Design, validation and implementation of a PROficiency-based StePwise Endovascular Curricular Training (PROSPECT) program

Heidi Maertens M.D.[1], Isabelle Van Herzeele M.D. PhD[1], Rajesh Aggarwal M.D. PhD[2], Liesbeth Desender M.D.[1], Frank Vermassen M.D. PhD[1]

[1]Department of Thoracic and Vascular Surgery, Ghent University Hospital, Ghent, Belgium.
[2]Department of Surgery, Faculty of Medicine, McGill University, Montreal, Canada.

Introduction

Increase in minimally invasive techniques, implementation of residents' working hour restrictions and increased focus on patient safety pose challenges to surgical education. Simulation-based training has been introduced to allow structured skills acquisition in a safe environment. Furthermore, training in a proficiency-based manner, focusing on training to expert-derived performance criteria, allows maximal skill acquisition and skill transfer to the operating room.

Objectives

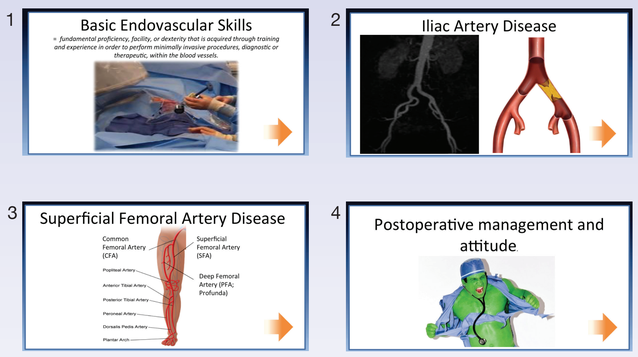
This study aimed to ***design***, ***validate*** and demonstrate the ***feasibility*** of a PROficiency-based StePwise Endovascular Curricular Training (PROSPECT) addressing the three core components of knowledge, technical skills and human factor skills in a modular approach. Each module consists of web-based learning as well as hands-on simulation training.

Material

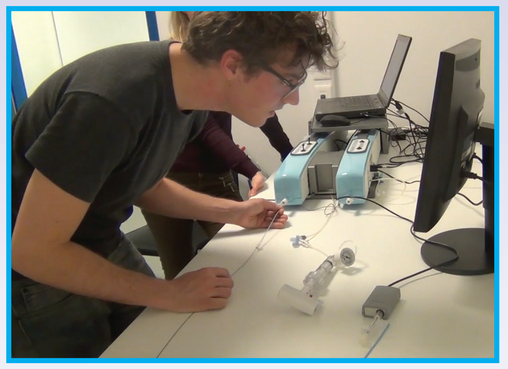
Technical endovascular skills training and assessment was carried out on the ANGIO MentorTM Express System (Simbionix USA Corp., Cleveland, Ohio, USA).

Methodology

A comprehensive structured curriculum for endovascular management of symptomatic vascular disease in the lower limbs (Rutherford classification 2-5; stenosis of iliac/ superficial femoral artery disease) was developed. Construct validity was investigated. Performances were assessed using multiple-choice questionnaires (MCQ), valid simulation metrics, Global Rating Scorings (GRS) and Examiner Checklists. Senior-year medical students were recruited at Ghent University Hospital.
Vascular surgeons, who had performed over 100 endovascular procedures as primary operator during the last 2 years, were invited to participate during conferences.
Feasibility was assessed by training two final-year medical students according to this new endovascular curriculum.



KNOWLEDGE AND ATTITUDE SKILLS
The four e-learning modules included in PROSPECT.

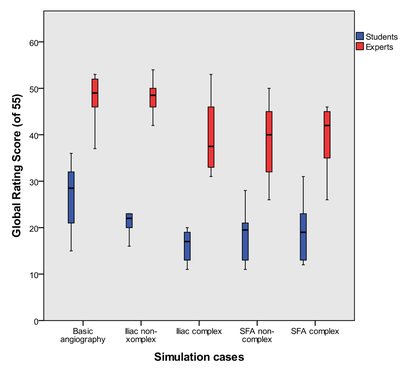


TECHNICAL SKILLS
Example of a hands-on simulation training session.

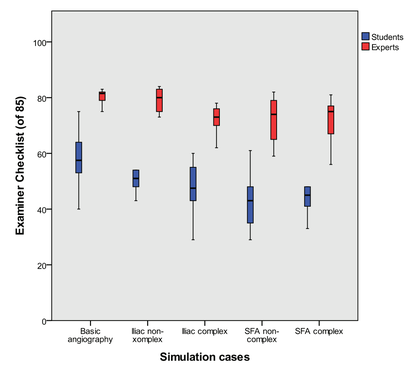
Results

Twenty-nine medical students and 20 vascular surgeons participated. Vascular surgeons obtained higher MCQ scores (median 24.5-22.0 vs. 15.0-12.0; P<0.001). Students took significantly longer to treat any iliac or femoral artery stenosis (3.3-14.8 vs. 5.8-30.1 min.; P=0.001-0.04) while in more complex cases, fluoroscopy time was significantly higher in students (8.3 vs. 21.3 min.; P=0.002; 7.3 vs. 13.1 min.; P=0.03).

In all cases vascular surgeons scored higher on GRS (51.0-42.0 vs. 29.5-18.0; P<0.001) and Examiner Checklists (81.5-75.0 vs. 54.5-43.0; P<0.001). Based upon median expert scores, proficiency-levels were determined.
Two students completed the entire training program and reached proficiency for each step within a 3-month period during their internships.



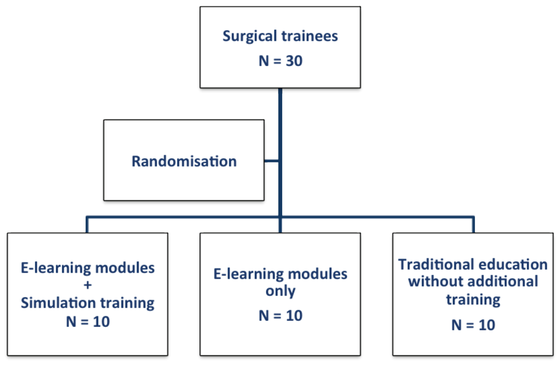
GLOBAL RATING SCORE for all simulation cases for student and expert groups.



EXAMINER CHECKLIST for all simulation cases for student and expert groups.

Conclusions

A feasible and validated endovascular curriculum to train cognitive, technical and non-technical endovascular skills has been developed. A randomised-controlled trial has been initiated to investigate its effect on performances in real-life, patient outcomes and cost-effectiveness.



Flowchart of the RCT.

Example of a real-life intervention performed by a surgical trainee after completion of the RCT.