## Platinum Priority – Education
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# Pilot Validation Study of the European Association of Urology Robotic Training Curriculum

**Alessandro Volpe** [a,b], **Kamran Ahmed** [c], **Prokar Dasgupta** [c], **Vincenzo Ficarra** [a,d], **Giacomo Novara** [a,e], **Henk van der Poel** [f], **Alexandre Mottrie** [a,g,*]

[a] OLV Vattikuti Robotic Surgery Institute, Aalst, Belgium; [b] Division of Urology, University of Eastern Piedmont, Novara, Italy; [c] MRC Centre for Transplantation, Kings College London, Guy's Hospital, London, UK; [d] Department of Experimental and Clinical Medical Sciences, Division of Urology, University of Udine, Udine, Italy; [e] Department of Surgical, Oncological and Gastrointestinal Sciences, Division of Urology, University of Padua, Padua, Italy; [f] Division of Urology, The Netherlands Cancer Institute, Amsterdam, The Netherlands; [g] Division of Urology, Onze-Lieve-Vrouw Hospital, Aalst, Belgium

## Article info

## Abstract

*Background:* The development of structured and validated training curricula is one of the current priorities in robot-assisted urological surgery.

*Objective:* To establish the feasibility, acceptability, face validity, and educational impact of a structured training curriculum for robot-assisted radical prostatectomy (RARP), and to assess improvements in performance and ability to perform RARP after completion of the curriculum.

*Design, setting, and participants:* A 12-wk training curriculum was developed based on an expert panel discussion and used to train ten fellows from major European teaching institutions. The curriculum included: (1) e-learning, (2) 1 wk of structured simulation-based training (virtual reality synthetic, animal, and cadaveric platforms), and (3) supervised modular training for RARP.

*Outcome measurements and statistical analysis:* The feasibility, acceptability, face validity, and educational impact were assessed using quantitative surveys. Improvement in the technical skills of participants over the training period was evaluated using the inbuilt validated assessment metrics on the da Vinci surgical simulator (dVSS). A final RARP performed by fellows on completion of their training was assessed using the Global Evaluative Assessment of Robotic Skills (GEARS) score and generic and procedure-specific scoring criteria.

*Results and limitations:* The median baseline experience of participants as console surgeon was 4 mo (interquartile range [IQR] 0–6.5 mo). All participants completed the curriculum and were involved in a median of 18 RARPs (IQR 14–36) during modular training. The overall score for dVSS tasks significantly increased over the training period ($p < 0.001$-$0.005$). At the end of the curriculum, eight fellows (80%) were deemed able by their mentors to perform a RARP independently, safely, and effectively. At assessment of the final RARP, the participants achieved an average score $\geq 4$ (scale 1–5) for all domains using the GEARS scale and an average score $> 10$ (scale 4–16) for all procedural steps using a generic dedicated scoring tool. In performance comparison using this scoring tool, the experts significantly outperformed the fellows (mean score for all steps 13.6 vs 11).

*Conclusions:* The European robot-assisted urologic training curriculum is acceptable, valid, and effective for training in RARP.

*Patient summary:* This study shows that a 12-wk structured training program including simulation-based training and mentored training in the operating room allows surgeons with limited robotic experience to increase their robotic skills and their ability to perform the surgical steps of robot-assisted radical prostatectomy.

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\* Corresponding author. OLV Vattikuti Robotic Surgery Institute, Department of Urology, Onze-Lieve-Vrouw Hospital, Moorselbaan 164, 9300 Aalst, Belgium. Tel. +32 53 724378; Fax: +32 53 724411.

E-mail address: a.mottrie@telenet.be (A. Mottrie).

# 1. Introduction

The concept of surgical training has been evolving in the last decade from the traditional concept of "see one, do one, teach one" towards better defined and standardized methodologies for surgical education based on the development of skill-based curricula [1–5]. Furthermore, the development and diffusion of surgical robotic platforms are increasingly supporting the development, use, and validation of simulation-based training methods ranging from bench-top synthetic models, animal, and cadavers to high-fidelity virtual training platforms [6–8]. Simulation-based training should be an essential part of surgical training programs to significantly improve the technical and nontechnical skills of trainees, shorten their learning curves for different procedures, and improve surgical safety [9,10].

