Updates in Surgery
https://doi.org/10.1007/s13304-025-02265-3

ORIGINAL ARTICLE

First Touch course—the impact of a nation-wide boot camp on the transition to Surgical residency

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Received: 12 February 2025 / Accepted: 7 May 2025

Abstract

Surgical residents face numerous challenges and undergo significant changes at the beginning of their residency. Although there are several courses throughout residency, it is difficult to address all of them in a single activity. Boot camps (BC) have been a way for easing this transition period. Our team developed the "First Touch Course" boot camp in 2017 to join all residents of the same year, before they initiate Surgical residency. Since then, 8 editions have been organised (one per year) with the participation of a total of 481 residents. Eighty-four residents have enrolled in the last two editions, mainly from General Surgery, Gynecology and Urology. The present study analysed the 2023 and 2024 editions to evaluate the impact of this BC on residents' preparedness and confidence to face residency. More than 71% of the participants rated the course as excellent and 100% considered it exceeded their expectations. Almost 100% considered it will have a significant impact and more than 75% felt better prepared to start residency after the course. More than 73% believe that having a laparoscopic simulator will be useful for continuous skills acquisition. This is the first nationwide, multi-speciality boot camp that promotes continuing education, providing each resident with a personal laparoscopy simulator and laparoscopic instruments, allowing for home-based training. This study highlights the importance and impact of this kind of boot camps in preparing residents for the early stages of surgical residency and the impact it may have on basic skills acquisition.

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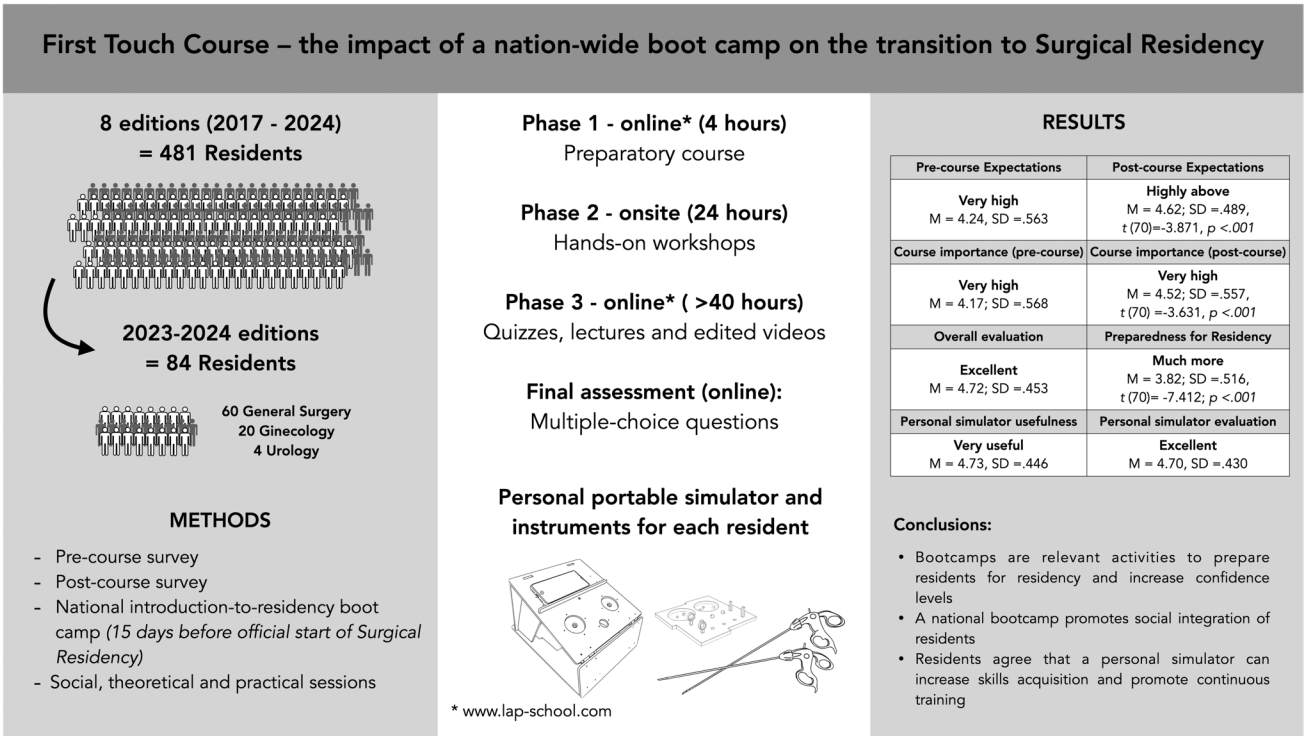
Published online: 30 June 2025

Graphical Abstract



Keywords Resident · Workshops · Hands-on · Training · Surgical education · Soft skills

Introduction

Surgical residency profoundly changes all aspects of a doctor's life. The transition between General and Surgical residency is, in fact, very abrupt and stressful. In Portugal, before Surgical residency, all residents go through 12 months of General residency (Fig. 1).

During General residency they have contact with surgical specialities for a period that lasts from 2 to 6 months. For many of them, this transition means relocation to a different city and hospital with unfamiliar internal protocols

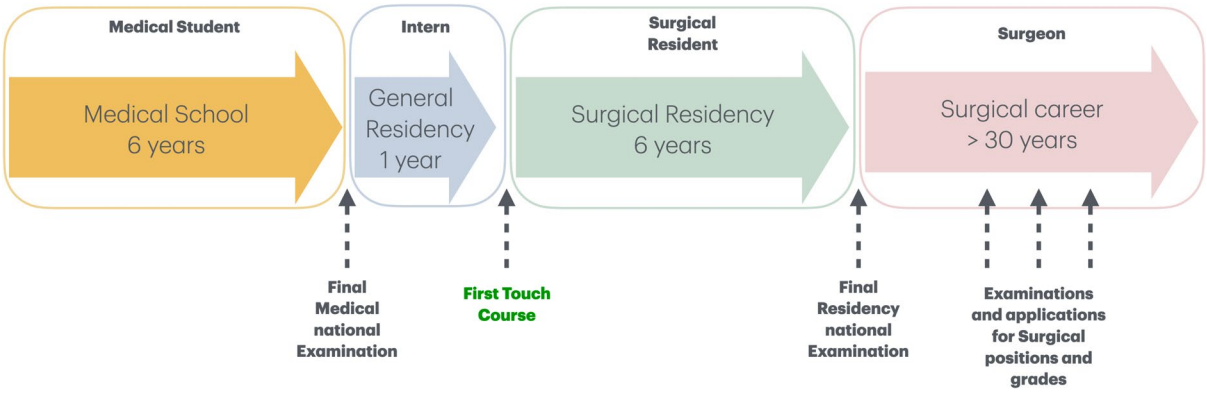


Fig. 1 Educational Pathway in Portugal—from Medical Student to Surgeon

and workflows. Besides that, residents also face growing responsibilities, a higher demand for knowledge, skills, and decision-making. Usually, they experience an overwhelming feeling of insecurity, stress, and unpreparedness [1, 2]. Surgical training opportunities are not equal among countries and access to training tools such as simulators and instruments is not widely available. Box trainers and virtual reality simulators help to minimize these difficulties as they can improve access to surgical training and thus to achieve proficiency, especially in laparoscopic and robotic surgery [3–6]. There is a growing emphasis on simulation-based assessment and training to achieve a predetermined skill level and competence, which can motivate doctors to engage in further practice [7, 8]. Although there are several courses for surgical residents, it is difficult to address all of these challenges that residents face at the beginning of residency in a single activity. This led us to develop the "First Touch Course" (FT) boot camp, in 2017.

