

Training the Next Generation of Future Surgical Residents: A Scoping Review and Proposal for an Undergraduate Curriculum From the Italian Polispecialistic Society of Young Surgeons

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AIM: The transition from medical school to surgical residency is marked by a persistent gap between theoretical instruction and clinical readiness. In Italy, variability in training programs across centers creates persistent gaps in residents' medical education. Scientific societies are asked to identify current training gaps and define the core competencies required for effective surgical training. We propose an undergraduate curriculum to support last-year medical students in Italy.

METHODS: A scoping review of the literature focusing on structured surgical curricula for undergraduate medical students was conducted. A suggested "curriculum" was introduced at the 2025 Congress of the Italian Polispecialistic Society of Young Surgeons (SPIGC) in Bari, Italy.

RESULTS: The SPIGC curriculum includes seven domains: (1) soft skills: communication, informed consent, and interdisciplinary collaboration; (2) clinical and diagnostic skills: outpatient clinic management and perioperative care; (3) hygiene, prevention, healthcare systems; (4) technical skills; (5) emergency and trauma surgery; (6) perioperative management, integrating Enhanced Recovery After Surgery (ERAS) protocols, nutritional assessment, and infections; (7) evidence-based medicine and recommendations. The SPIGC curriculum highlights the importance of simulation labs, hands-on workshops, and online learning, while providing clear pathways for fellowships or masters. It also introduces artificial intelligence (AI) systems as a modern learning tool, while highlighting the importance of their safe and responsible use.

CONCLUSIONS: The SPIGC curriculum may provide a structured plan to improve surgical education for medical students in Italy and to align it with international standards. Its acceptability and impact on training quality and patient outcomes remain to be evaluated through future consensus and prospective studies.

Keywords: curriculum; teaching; simulation training; students; residency; education; health education



Training the next generation of future surgical residents
a scoping review and proposal for an undergraduate curriculum from the
Italian Polyspecialistic Society of Young Surgeons (SPIGC)



GE Poto, L Carbone, on behalf of SPIGC - Annali Italiani di Chirurgia, 2026_X @spigc2018_www.spigc.it

Graphical Abstract.

Introduction

Ongoing advancements in technology and techniques make the training of young surgeons increasingly demanding. The adoption of a standardized approach could significantly improve the quality of their education, the level of surgical care, and facilitate the organization of exchange programs between countries [1].

In the past, training often depended on a close relationship between a mentor and their trainee. However, as more surgical subspecialties have been introduced and new ways to diagnose and treat patients have emerged, it's become clear that a more interdisciplinary approach is needed, which brings together different medical specialists [2]. In this context, mentoring young surgeons deserves dedicated support and attention [3].

Italy is currently facing a significant vocational crisis among surgeons. In 2023, around 55% of general surgery residency positions remained unfilled, and nearly 20% of residents left after just one year [4]. This decline could be linked to bureaucratic hurdles, insufficient incomes, and poor work-life balance [5,6].

The Coronavirus Disease 2019 (COVID-19) pandemic further exacerbated that condition [7,8]. Recent reports highlight how nearly 70% of residents in surgery have been unable to meet the minimum surgical caseload requirements due to the reduction in elective procedures [9,10].

To bridge these training gaps, scientific societies are advocating for a learning roadmap that incorporates the en-

tire clinical process and fits within a modern public health system [2,11]. The modern surgeon must enhance their "soft skills" and stay constantly UpToDate, in addition to possessing excellent technical skills [12]. Their education should integrate patient communication, decision-making, and the ability to review clinical research [1]. For this purpose, post-graduate fellowships, hands-on workshops, and online courses allow young generations to meet international standards of excellence.

Keypoints:

- Traditional mentor-trainee relationships is changing, as young doctors are required to acquire a growing range of competencies;
- Scientific societies are referred to propose a structured educational curriculum.

Education in Surgery in Italy: From Medical School to Residency

In Italy, surgical training starts with the last two years of medical degree. However, students' hands-on experience usually remains limited, as supervising physicians are constantly stretched thin by full work schedules [13]. Because of this, many exchange programs, such as Erasmus, offer medical students the chance to do clinical and research rotations and experience new cultures. It not only broadens their clinical perspective but also helps harmonize training standards across Europe [14].

