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 Mentor™ 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.

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.

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.