The concept of the FT

The FT is a nationwide and annual introduction course to surgical residency. It is all-inclusive, including an onsite and online scientific program, housing, meals, social program, a portable laparoscopy simulator, a set of basic and intermediate exercises plus one Maryland and one clinch grasper. We hypothesized that this format, besides empowering the surgical residents with knowledge and technical skills, would foster social relationship among the participants of the same year. FT covers mainly 3 specialities: General Surgery, Gynecology, and Urology. It is also open to Pediatric, Cardiac and Thoracic Surgery Residents.

The main goals of FT are:

1. To welcome all residents to the surgical community, providing opportunities to network with their colleagues, Senior residents and Surgeons (Faculty);
2. To offer hands-on, simulation-based training for the most common initial surgical procedures;
3. To provide a portable laparoscopy simulator and instruments for home-based continuous practice;
4. To be an introduction to Surgical residency boot camp (BC), with lectures and videos covering numerous topics including surgical treatment of surgical pathologies, residency structure, labor rights, and legislation;

We developed a pilot edition of the BC in 2017, only for General Surgery residents. The curriculum covered theoretical lectures and practical skills on surgical topics, running through 3,5 days of lectures and workshops. Additional hours were allocated for team-building activities (4 h) and during meals and at the end of the day some cultural/social activities have been developed (6 h). The original curriculum was repeated in 2018. The positive feedback from participants in both 2017 and 2018 editions generated interest from Gynecology and Urology residents. For the 3rd edition (2019), and continuing thereafter, we expanded registrations to include Gynecology/Obstetrics and Urology as they share similar skills, interests and duties in residency. A specific program has been designed for each group and included in the main program.

In December 2020, it wasn't possible to organize the onsite session of the course due to the COVID-19 pandemic. Because of the limitations imposed, the project had to face major changes concerning the format. Consequently, our team developed an online school (www.lap-school.com) in November 2020, and the theoretical component was moved online to avoid personal gatherings. Additionally, the curriculum underwent structural changes so that we could deliver it in less days and fully dedicated to hands-on skills training. The new format has been repeated in December 2021 and December 2022. In 2023, gathering all the experience from the six previous editions, we redesigned all the scientific programs, workshops, and the overall structure of the BC to develop our definitive curriculum, which is described and analyzed in the present paper. This format has been repeated in 2024. Over 8 editions, a total of 481 participants from various Portuguese hospitals attended the BC, including 312 in General Surgery, 110 in Gynecology, 42 in Urology, 15 in Pediatric Surgery, and 2 in Thoracic Surgery. According to the concept and aims of the course, we decided that the best date for the BC would be 2 weeks prior to the start of residency (Portuguese Surgical residency starts on January 1st every year). The video-lectures in lap-school.com have an average duration of 15 to 20 min and are grouped in "modules". These are focused on various topics, that we believed to be the most important ones for new residents. Since the first edition, the course has been advertised by social media (e.g. Facebook, Instagram) and also by word of mouth. The 2024 fee was established at 349€ per participant. The aims of this study are to assess the quality and educational value of this introduction-to-residency BC for new surgical residents; and understand its impact on residents; preparedness and self-perceived confidence levels at the early stages of residency. The authors are Surgeons and Senior Surgical residents that coordinate the whole BC and also participate in Session 2, as leaders of the workshops.

Methods

Online surveys

Two online surveys have been developed using Google forms® platform, and sent before (pre-course survey) and just immediately after the last workshop (post-course

survey). The pre-course survey aimed to assess demographics; previous contact with surgical specialities; residents' confidence and preparedness for residency; and the main expectations about the course. The post-course survey aimed to analyze the global evaluation and utility of the course; the workshops; the laparoscopic simulator; and to assess residents' perception of the boot camp's impact on confidence and preparedness for residency. Both questionnaires included open, closed and multiple-choice questions. Data received was analyzed anonymously.

The FT curriculum

The curriculum is divided into three sessions: online preparatory course, FT boot camp and online theoretical course. Session 1 and 3 (online) are accessible through all the 6-year period of residency, so Residents can view and review lectures, videos, etc. as many times as they need.

Session 1: online preparatory course

This session is carried out on our online school (www.lap-school.com) and it covers theoretical content that is essential for the in-person workshops, with a duration of almost 2 h. Completing this session is mandatory prior to session 2 (onsite) (Table 1).

Session 2: The "FT Boot camp"—2.5-day onsite course

This session is entirely dedicated to hands-on practice. Each workshop is supervised by a dedicated instructor, either a senior Resident (> PGY 6) or a Surgeon, ensuring that participants receive adequate guidance and support throughout the sessions (Fig. 2).

These workshops last from 1 to 2 h and formative and summative feedback is provided. A review of indications and contraindications for each procedure, relevant anatomy, procedural kit and equipment management, sterilization technique, and simulation are included (Fig. 3). The stations and workshops with the models used and the learning objectives are detailed in Table 2. Usually the activities start at 08:30 and there are 2 coffee breaks and 1 lunch, per day.

The final workshop of the course is an introduction to laparoscopy workshop. Before the final workshop all the residents receive their First Trainer®, an accessible/low-cost, lightweight and portable training box, and 2 surgical instruments—1 maryland and 1 clinch grasper. Residents receive comprehensive instruction on the use of the First Trainer, principles of laparoscopic ergonomics and triangulation, as well as technical aspects of the laparoscopic instruments. Various exercises and tasks are used to this purpose (Fig. 4). Following this workshop, residents engage in a hands-on laparoscopic competition that consists of scoring the maximum number of points in each exercise, on multiple rounds, while the time to perform the task is reduced. This adds pressure in two dimensions: competition and time.

The top performers on the laparoscopy contest are selected to participate in the FT Championship. This last competition challenges residents to complete designated tasks within a specified time frame and allows for the assessment of their performance and the skills learned during the whole BC. The resident who demonstrates the highest level of proficiency and completes the tasks in the shortest time is declared the winner and receives a prize as recognition of his/her achievement. After Session 2, a certificate is issued to every participant.

Session 3: theoretical online course

The third and final session of the course has more than 40 hours of theoretical lectures and is carried out on www.lap-school.com. These lectures are available since the moment the resident registers in the course and during the 6 years of residency. The contents of this part can be consulted in Table 1.

There are online multiple-choice question examinations after every Session 3 module (Table 1).

When the participants complete the 3 Sessions, an online certificate is automatically issued by the www.lap-school.com platform.