Nevertheless, training for robotic techniques remains mainly unstructured. There has been a recent call by various training bodies for the development of well-organized educational curricula to increase preclinical exposure and of validated assessment tools that allow constructive feedback for performance improvement. These curricula, as well as proficiency-based credential processes, are important for improving patient safety and surgical outcomes in urological surgery [5,11].

On the basis of these considerations, the European Association of Urology (EAU) Robotic Urologic Section (ERUS) has designed and developed a structured training program and curriculum in urology that focuses on robot-assisted radical prostatectomy (RARP). The aim of the present study was to assess the feasibility, acceptability, face validity, and educational impact of this curriculum, and to assess improvements in performance and ability to perform RARP after completion of the curriculum.

# 2. Materials and methods

## 2.1. Study design and participants

This was a longitudinal prospective study using quantitative observational measures. The participants were ten international fellows training in robotic surgery provided by major teaching European institutions under the recommendation of an expert mentor.

## 2.2. Curriculum

The curriculum was developed based on an expert panel discussion [12] and was used for training of fellows. The key components of the curriculum include: (1) e-learning, (2) an intensive week of structured, simulation-based training (virtual reality synthetic, animal, and cadaveric platforms), and (3) supervised modular training in RARP (Fig. 1).

## 2.3. Process

The overall study duration was 12 wk. After evaluation of baseline experience, the fellows underwent e-learning using the e-module developed by the ERUS expert panel [13] and observed and assisted in live surgery for 3 wk. The participants then underwent an intensive week of structured, simulation-based laboratory training including virtual reality simulation (da Vinci surgical simulator, dVSS) and dry and wet laboratory simulation platforms (synthetic, animal, and cadavers) (Supplementary Table 1). Following this, the fellows participated into a modular training program under supervision, which involved progressive, proficiency-based training through surgical steps with increasing levels of complexity (Supplementary Table 2) [14]. The fellows continued the training until they carried out a full RARP procedure, which was assessed by their mentors and video-recorded for review and evaluation of performance by blind assessors.

## 2.4. Study outcomes

The outcomes of interest were (1) the feasibility, acceptability, face validity, and educational impact of the curriculum [15] and (2) improvements in performance and ability to perform RARP following completion of the curriculum. Face validity is the extent to which the learning and assessment environment resembles the situation in the real world [15].

## 2.5. Evaluation of outcome parameters

Feasibility, acceptability, face validity, and educational impact were assessed using quantitative surveys that were developed and validated according to the expert opinions of robotic surgeons.

The technical skills of the participants were assessed via inbuilt validated assessment metrics on the dVSS. The specific skills included
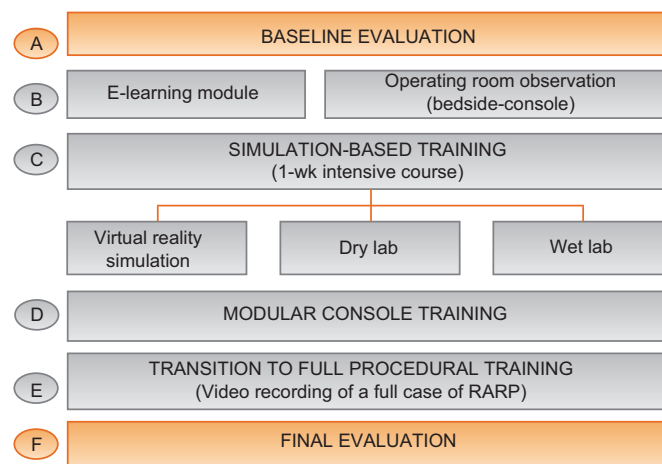


Fig. 1 – Structure of the European Association of Urology Robotic Training Curriculum.