After graduation, students pursue postgraduate residencies through a competitive national exam. This exam determines placement into various residency schools, such as general surgery, vascular surgery, thoracic surgery, gynecology, and urology, which last between four and five years and are overseen by the Ministry of University and the Ministry of Health. During these years, residents rotate through different specialties, including endoscopy and minimally invasive surgery [13]. A law passed in 2005 changed the status of residents, defining them as "doctors in training", thereby helping them to integrate into the healthcare staff and gradually gain greater autonomy [15].

The residency course is divided into three key-phases:

- (i) First, the "foundation" phase focuses on core knowledge and basic technical skills and is usually based in university hospitals. Today's medical education is largely centered on theoretical knowledge. Students frequently complain that they are forced to memorize a lot of information without learning how to make real-world decisions or to handle patients. Although a deep understanding of human anatomy, physiology, and basic surgical techniques is a fundamental step, simulation courses, including suture labs, laparoscopy simulators, and basic life support (BLS), may play a crucial role in acquiring confidence before residents actively participate in the operating room.
- (ii) During the "progression" phase, residents gradually assume greater responsibility. They are involved in increas-

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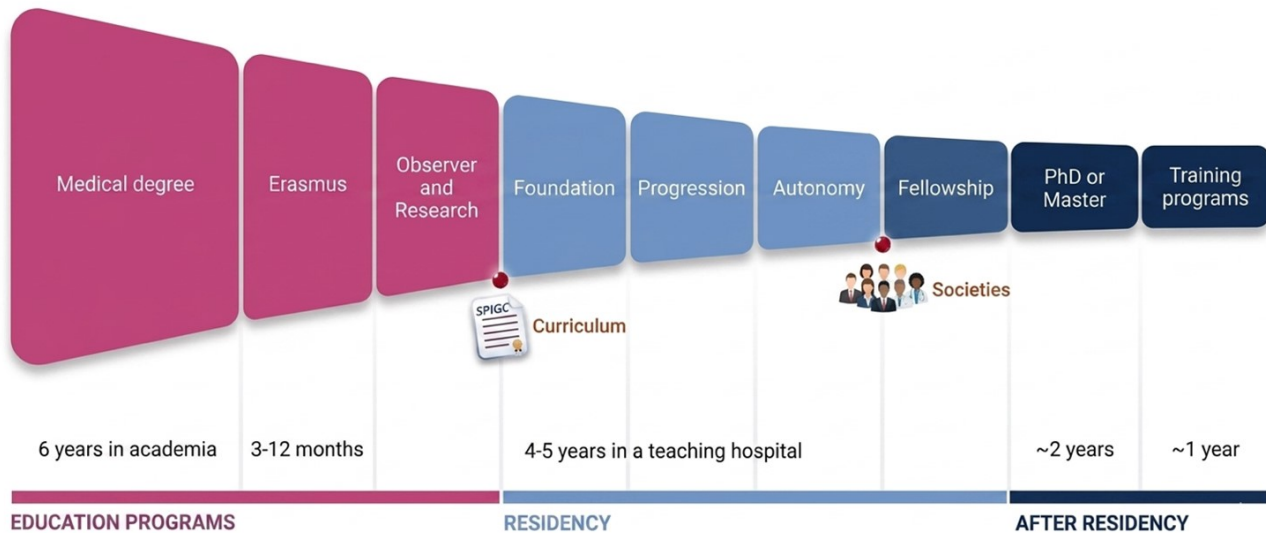


Fig. 1. Education and opportunities for a medical career in Italy. Generated with Biorender (<https://www.biorender.com/>).

ingly complicated surgeries and play a more active role in patient management and decision-making. Training at this level should ensure solid experience in the main surgical fields: elective surgery (focusing on planned procedures, facilitating residents to learn structured operative routines and maximize patient results through scheduled interventions), oncologic surgery (which needs an extensive understanding of tumor biology, staging, and radical excision principles while limiting damage to surrounding structures, and requires close coordination with other branches of medicine, radiology, pathology, and medical oncology), emergency and trauma surgery (that trains residents to manage acute, life-threatening conditions such as internal bleeding, perforations, or severe trauma; it requires rapid decisions under pressure and mastery of techniques like damage control surgery or exploratory laparotomy/laparoscopy). Residents face a transition exam every year to demonstrate to possess elective, oncological and emergency competencies.