Statistical analysis

All anonymous data were analyzed using SPSS (IBM SPSS Statistics for Windows, Version 30.0). Descriptive data were presented as frequencies, means and standard deviation. Paired-samples t-Student tests were performed to compare means between pre and post-intervention surveys.

Results

A total of 84 residents participated in the BC, 39 in 2023 and 45 in 2024. The group was composed of 60 new General Surgery residents (71,4%), 20 new Gynecology residents (23,8%) and 4 new Urology residents (4,8%).

Survey response rates and participants demographics

Seventy-eight participants ($n = 78$, response rate 92,9%) answered to the pre-intervention survey, with 66,6% females ($n = 52$) and 33,4% males ($n = 26$). The mean age of the population was 26,28 years (24–39) and 55 participants were future residents of General Surgery (70,5%), 19

Table 1 Online lectures of the course (Session 1 and Session 3)

Online Module 1	General surgery	Urology	Gynecology
(This Pre-course module corresponds to Session 1) Average duration—15 min video lectures	Theme 1: Minor Surgical Procedures - Asepsis - Local Anesthesia - Threads and needles - Knots and suture - Chest Tube Placement – Indications and technique - Central Venous catheter placement – Indications and technique		
Online Module 2			
(These lectures correspond to Session 3) Average duration—15 min video lectures	Theme 1: Emergencies in Surgery I - Acute cholecystitis - Acute appendicitis - Acute pancreatitis - Acute diverticulitis - Digestive hemorrhage - Intestinal occlusion - Perforation of hollow viscera - Perianal pathology	Theme 1: Introduction to Urology I - Mandatory/optional internships and internships abroad: what should I do? - Laparoscopic surgery in Urology	Theme 1 – Gynecological Emergencies - Abnormal Uterine Bleeding - Pelvic Pain - Vulvovaginitis - Pelvic Inflammatory Disease
	Theme 2: Emergencies in Surgery II - 5 clinical cases	Theme 2: Introduction to Urology II - Approach to the urological patient - Urological emergencies - Introduction to emergency surgery in Urology - Basic procedures in Urology - Outpatient surgery in Urology: basic surgical techniques - Introduction to Endourology	Theme 2 – Obstetric Emergencies - Hemorrhage in the 1st trimester - Hemorrhage in the 2nd and 3rd trimester - Hypertensive Disorders of Pregnancy - Pregnancy Intrahepatic Cholestasis - Obstetric Emergencies
	Theme 3: Emergencies in Surgery III - Hemorrhoidal Thrombosis Incision – pathology, indications and video - Abscess incision and drainage—pathology, indications and video		Theme 3 – Breast Pathology - ABC of Benign Breast Pathology - ABC of Malignant Breast Pathology
	Theme 4: Emergencies in Surgery IV - The polytrauma patient – types of shock - Trauma – what to think about on the way to the emergency room? – Initial approach to ABCDE - Damage control trauma surgery		Theme 4 – Infertility - Introduction to medically assisted reproduction techniques
			Theme 5 – Pelvic Anatomy - Pelvic Anatomy
			Theme 6 – Complementary Exams in Gynecology - Gynecological Ultrasound

Table 1 (continued)

Online Module 3		
Introduction to the Surgical Patient (These lectures correspond to Session 3) Average duration—15 min video lectures	Theme 1: Introduction to the Surgical Patient—Pre-operative I - Pre-anesthetic evaluation—The anesthesiologist's point of view - Surgical risk stratification - Concept, advantages and inclusion criteria in outpatient surgery - Hypocoagulation and reversal - Risk of venous thromboembolism and prophylaxis Theme 2: Introduction to the Surgical Patient—Pre-operative II - Operative preparation - The Upper GI surgeon's point of view - The Bariatric surgeon's point of view - The Colorectal surgeon's point of view - The HBP surgeon's point of view - The Abdominal wall surgeon's point of view - The Thyroid surgeon's point of view - The Outpatient surgeon's point of view - The Robotic surgeon's point of view Theme 3: Introduction to the Surgical Patient-Pre-operative III - Introduction to the ERAS program in General Surgery - Assessment of nutritional status – global approach	Theme 1: Introduction to the Surgical Patient—Pre-operative I - Pre-anesthetic evaluation - Pre operative appointment - Risk of venous thromboembolism and prophylaxis
Module 4		
Introduction to the Surgical Patient - Intraoperative (These lectures correspond to Session 3) Average duration—15 min video lectures	Theme 1: Our first surgeries step by step - Laparoscopic cholecystectomy - Laparoscopic appendectomy - Anterior inguinal hernioplasty - Posterior inguinalhernioplasty - Excision of Pilonidal cyst Theme 2: Introduction to the operating room I - Incisions in General Surgery - Drains in General Surgery - Ostomies and precautions to be taken in their construction Theme 3: Introduction to the operating room II - Surgical Table - Asepsis in the operating room	Theme 1 – Gynecological Surgery - Abdominal and Laparoscopic Hysterectomy - Vaginal Hysterectomy - Stress Incontinence Surgery - Surgical Therapy for Pelvic Organ Prolapse Correction OASIS, Lacerations and their correction

Table 1 (continued)

Module 5	
Introduction to the Surgical Patient - Post-operative (These lectures correspond to Session 3) Average duration—15 min video lectures	Theme 1: Post-operative - Postoperative complications – The importance of the operative report! - Therapeutic table – How to minimize complications? Theme 2: Complications - Non-surgical complications of surgical patients! - Complications in the immediate postoperative period - Early surgical complications - Late surgical complications - Systematic recording of complications – Clavien-Dindo classification
Module 6	
Introduction to the practical session (These lectures correspond to Session 3) Average duration—15 min video lectures	Theme 1: Minimally invasive surgery- Laparoscopy – Positioning of the patient and the team - Pneumoperitoneum - Electrosurgery
	Theme 1: Post-operative - The operative report! and therapeutic table - Pain Control Theme 2: Complications - Complications vascular, intestinal, urinary and nervous - Surgical infections and prophylactic antibiotic therapy
	Theme 1: Minimally invasive surgery - Ergonomics and the operating Room - Surgical Exposure - Electrosurgery

of Gynecology residents (24,4%) and 4 of Urology (5,1%) (Table 3).

Seventy-one participants (n = 71, response rate of 84,5%) answered to the post-intervention survey, with 69% females ($n = 49$) and 31% males ($n = 22$). The mean age of the population was 26,52 years (24–39) and 48 participants were future residents of General Surgery (67,6%), 19 of Gynecology (26,8%) and 4 of Urology (5,6%) (Table 3).

Expectations about the boot camp

Before the course, 93.6% ($n = 73$) of the respondents considered that both the expectations regarding their participation in the course and the importance of residency were "High/very high" ($M = 4.24$; SD = 0.563 and $M = 4.17$; SD = 0.568, respectively) (Table 4).

Sixty-two percent ($n = 44$) of the respondents considered that the BC has been "Highly above" their initial expectations ($M = 4,61$; SD = 0.490) and all of them would recommend the course to other residents (100%, $n = 71$).

