-based, well-developed, validated training and assessment methods. The technical and nontechnical skills required are imperative for the procedure, yet they can also be translated across to other specialties.

This study sought to construct a modular training pathway for RARP using principles that can be used to construct similar pathways in different operations and specialties. To do so we aimed to:

(1) Determine how surgeons progress through training for RARP at present.
(2) Determine the relationship between the difficulty of a procedural sub-step, when it is first undertaken in training, and the frequency with which it is performed.
(3) Construct a modular training pathway integrating the theory-based recommendations from the ERUS pilot study with evidence on how surgeons train in reality.

METHODS

Study Design and Participants

The study was conducted at an international, multi-institutional level with a prospective, observational, longitudinal design. The participants recruited were 15 urology fellows and their mentors from across Europe and Australia. There was no requirement for Institutional Review Board approval.

Process

Fellows progressed through the ERUS training curriculum using the 17-step RARP Assessment Score for training and progression assessment (Fig. 1).[3,4] This has previously been validated for use by expert urology surgeons and fellows. Fellows' technical proficiency was scored by their mentor each time they performed a step of RARP in the operating room. At the end of the study period, results were analyzed to examine patterns in training demonstrated by the fellows. Comparison was made to identify differences between recommendations from the literature and training pathways undertaken in practice.

Outcomes

Outcomes of interest were in the order of RARP steps as recommended by the literature according to the difficulty level, the total number of attempts of each step of RARP by the 15 fellows, and the case number at which each step was undertaken for the first time by fellows. Difficulty level was derived from the RARP Assessment Score where previously it had been designated by expert surgeons and undergone extensive content validation reaching a consensus. These parameters were used to formulate a modular training pathway using evidence from the literature and from the reality of the practice of the 15 fellows.

Statistical Analysis

SPSS version 22 was employed by this study (IBM Corp., Armonk, NY). Descriptive statistics were used to report results on patterns of training practice. Median case number and inter-D for when steps were first attempted were noted. A $p < 0.05$ was taken as statistically significant.

RESULTS

Descriptive Statistics

After 425 RARP procedures, 15 urology fellows had attempted all steps of RARP (Table 1). All steps except steps 3 (laparoscopic adhesiolysis—86.7%), 7 (stitching and division of the dorsal venous complex—86.7%), 9 (posterior bladder neck transection—86.7%), and 17 (lymph node dissection—80.0%) had been done by all surgeons. The step performed most frequently was step 4: initiation of the console (372 cases), and the least practised was step 17: lymph node dissection (82 cases). The maximum number of attempts of a step of RARP by any 1 fellow was 79 (step 4: initiation of the console, step 2: pneumoperitoneum and port placement, and step 1: robot setup and patient positioning). The minimum number of attempts of a step by a fellow was 16 (step 13: apical dissection of the prostate, step 3: laparoscopic adhesiolysis).

Identification of Procedural Steps in a Chronological Manner

We used the steps of RARP as described in the RARP Assessment Score in chronological order within the procedure (Fig. 1).[4] Observation was made of the chronological order of steps of RARP, their difficulty (as designated in the literature), and the order in which the study population undertook them.

Relationship Between the Difficulty, First Attempt, and Frequency of Performance

On grouping steps of RARP according to difficulty level as rated by ERUS, it was apparent that there were differences between that and the chronological order of steps within a RARP procedure. Case number at which the cohort of fellows first attempted each step is reported in Table 2. At