(iii) During the “autonomy” phase, residents practice with a high degree of independence under the guidance of senior supervision. Trainees start to perform full procedures and manage surgical complications, as surgical practice becomes increasingly subspecialized.

After completing residency, surgeons generally head down different paths. They compete for public general hospital positions, take on academic research roles at university, or enter private practice [16]. Because the Italian system places so much emphasis on continuing education, residents are actively encouraged to pursue national and international scholarships, master’s degrees, PhDs, or training programs promoted by scientific societies [17,18]. These opportunities are essential for mastering highly specialized fields like robotic, transplant, and oncologic surgery (Fig. 1).

Keypoints:

- A gap persists between what is learned during university education and what is applied in clinical practice.
- The residency program in Italy aims to train in multiple areas of surgery before directing toward a specific area of expertise.

The Key Role of Scientific Societies

Scientific societies play a key role in connecting younger surgeons with the real-world hospital practice. The Italian Polispecialistic Society of Young Surgeons (SPIGC, <https://www.spigc.it>) and its Tuscany Regional Committee annually endorse research and education through conferences, journal clubs, and intensive hands-on programs [9].

The SPIGC-AIMS Model

From 2020, nearly 250 residents participated in classes focused on minimally invasive surgery, liver surgery, and reconstructive microsurgery, endorsed by a strong partnership between the Italian Academy of Medical Residents (AIMS Academy) and SPIGC. The main strengths of these courses are a maximum of two participants per station, one dedicated tutor for personalized guidance, trainees with similar levels of experience, and a short theoretical session immediately before the hands-on training [19].

Steering Through the Digital Territory: YouTube and Video-Based Learning

Surgical training has gone hybrid, and video platforms are essential add-ons to traditional learning. They give trainees instant access to step-by-step videos and expert lectures from global experts.

Evidently, this change places a great deal of responsibility on trainees. The “algorithmic ecosystem” of social media

often prioritizes engagement and immediate responses over accuracy and context. It risks leading to the spread of sub-optimal practices or unverified information [20]. The LAP-Paroscopic surgery Video Educational Guidelines (LAP-VEGaS) guidelines were established to provide a standardized checklist for educational video production. These guidelines stress the need for peer reviews, clear standards, and high-quality images [21].

Generative Artificial Intelligence (GenAI)

GenAI is changing surgical training from the ground up, designing realistic patient cases and clinical scenarios. Artificial intelligence (AI) also offers practical applications, such as supporting diagnosis, helping with decision-making, and organizing conceptual maps.

On the other hand, GenAI is not free from major errors, including “hallucinations”, the generation of plausible but completely wrong answers, inherent biases, and recommendations that completely clash with current clinical guidelines [22]. A study in pediatric surgery found that, while advanced models like GPT-4 can beat junior doctors on basic medical questions, AI performance drops quickly on complex cases, proving that technology is still nowhere near ready to replace human expertise [23].

However, as interest in AI increases, medical schools should begin incorporating “AI literacy” in their programs. Young surgeons need to learn how to verify GenAI answers with medical research, understand the technology’s limitations, and consider the ethical concerns related to sensitive data privacy and bias [24,25]. Scientific societies must take the lead in guiding this shift, ensuring that AI supports, rather than replaces, clinical judgment and compassionate patient care.

Keypoints:

- Scientific societies should lead a systematic amendment of surgical training. Planning modern surgical training requires a structured, multi-phase approach.
- GenAI and social media must be integrated into academic curricula through minimum standards, critical thinking training, and systematic audits.