The three features of the BC considered as the most important aspects were the laparoscopy simulator (80%, $n = 57$); the hands-on workshops (77,5%, $n = 55$); and the social networking with their new colleagues (52,1%, $n = 37$).

Course evaluation

The full results of the global evaluation of the workshops and the course can be found in Table 4. Concerning the individual evaluation and impact of each workshop, the majority rated them very positively (Table 5).

All of the participants ($n = 71$) evaluated the workshops positively ($M = 4.68$; SD = 0.471) and considered that they will be useful for residency ($M = 4.76$; SD = 0.430). Regarding the overall opinion of the laparoscopy simulator, 71.8% ($n = 51$) of the participants rated it as "Excellent" ($M = 4.70$; SD = 0.490) and 73.2% ($n = 52$) considered it will be "Very useful" during residency for skills acquisition ($M = 4.73$; SD = 0.446).

Regarding the overall opinion of the course 71,8% ($n = 51$) rated the course as "Excellent" ($M = 4.72$; SD = 0.453). After the course, the residents' opinion on the importance of the course has increased and almost 55% ($n = 39$) totally agreed that the BC will be "Very important" for their future residency ($M = 4.52$; SD = 0.557, t (70) = − 3.631; $p < 0.001$) (Table 4).

Fig. 2 General and specific workshops

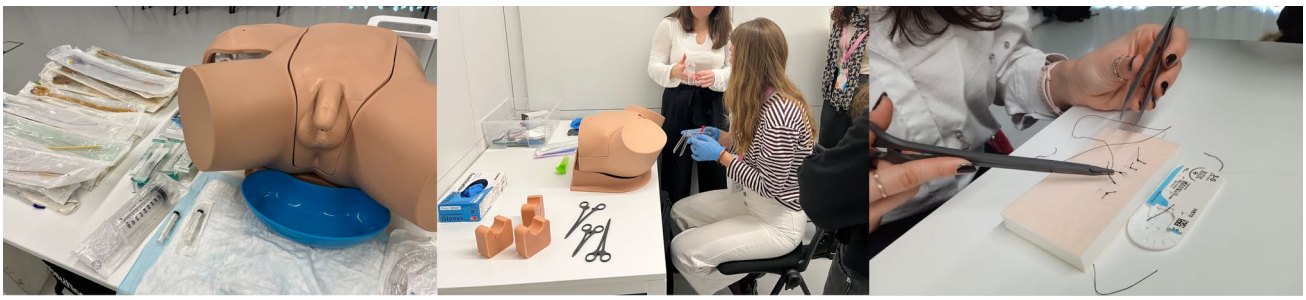


Fig. 3 Examples of the models used during the workshops

Self-perceived preparedness for residency

The course significantly improved residents' self-perceived preparedness for residency and more than 75% of the residents felt more or much more prepared by the end of the BC ($M = 3.82$; SD = 0.516, t (70) = − 7.412; $p < 0.001$)—(Table 4).

Self-perceived confidence

The full results of both the pre and post-course self-perceived confidence can be found in Tables 6, 7 and 8 (also see Supplementary file 1–4).

Pre-course

After General residency, 91% ($n = 71$) considered to be confident when performing open suture; 21,8% ($n = 17$) were very confident when performing elective minor surgeries; and 15,4% ($n = 12$) considered to be very confident to participate in the Operating room (Table 6).

Considering both the future General Surgery and Urology residents ($n = 59$), the great majority felt "Low/very low confidence" regarding the placement of a central venous catheter (89,8%), of a chest tube (91,6%), and the performance of an orotracheal intubation (79,7%). Almost 80% of the participants felt unconfident about nutrition in the surgical patient (Table 6).

Regarding the future Gynecology/Obstetrics residents ($n = 19$), 31,6% were confident when performing a gynecological examination. On the other side, all of them (100%) felt unconfident when performing an obstetric evaluation or a repair of a perineal laceration. Most of them were not confident to insert an Intrauterine Device (IUD) or an Implanon® (94,7%, 63,2%, respectively)—(Table 7).

Regarding the specific Urological workshops ($n = 4$), the future Urology residents did not feel confident placing an urinary catheter or performing a scrotal examination alone (100%)—(Table 8).

Post-course

When comparing levels of perceived confidence, there was a significant improvement from before to after the course in all workshops, for all specialities. Comparative means and significance can be consulted on Tables 6, 7 and 8 (also see Supplementary file 1–4).

Table 2 Workshops, models and learning objectives

	Specialty	Model and material	Learning objectives	Duration	Faculty	Ratio trainer/trainees	Evaluation
Suture training workshop	All	- Suture pad (Limbs and things®) - Surgical instruments (multi-brand) - Sutures (Ethicon®)	Presentation of surgical material used in minor surgery situations; - How to approach the wounds; - Types of threads and different sutures, their indication and how to perform them; - Suture training	1 h	Senior Residents (> PGY 6) and Surgeons	Between 1:4 and 1:10 ratio	Formative and Summative feedback for all sessions
Operating room workshop	All	- Mannequin - OR surgical drapes (®Molnlycke) - Surgical instruments (multi-brand)	Exposure to materials in the surgical center (surgical gowns, gloves, surgical material, surgical fields…); - Explanation and training on putting on surgical clothing; - Training of placement of surgical tables and wards	1 h	Senior Residents (> PGY 6) Surgeons and Nurses	Between 1:4 and 1:10 ratio	
Laparoscopy Training	All	- First trainer simulator (FTacademy®) - Laparoscopic instruments (FTacademy®) - Basic and Intermediate exercises pad (FTacademy®)	Exposure to laparoscopic material; - Training of manual dexterity, motor skills and coordination in laparoscopy; - Laparoscopic suture training	3 h	Surgeons	Between 1:4 and 1:10 ratio	
CVC Training Workshop	- General Surgery - Urology	- CVC model (FTacademy®) - CentralLineMan® and FemoralLineMan®Models (Medical Simulator®) - Commercial catheters (Bbraun®) - Ultrasound (Fujifilm®)	Central catheterization material display; - Understanding indications and contraindications of central catheterization; - Understanding the anatomy of the cervical, subclavian and femoral regions; - Training in the placement of central catheters using ultrasound guidance and anatomical references	1 h	Senior Residents (> PGY 6) Surgeons	Between 1:4 and 1:10 ratio	

Table 2 (continued)