Research Strategy

A literature search was conducted in accordance with the Joanna Briggs Institute (JBI) methodology for scoping reviews and reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines. The medical subject headings (MeSH) and keywords “Curriculum”, “Teaching”, “Surgery” together with “Students”, “Medical Student”, “Undergraduate” or “Generative Artificial Intelligence” were independently undertaken by two investigators (GEP and LC) in PubMed [MEDLINE]. The keywords were used in all possible combinations to retrieve the maximum number of articles available.

The study was first presented at the SPIGC National Congress held in Bari (Italy) in June 2025. Over the following year, the working group further updated the available literature search from 2000 to 2026, and accomplished the curriculum. Medical students intending to pursue a surgical career and trainees. A total of 720 records were initially identified through PubMed/MEDLINE database searching. After removal of 13 records that did not meet the full-text availability or language criteria, 707 records underwent title and abstract screening. Following screening, 702 records were excluded because they did not meet the eligibility criteria defined according to the Population–Concept–Context (PCC) framework: Population, medical students intending to pursue a surgical career; Concept, a curriculum based on competencies and skills to be acquired before starting a surgical career; and Context, university hospitals. The remaining 5 full-text articles were assessed for eligibility. After full-text assessment, no additional articles were excluded. Finally, 5 studies and documents met all eligibility criteria and were included in the qualitative synthesis.

Two reviewers (GEP and LC) independently assessed the eligibility of studies in abstract form or, if appropriate, in full text, by determining whether the inclusion criteria and outcome measures were met. A total of five studies has been summarized (Table 1).

International Models

The global variability in surgical education has highlighted an urgent need for standardized undergraduate curricula to ensure the consistency and quality of medical training [26]. “Do we need a core curriculum for medical students?” As noted in a recent scoping review, the lack of a coherent benchmark poses a significant risk to the preparedness of medical graduates worldwide [27].

In the USA, the Surgical Council on Residency Education (SCORE) offers an online platform aligned with Accreditation Council for Graduate Medical Education (ACGME), facilitating progressive learning from theory to clinical decision-making and technical skills [28]. This program firstly highlighted the huge gap between actual resident operative experiences and expectations set by the SCORE curriculum. Interestingly, after the American Board of Surgery (ABS) started to adopt the SCORE curriculum in 2015, studies have reported improved trainee performance and board examination outcomes following the implementation of SCORE-based educational approaches [29]. These results have significantly reinforced the need for shared activities for surgical residents. On the other hand, the American College of Surgeons (ACS) and the Association for Surgical Education (ASE) have designed a curriculum for medical students to standardize their general knowledge, trying to encourage their interest in surgery [30]. Their education consists of practical laboratory sessions during the first three years of the medical course, with general assessments scheduled for the third and fourth years. The aim of the

Table 1. Summary of selected international surgical curricula and training models.

Year	Name	Country	Target audience	Main outcomes
2009	Royal College of Obstetrics and Gynecology	United Kingdom (UK)	All undergraduate medical students in Great Britain and Ireland.	A curriculum for core knowledge, clinical skills, and professional attitudes aligned with General Medical Council requirements.
2015	Royal College of Surgeons	United Kingdom (UK)	All undergraduate medical students in the UK.	A national curriculum mapping a syllabus of surgical conditions. It integrates clinical principles, practical and interventional skills, or generic professional capabilities such as ethics, informed consent, and teamwork.
2019	American College of Surgeons and Association for Surgical Education	United States (USA)	Late-stage undergraduate medical students (3rd and 4th years) preparing for clinical rotations and the technical transition into surgical residency.	A simulation curriculum structurally mapped (“crosswalked”) to Entrustable Professional Activities (EPAs). It promotes intensive, laboratory, and practical simulation.
2021	ISCP	United Kingdom (UK)	Undergraduate medical students preparing for surgical training.	An outcome-based curriculum that replaces fixed time training and focuses on practical skills and professional competencies.
2022	University of Milan	Italy	Undergraduate medical students interested in global health, humanitarian medicine, and international healthcare equity.	An educational proposal that combines theoretical lectures on public health, global burden of surgical diseases, general surgery research projects, and bilateral clinical exchange rotations.