	Specialty	Model and material	Learning objectives	Duration	Faculty	Ratio trainer/trainees	Evaluation
Chest tube training Workshop	- General Surgery - Urology	- Chest tube model (FTacademy® Simulator®) - Commercial chest tubes (Bbraun®) - Surgical instruments (Bbraun®)	Chest tube material display; - Understanding indications and contraindications of chest tubes; - Understanding the anatomy of the thoracic region; - Training in the placement of chest tubes using anatomical references	1 h	Senior Residents (> PGY 6) Surgeons	Between 1:4 and 1:10 ratio	Formative and Summative feedback for all sessions
Airway management Workshop	- General Surgery - Urology	- Orotracheal intubation models - Orotracheal tubes (Bbraun®)	Exhibition of material used in airway protection (Guedel tubes, laryngeal mask, endotracheal tubes…) - Airway approach in trauma situations; - Orotracheal intubation training on mannequins	1 h	Anethesists	Between 1:4 and 1:10 ratio	
Introduction to Nutrition Workshop	- General Surgery - Urology	- Commercial nutrition products (Baxter®)	Learning about the different types of nutrition (enteral, parenteral); - Understanding the usefulness of parenteral and enteral nutrition, as well as the calculations required for their application; - Care in prescribing nutrition to ensure the patient's basic needs	1 h	Surgeons	1:16 ratio	
Female and male catheterization training Workshop	- Urology	- Model (Limbs and things®) - Foley catheter (Bbraun®)	Knowledge of female and male urogenital anatomy; - Display of the different materials to be used when performing a genital catheterization; - Female and male catheterization training	2 h	Senior Residents (> PGY 6) and Surgeons	1:2 ratio	
Scrotal examination Workshop	- Urology	- Model for scrotal palpation (Medical Simulator®)	Knowledge of female and male urogenital anatomy; - Introduction to scrotal pathology; - Palpation of healthy anatomical models and those with malignant scrotal pathology	2 h	Senior Residents (> PGY 6) and Surgeons	Between 1:4 and 1:10 ratio	

Table 2 (continued)

	Specialty	Model and material	Learning objectives	Duration	Faculty	Ratio trainer/trainees	Evaluation
Gynecological examination workshop	- Ginecology	- Model for uterine palpation (Medical Simulator®)	Knowledge of female uterine anatomy; - Introduction to uterine pathology; - Palpation of healthy anatomical models and those with malignant uterine pathology	1 h	Senior Residents (> PGY 6) and Surgeons	Between 1:3 to 1:5 ratio	Formative and Summative feedback for all sessions
Obstetric examination and ultrasound	- Ginecology	- Human volunteer (Pregnant woman) - Ultrasound (Fujifilm®)	Introduction to obstetric ultrasound with the aim of enabling: - Confirm gestational age; - Check for adequate fetal growth; - Check the position of the placenta; - Determine the cranio-caudal length, biparietal diameter, head circumference and femur length - Know how to look for and identify fetal developmental abnormalities; - Ultrasound training in pregnant volunteers	1 h	Senior Residents (> PGY 6) and Surgeons	Between 1:3 to 1:5 ratio	
Laceration management	- Ginecology	- Laceration model (FTacademy®) - Surgical instruments (multi-brand)	Understanding of female pelvic anatomy and associated injuries during childbirth; - Learning about episiotomies and pelvic lacerations; - Pelvic laceration repair training on anatomical models	1 h	Senior Residents(> PGY 6) and Surgeons	Between 1:3 to 1:5 ratio	
IUD training	- Ginecology	- Model (Bayer®) - Speculum (Bayer®) - IUD (Bayer®)	Display of the material needed to place the intrauterine device (IUD); - Indications and contraindications for the different types of IUD; - IUD placement training	1 h	Senior Residents(> PGY 6) and Surgeon	Between 1:3 to 1:5 ratio	

Table 2 (continued)

	Specialty	Model and material	Learning objectives	Duration	Faculty	Ratio trainer/trainees	Evaluation
IMPLANON Training	- Ginecology	- Model (Organon®) - Implanon (Organon®)	Display of the material needed to place the Implanon; - Indications and contraindications for the Implanon; - Implanon placement training and certification	1 h	Senior Residents (> PGY 6) Surgeons	Between 1:3 to 1:5 ratio	Formative and Summative feedback for all sessions

Minor surgery and operating room workshops At the end of these workshops, there was a significant improvement in confidence among the residents ($p < 0.001$) (Table 6).

Laparoscopy workshop More than 80% ($n = 57$) of the trainees felt a "Big/Very big improvement" on their laparoscopic skills ($M = 4{,}01$; SD = 0.686) (Table 6).

General Surgery specific Workshops At the end of these workshops, a significant improvement was observed and the majority of the residents felt "Confident/very confident" in regard to the procedures ($p < 0.001$) (Table 6).

Ginecology specific workshops A significant improvement was observed and the majority of the residents felt "Confident/very confident" in regard to the gynecological examination, the IUD placement and the Implanon® placement ($p < 0.001$). Although the improvements on the obstetric examination and perineal laceration workshops were significant ($p < 0.001$), the majority of the residents still felt low confidence with these procedures (Table 7).

Urology specific workshops All respondents considered to be "Confident/Very confident" when performing an urinary catheterization or performing a scrotal examination ($p = 0.015$ and $p = 0.003$, respectively)—(Table 8).

Discussion

Although it varies among Countries, to become a Surgeon it is mandatory to go through internships and Surgical residency. In Portugal, the transition between General and Surgical residency happens from one day to another, usually on the 1st of January. The challenges faced by these young doctors are numerous and make them experience a feeling of insecurity, stress, and unpreparedness [9–11] on a crucial phase that lays the foundation for their future careers and professional development in surgery [12]. A new position as a surgical resident means facing challenges in 6 main domains of life: personal; professional; responsibility and accountability; scientific knowledge (cognitive); technical skills (psychomotor); and social (affective). The course surveys provided valuable insights into participants' perceptions and experiences from the First Touch course. Previous to the course, residents pointed out that "Receive a portable laparoscopic simulator" was the most important feature of the course, followed by "To be prepared for residency" and "Contact with my new colleagues". These aspects may correspond to the level 4 to 6 (cognitive, psychomotor and affective) in which the FT aims to have an important influence.

Fig. 4 Laparoscopic surgery workshop and the First Trainer simulator

Table 3 Characteristics of the Participants

	Pre-course				Post-course			
	Total n		n	%	Total n		n	%
Gender	78	Male	26	33.3	71	Male	22	31
		Female	52	66.7		Female	49	69
Age (years)		Mean	26.28			Mean	26.14	
		24	3	3.8		24	3	4.2
		25	38	48.7		25	35	49.3
		26	21	26.9		26	19	26.8
		27	7	9.0		27	7	9.9
		29	3	3.8		29	3	4.2
		30	1	1.3		30	1	1.4
		31	1	1.3		31	1	1.4
		33	1	1.3		39	2	2.8
		34	1	1.3				
		39	2	2.6				
Speciality		General Surgery	55	70.5		General Surgery	48	67.6
		Urology	4	5.1		Urology	4	5.6
		Ginecology	19	24.4		Ginecology	19	26.8
MIS experience		None	78	100		None	71	100
Group		FT 2023	38	51,3		FT 2023	34	47.9
		FT 2024	40	48,7		FT 2024	37	52.1

Cognitive level

When designing the curriculum we selected workshops that allow training and simulation of usual and frequent procedures, characteristic of the early stages of residency. Furthermore, these workshops are specifically selected and developed for each speciality. Our study showed that this fact increased residents' engagement, highlighted by the excellent evaluation of the BC. We believe it has also influenced the self-confidence improvement related to these procedures. This significant improvement on confidence resulted on an improved sense of global preparedness to face the real-world challenges of surgical residency.

Psychomotor level

Concerning the 5th domain (psychomotor), the ability to train and learn from one's mistakes in a controlled and secure environment underscores the essential importance of surgical simulation as the most effective approach for enhancing psychomotor skills and achieving technical proficiency—all without exposing patients to any risk [3, 13, 14]. Training and simulation yield significant improvements across a range of medical and surgical procedures [15]. Box trainers, simulators and simulation models have played a major role in surgical education but there are yet some limitations and challenges [4, 16]. One of the strengths of the FT is the laparoscopy hands-on session with the First Trainer and the possibility for the residents to take it home so they can continue to practice [5]. The overall opinion on our simulator was very positive. The great majority of the residents considered that having the laparoscopic simulator and instruments will be very usefull for their future, which corroborates our hypothesis.

Table 4 Global expectations, utility and evaluation

Results	Value	Precourse					Postcourse					Comparison		
		Total N	N	%	M	SD	Total N	N	%	M	SD	t-test	df	Sig
Course expectations	3—Neither high or low	78	5	6.4	4.24	.563	–	–	–	–	–	− 3.871	70	< .001
	4—High expectations		49	62.8										
	5—Very High expectations		24	30.8										
	4—Above my expectations	–	–	–	–	–	71	27	50.7	4.62	.489			
	5—Very above my expectations							44	49.3					
Utility of Workshops	4—High utility	–	–	–	–	–	71	17	23.9	4.76	.430	–	–	–
	5—Very high utility							54	76.1					
Workshops evaluation	4—Good	–	–	–	–	–	71	23	32.4	4.68	.471	–	–	–
	5—Excellent							48	67.6					
Course evaluation	4—Good	–	–	–	–	–	71	20	28.2	4.72	.453	–	–	–
	5—Excellent							51	71.8					
First trainer evaluation	3—Neither good or bad	–	–	–	–	–	71	1	1.4	4.70	.490	–	–	–
	4—Good							19	26.8					
	5—Excellent							51	71.8					
First Trainer utility in the future	4—High utility	–	–	–	–	–	71	19	26.8	4.73	.446	–	–	–
	5—Very High utility							52	73.2					
Importance for Residency	2—Low importance	78	1	1.3	4.17	.568	71	0	0	4.52	.557	− 3.631	70	< .001
	3—Neither low or high importance		4	5.1				2	2.8					
	4—High importance		54	69.2				30	42.3					
	5—Very High importance		19	24.4				39	54.9					
Preparedness for Residency	1—Totally disagree	78	9	11.5	2.79	.998	71	0	0	3.82	.516	− 7.412	70	< .001
	2—Disagree		19	24.4				0	0					
	3—Neither agree or disagree		31	39.7				17	23.9					
	4—Agree		17	21.8				50	70.4					
	5—Totally agree		2	2.6				4	5.6					

Table 5 - Evaluation and impact of the workshops

		Value	n	%	Mean	SD
Suture training	Evaluation	3—Neither good or bad	9	12.7	4.34	.696
		4—Good	29	40.8		
		5—Excellent	33	46.5		
	Impact	3—Neither low or high impact	1	4	4.39	.597
		4—High impact	20	35		
		5—Very High impact	31	32		
Operating room	Evaluation	2—Bad	1	1.4	4.24	.686
		3—Neither good or bad	7	9.9		
		4—Good	37	52.1		
		5—Excellent	26	36.6		
	Impact	2—Low impact	3	4.2	4.34	.792
		3—Neither low or high impact	5	7.0		
		4—High impact	28	39.4		
		5—Very High impact	35	49.3		
Laparoscopy Training	Evaluation	3—Neither good or bad	3	4	4.72	.539
		4—Good	14	20		
		5—Excellent	54	76		
CVC Training Workshop	Evaluation	3—Neither good or bad	2	3.8	4.62	.565
		4—Good	16	30.8		
		5—Excellent	34	65.4		
	Impact	3—Neither low or high impact	1	1.9	4.56	.608
		4—High impact	20	38.5		
		5—Very High impact	31	59.6		
Chest tube training Workshop	Evaluation	2—Bad	1	1.9	4.31	.701
		3—Neither good or bad	4	7.7		
		4—Good	25	48.1		
		5—Excellent	22	42.3		
	Impact	2—Bad	2	3.8	4.29	.750
		3—Neither good or bad	3	5.8		
		4—Good	25	48.1		
		5—Excellent	22	42.3		
Airway management Workshop	Evaluation	3—Neither good or bad	8	15.4	4.23	.703
		4—Good	24	46.2		
		5—Excellent	20	38.5		
	Impact	2—Low impact	1	1.9	3.90	.634
		3—Neither low or high impact	10	19.2		
		4—High impact	34	65.4		
		5—Very High impact	7	13.5		
Introduction to Nutrition Workshop	Evaluation	2—Bad	1	1.9	4.21	.848
		3—Neither good or bad	11	21.2		
		4—Good	16	30.8		
		5—Excellent	24	46.2		
	Impact	3—Neither low or high impact	4	7.7	4.35	.623
		4—High impact	26	50		
		5—Very High impact	22	42.3		
Female and male catheterization training Workshop	Evaluation	4—Good	1	25	4.75	.500
		5—Excellent	3	75		
	Impact	4—High impact	1	25	4.75	.500
		5—Very High impact	3	75		
Scrotal examination Workshop	Evaluation	4—Good	1	25	4.75	.500
		5—Excellent	3	75		
	Impact	4—High impact	1	25	4.75	.500
		5—Very High impact	3	75		
Gynecological examination Workshop	Evaluation	4—Good	1	5.3	4.95	.229
		5—Excellent	18	94.7		
	Impact	4—High impact	2	10.5	4.89	.315
		5—Very High impact	17	89.5		

Table 5 (continued)

		Value	n	%	Mean	SD
Obstetric examination and ultrasound	Evaluation	2—Bad	1	5.3	4.68	.749
		3—Neither good or bad	0	0		
		4—Good	3	15.8		
		5—Excellent	15	78.9		
	Impact	3—Neither low or high impact	1	5.3	4.68	.582
		4—High impact	4	21.1		
		5—Very High impact	14	73.7		
Laceration management	Evaluation	3—Neither good or bad	4	21.1	4.37	.761
		4—Good	7	36.8		
		5—Excellent	8	42.1		
	Impact	4—High impact	1	5.3	4.68	.478
		5—Very High impact	5	26.3		
			13	68.4		
IUD training	Evaluation	3—Neither good or bad	3	15.8	5	.000
		4—Good	6	31.6		
		5—Excellent	10	52.6		
	Impact	3—Neither low or high impact	6	31.6	5	.000
		4—High impact	13	68.4		
		5—Very High impact				
IMPLANON Training	Evaluation	5—Excellent	19	100	4.21	.787
	Impact	5—Very High impact	19	100	4.63	.597