ISCP, Intercollegiate Surgical Curriculum Programme.

ACS/ASE curriculum is to reach the so-called “Entrustable Professional Activities” (EPAs), emerged from a consensus of experts that are going to be internationally validated.

Looking at Europe, the UK’s Intercollegiate Surgical Curriculum Programme (ISCP) program replaces traditional (“time-based”) training with a practical approach, using workplace tests, discussion of clinical cases, and self-evaluation models, adopting a specific “e-portfolio” [31]. It has been currently accredited at both institutional and national levels, as required by the Joint Committee on Surgical Training (JCST) and the General Medical Council. However, as systematically reviewed by Glossop et al. [32], undergraduate surgical training in the UK remains highly fragmented. The Royal College of Obstetrics and Gynecology (RCOG) created a national undergraduate curriculum to standardize education across gynecological schools on pelvic examinations and delivery room training, whereas its scope remains narrow and specialty specific. Notably, the 2015 Royal College of Surgeons of England (RCSE) curriculum represents the only formally validated program [32]. It aims to establish a basic standard, consisting of 35 key surgical conditions and 26 core practical skills, that

medical graduates could reach regardless of their future specialty. For instance, medical students are required to practice suturing techniques or demonstrate their understanding of the steps involved in more complex procedures, using various teaching methods (traditional apprenticeship, simulation, e-learning, peer learning) and assessment strategies (logbooks or self-assessment questionnaires) [1,28]. However, this curriculum is closely tied to the UK National Health Service context, lacks checklists or performance indicators, and does not include recent developments such as minimally invasive surgery, video learning, GenAI, and modern diagnostic techniques [33].

In 2022, Rossi et al. [26] proposed several global surgery courses and clinical rotations at European universities. Their aim is to enable medical students to develop essential practical and interdisciplinary skills, such as the ability to adapt, to understand the social and economic factors that influence health, and to learn how to manage resources when they are limited. To achieve these goals, the authors identified a multimodal combination of seminars, research projects, and international internships, based on a narrative review of eight existing international programs. However,

the authors propose a predominantly theoretical model that has not yet been validated, which limits the current evidence supporting its formal implementation within university curricula.

Including these studies, despite their differences in target population, geographical setting, and stage of training, highlights the considerable fragmentation that an Italian model must overcome. Basically, addressing this limitation is essential for developing a shared curriculum.

Keypoint:

- A curriculum could clearly guide students in their choices.
- The models proposed by the US and UK international societies are of limited applicability to the Italian context, but they can serve as a starting point for the development of an integrated Italian curriculum.

Curriculum Development

This section outlines the SPIGC proposal for a curriculum, suitable for the Italian background, through seven competency domains that final years' medical students could progressively acquire during their transition into residency in surgery.

Communication, Ethics, and Professionalism

Surgical success requires a strong connection with the patient. Communication is a core clinical skill, essential for turning complex medical data into a shared plan with the patient. Speaking clearly and with empathy, without hiding behind medical jargon, leads to better health outcomes and fewer misunderstandings. A recent survey by the "Young Section of the Italian Society of Surgical Oncology" (Y-SICO) shows that communication training for surgical residents remains largely unimplemented, despite its recognized importance for patient care [34].

A main aspect of patient-doctor relationship is the "informed consent". For the consent to be valid, the information provided must be truthful, personalized and understandable, and must cover the diagnosis, prognosis, expected benefits, risks, treatment alternatives, and the consequences of refusal.

Furthermore, collaborative practice is essential in modern care. Surgeons must be effective members of a wider Multidisciplinary Team (MDT), collaborating with pathologists for diagnosis, anesthesiologists for perioperative safety, radiologists for diagnostic guidance, and medical and radiation oncologists for systemic planning [35].