Affective level

Lastly, the 6th domain in which the transition to residency has an important impact is the social aspect of Residents' life (affective domain). In recent years, BC have shown that can be a valuable solution for residents integration. They gather residents together, fostering contact and network and explore simulation-based activities to improve skills and knowledge acquisition [17–19]. In Portugal, a national BC for anesthesiology residents—"InAnestesia"—that gathers all the residents of the same year for an introduction to residency, is running since 2011 [20]. In 2014, the University of Toronto established a BC focused on Thoracic Surgery, which received positive feedback from participants, directors, and faculty [21]. In 2016, Rábago JL, et al. published the outcomes of a simulation-based introductory course to anesthesia and found that it has been increased self-reported efficacy and led to transfer skills from simulation to clinical practice [22]. Also in 2016, Cleland et al. implemented the first surgical bootcamp in the UK. It ran over 4 days and included training in non-technical, communication and operative surgical skills. Like in our case, formal social events were incorporated into the program and informal socialization among learners was encouraged. The authors found that a surgical BC can deal with social and cultural processes as well as the usual individual, cognitive and acquisitive learning [23]. In 2023, Buscail et al. developed an immersive operating room BC aiming to create awareness about anesthesiology and surgical specialities among sixth-year of medical students. Students found the BC very useful and considered that it worked as a way of changing preconceived notions about these specialities [24]. Sadati et al. in 2024, developed a surgical bootcamp for first-year surgical residents in General surgery, orthopedics, neurosurgery, and gynecology. Like in our case, they implemented a multi-speciality BC although we only focused on specialities that perform laparoscopy and work on the abdominal cavity. The authors found that their surgical BC played a crucial role in enhancing the satisfaction, knowledge, and competence of surgical residents [25].

Despite the fact that many BC have been described, it is difficult to address all of these challenges that residents face at the beginning of residency on a single activity [10]. An all-inclusive BC such as the FT promotes even further the contact between the residents and can improve the feeling of belonging to the new community. Additionally, in every edition of our BC we create a specific WhatsApp® group and we invite all the attendants to sign in. From our experience, this greatly increases networking and promotes a lasting effect during residency.

Table 6 Confidence levels—Basic and General Surgery Workshops

Confidence levels	Speciality	Value	Precourse					Postcourse					Comparison		
			Total N	N	%	M	SD	Total N	N	%	M	SD	t-test	df	Sig
Suturing and Wound Workshop	All	1—Very low confidence	78	3	3.8	3.60	1.061	71	0	0	4.49	.504	-6.822	70	< .001
		2—Low confidence		8	10.3				0	0					
		3—Neither low or high confidence		23	29.5				0	0					
		4—High confidence		27	34.6				36	50.7					
		5—Very High confidence		17	21.8				35	49.3					
Operating room Workshop	All	1—Very low confidence	78	3	3.8	3.67	.949	71	0	0	4.38	.663	-6.035	70	< .001
		2—Low confidence		5	6.4				1	1.4					
		3—Neither low or high confidence		29	24.4				4	5.6					
		4—High confidence		39	50.0				33	46.5					
		5—Very High confidence		12	15.4				33	46.5					
Laparoscopy Workshop	All	1—Very small Improvement	-—	—-	—-	—-	—-	71	0	0	4.01	.686	-—	—-	—-
		2—Small improvement							1	1.4					
		3—Neither small or big improvement							13	18.3					
		4—Big improvement							41	57.7					
		5—Very big improvement							16	22.5					
CVC training Workshop	General Surgery Urology	1—Very low confidence	59	38	64.4	1.54	.934	52	2	3.8	3.37	.971	-11.290	51	< .001
		2—Low confidence		15	25.4				8	15.4					
		3—Neither low or high confidence		3	5.1				15	28.8					
		4—High confidence		1	1.7				23	44.2					
		5—Very High confidence		2	3.4				4	7.7					
Chest tube training Workshop	General Surgery Urology	1—Very low confidence	59	45	76.3	1.34	.685	52	2	3.8	3.21	.848	-13,549	51	< .001
		2—Low confidence		9	15.3				6	11.5					
		3—Neither low or highconfidence		4	6.8				25	48.1					
		4—High confidence		1	1.7				17	32.7					
		5—Very High confidence		0	0				2	3.8					
Airway management Workshop	General Surgery Urology	1—Very low confidence	59	42	71.2	1.61	1.114	52	1	1.9	3.42	.776	-13.549	51	< .001
		2—Low confidence		5	8.5				4	7.7					
		3—Neither low or high confidence		8	13.6				21	40.4					
		4—High confidence		1	1.7				24	46.2					
		5—Very High confidence		3	5.1				2	3.8					
Nutrition Surgical patient Workshop	General Surgery Urology	1—Very low confidence	59	20	33.9	1.92	.816	52	0	0	3.77	.675	-12.194	51	< .001
		2—Low confidence		26	44.1				0	0					
		3—Neither low or high confidence		11	18.6				19	36.5					
		4—High confidence		2	3.4				26	50					
		5—Very High confidence		0	0				7	13.5					

Table 7 Confidence levels—Gynecology

Confidence levels	Value	Precourse					Postcourse					Comparison		
		Total N	N	%	M	SD	Total N	N	%	M	SD	t-test	df	Sig
Gynecological examination Workshop	1—Very low confidence	19	1	5.3	2.89	.937	19	0	0	4.26	.562	-5344	18	< .001
	2—Low confidence		6	31.6				0	0					
	3—Neither low or high confidence		6	31.6				1	5.3					
	4—High confidence		6	31.6				12	63.2					
	5—Very High confidence		0	0				6	31.6					
Obstetric examination and ultrasound Workshop	1—Very low confidence	19	14	73.7	1.26	.452	19	3	15.8	2.47	.905	-6.172	18	< .001
	2—Low confidence		5	26.3				6	31.6					
	3—Neither low or high confidence		0	0				8	42.1					
	4—High confidence		0	0				2	10.5					
	5—Very High confidence		0	0				0	0					
Perineal laceration repair Workshop	1—Very low confidence	19	17	89.5	1.11	.315	19	3	15.8	2.53	.905	-6.444	18	< .001
	2—Low confidence		2	10.5				5	26.3					
	3—Neither low or high confidence		0	0				9	47.4					
	4—High confidence		0	0				2	10.5					
	5—Very High confidence		0	0				0	0					
IUD training Workshop	1—Very low confidence	19	16	84.2	1.21	.535	19	1	5.3	3.37	.831	-11.275	18	< .001
	2—Low confidence		2	10.5				1	5.3					
	3—Neither low or high confidence		1	5.3				7	36.8					
	4—High confidence		0	0				10	52.6					
	5—Very High confidence		0	0				0	0					
Implanon training Workshop	1—Very low confidence	19	8	42.1	2.00	1.000	19	0	0	4.32	.671	-9.551	18	< .001
	2—Low confidence		4	21.1				0	0					
	3—Neither low or high confidence		6	31.6				2	10.5					
	4—High confidence		1	5.3				9	47.4					
	5—Very High confidence		0	0				8	42.1					

Strenghts

We believe that our Boot camp is really innovating in some aspects that make it important for other research or surgical teams to implement future boot camps. In fact, our BC is the first and the only one that offers a personal simulator and laparoscopic instruments to each participant to take home and keep practicing to improve minimally invasive surgery skills. We believe this is game changing in regard to increase access to MIS training. Additionally, we also think that other aspects of our BC are very important, positive and different from the ones previously published:

1 - This is a nationwide boot camp
2 - It is targeted at new surgical residents
3 - As an introduction to residency BC, it happens just 15 days before the beginning of residency allowing residents to be more prepared for the "first day"; to know other colleagues of the same year; and meet senior residents and surgeons (our Faculty) thus entering this national community established since 2017. These interactions are favoured by various social and team-building activities during the course—Fig. 5.

Finally, we consider that another differentiating aspect of our BC in comparison to others is that it is a part of a much more complete learning activity, that includes 3 sessions, two of them online and the most important one, onsite, fully hands-on. These 3 sessions complement each

Table 8 Confidence levels—Urology

confidence levels	Value	Precourse					Postcourse					Comparison		
		Total N	N	%	M	SD	Total N	N	%	M	SD	t-test	df	Sig
Urinary Catheterisation training Workshop	Very low confidence	4	2	50	2.00	1.155	4	0	0	4.50	.577	− 3.873	3	.015
	Low confidence		0	0				0	0					
	Neither low or high confidence		2	50				0	0					
	High confidence		0	0				2	50					
	Very High confidence		0	0				2	50					
Scrotal examination Workshop	Very low confidence	4	2	50	1.75	.957	4	0	0	5.00	.000	− 6789	3	.003
	Low confidence		1	25				0	0					
	Neither low or high confidence		1	25				0	0					
	High confidence		0	0				0	0					
	Very High confidence		0	0				4	100					

Fig. 5 Social activities during the course

other and increase residents' engagement and the outcomes of the course.

Conclusions

Transition from General to Surgical residency is a stressful period for Residents. To diminish the impact on the cognitive, psychomotor and affective domains during this period, it is important to stimulate and support the participation of Residents in training activities since the first moment. As far as we know, this is the first, all-inclusive, introduction to residency course that aims to bring together all the new residents just before the start of their residency. This concept increases opportunities for networking, enhances skill acquisition and promotes continuous practice "at home" by including a portable laparoscopy simulator to every participant [26]. The analysis of the last 2 editions of the BC confirmed that it has had a positive impact over the last 8 years on how residents face the beginning of residency, enhancing their sense of preparedness and increasing their confidence in important procedures. The social impact of a BC like the FT is enormous and it has a lasting effect on residents during all the residency period, promoting network and a sense of belonging within the surgical community. This study brings new data to support that these national boot camps should be mandatory and that residents should have protected time and financial support to attend them. These promising results open up exciting prospects for future research in this area and the expansion of such BC to other medical and surgical specialities, even outside of Portugal. Our next steps and future research will focus on evaluating the long-term impact of this BC throughout the six years of residency.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s13304-025-02265-3.

Acknowledgements The authors would like to acknowledge all the members of the First Touch Courses' Faculty since 2017 for their participation and support, recognizing the hippocratic and abnegated dedication to the education of young residents: Mariana Lemos, Gustavo Factori, Miguel Silvestre, Bruno Barbosa, Maria Eduarda Roxo, Filipa Rato, Joana Domingos, Nadia Laezza, Pedro Rodrigues, Pedro Ponte, Miguel Brito, Daniela Albuquerque, Catarina Sabbo, Filipe Almeida, Raquel Pereira, Pedro Miranda, Thiago Guimarães, Mariana Medeiros, Vanessa Andrade, Ricardo Matos, Bárbara Vieira, Mariana Alves, Diana Melo, Angela Rodrigues, Sofia Pedrosa, Mafalda Simões, Luisa Alves, João Moreira Pinto, António Pinho, Débora Araújo, Miguel Gil, Alexandra Rocha, Pedro Baltazar, João Guerra, Sofia Frade, Inês Barros, Nuno Carvalho, Júlio Leite, Jorge Maciel, António Bernardes, Ana Melo, Cristina Carvalho, Miguel Rocha, Inês Gonçalves, José Pedro Ferreira, Vânia Castro, Manuel Lozano, Andreia Fernandes, Juan Rachadell, Gabriel Oliveira, Andreia Santos, Daniela Chaló, Carlos Luz, Leonor Manaças, José Castro, Joana Correia, Nádia Andrade, Cátia Ferreira, Albino Cunha, Helena Monteiro, Rita Pereira, Nuno Malheiro, Adriana Rodrigues, Vicente Vieira, Miguel Castelo Branco, Álvaro Gonçalves, Mariana Leite, Sofia Fonseca, Teresa Braga, André Silva, Brigitta Cismasiu, Diana Matos, Ana Rita Ferreira, João Ribeiro, António Girão de Caires, Inês Sousa, Manuel Teixeira, Miguel Neves, Rita Andrade, Alexandra Cabeleira, André Tojal, Mário Pereira, António Gandra D'Almeida, Catarina Rolo Santos, António Albuquerque, Andreia Fernandes, Carlos Vaz, Rita Lima, Pedro Santos, Renato Barradas, Diogo Pinto, Marta Martins, Catarina Longras, Ignacio Castillón Vela, Federico del Castillo, António Paraíso, Duarte Alves, Rita Pereira, Sofia Pina, Mário Pereira, Rui Escaleira, Isabel Marques, Miguel Rocha Melo, Rita Franco, João Barbosa, Conceição Cardante, Sofia Freitas, Cristiana Ferreira, Maria Valentim, Rita Arantes, Carlos Magalhães, Bruno Santos, Bruno Pinto, Rodrigo Galhego, João Ribeiro, Inês Sousa, Miguel Neves, Lúcia Carvalho, Catarina Rolo Santos, Pedro Santos, André Aguiar da Silva, Helder Ferreira, Luísa Jerónimo Alves, Débora Araújo, Miguel Pinho Gil, Maria Alexandra Rocha, Daniela Pereira, João Ferreira Guerra, Alexandre Gromicho, Ângela Melo, Rita Dunkel, Mariana Solinho, Rita Cravo Silva, Ana Filipa Maia, Margarida Figueiredo, Sofia Estevinho, Madalena Nogueira, Pedro Brandão, Claudia Andrade, Nuno Oliveira, Joana Oliveira, Rita Franco, Filipa Osório, Maria Geraldina Castro, Denise Bacalhau, João Oliveira, Pedro Oliveira, Ana Mações, Susana Maia, Sónia Barata. We would also like to acknowledge the support of Palmira Carlos Alves, Irene Cadime and Miguel Castelo-Branco Sousa. The authors would like to acknowledge all the companies that sponsor this activity since 2017, showing a great support to residents education and training.

Author contributions MRG, SGR conception, design, statistical analyses, assembly and interpretation of data, manuscript writing; AR, CA conception, assembly and interpretation of data, manuscript writing, review; GG, RM, AO, JNM, assembly and interpretation of data, review. All authors have read and approved the manuscript.

Funding Open access funding provided by FCT|FCCN (b-on). This manuscript did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability All data access is granted upon request to the authors.

Declarations

Conflict of interest The authors have no conflicts of interest or financial ties to disclose regarding this manuscript.

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