Clinical and Diagnostic Skills

The surgeon's role begins and ends outside the operating room through effective clinical governance. Running a surgical clinic requires diagnostic acumen and organizational skills [36]. In the hospital, the daily ward round is central of postoperative recovery. This involves integrating clinical findings, laboratory tests, and imaging data to plan ongoing care and identify potential complications, such as sepsis or

wound infections. This "holistic" approach is the only way to move beyond focusing on a single diseased organ and to treat the patient's body as a whole [37]. Equally important, hospitals give junior trainees valuable opportunities to discuss and learn from other professionals, such as nurses, physiotherapists, and dietitians.

Safety and Hygiene

The operating room is where technical expertise and patient safety come together. Personal protective equipment (PPE) protects from infections and helps keep the environment sterile. Typical PPE includes sterile gowns, medical masks or respirators, eye protection, and double gloves.

Hand hygiene is the most effective way to prevent the spread of infections. Based on WHO "My Five Moments for Hand Hygiene", surgeons should wash their hands before patient contact, before sterile procedures, after exposure to body fluids, and after touching a patient or surroundings. Nowadays, the recommended approach for surgical hand preparation is "Rub, Don't Scrub", which is both effective and less harsh. Alcohol-based hand rubs are more effective than traditional scrubbing with brushes and antiseptic soaps for quickly reducing skin bacteria. Gentle cleaning helps protect the skin's natural barrier against germs and also saves (non-sterile) water [38,39].

Technical Skills

Precision in suturing is fundamental to bring tissues together smoothly and securely, avoiding excessive tension, which could slow the healing process. Residents must master the main techniques, including the simple interrupted stitch, the continuous running stitch, and the vertical mattress suture, as well as the fundamental knot-tying techniques, mainly the two-handed tie, the one-handed tie, and the instrument tie.

Hemostasis is crucial for maintaining a clear surgical field and preventing postoperative bleeding. Modern surgical procedures rely on various energy devices, from standard monopolar and bipolar electrosurgery to more advanced bipolar, radiofrequency, and ultrasonic (harmonic) instruments. Since each technology produces a unique heat pattern and interacts differently with tissue, residents should understand their specific indications, limitations, and safety considerations.

Minimally invasive surgery, including laparoscopy and robotic platforms, is now a mandatory part of modern training. A highly specialized set of motor skills is required to handle the instruments through a fixed point while looking at a 2D or 3D screen. Core skills include safe abdominal entry, proper trocar placement to achieve triangulation, camera navigation, grasping, tissue retraction, and clip application within a confined space [40].

Subspecialty-Specific Aspects

Each surgical subspecialty is defined by Italian government (<https://www.mur.gov.it/it>):

(i) Cardiac surgery covers both acquired and congenital heart conditions, from coronary artery bypasses and valve repairs to thoracic aorta surgery and full heart transplants. It requires absolute coordination with perfusionists and anesthesiologists.

(ii) Emergency surgery: even though it isn't a distinct specialty in Italy, it is defined by the complexity of the cases rather than an anatomical region. It spans everything from perforated viscera and incarcerated hernias to necrotizing soft-tissue infections and "damage control" in severe poly-trauma, demanding the ability to operate safely under time pressure.

(iii) General surgery remains the broadest surgical field, covering the entire gastrointestinal tract, from upper GI and colorectal cancers to inflammatory bowel disease, diverticulitis, and hernias. It also manages liver, biliary, and pancreatic disorders, breast pathologies, and endocrine surgeries for the thyroid and adrenal glands.

(iv) Gynecological surgery manages benign uterine pathology, such as fibroids, endometriosis, and prolapse, alongside gynecological malignancies of the uterus, ovary, and cervix, frequently using minimally invasive procedures.

(v) Neurosurgery focuses on intracranial tumors, cerebrovascular issues like aneurysms and arteriovenous malformations, as well as spinal disorders and trauma. Because these procedures take place entirely within critical anatomical zones, they demand absolute precision and extreme care during any tissue manipulation.

(vi) Ophthalmology manages pathologies of the globe and adnexa, including cataract, glaucoma, retinal detachment, corneal disease, strabismus, and ocular tumors, and involves handling tissue at a microscopic level.

(vii) Orthopedic and trauma surgery addresses diseases and injuries of the musculoskeletal system, including fractures, degenerative joint disease, ligamentous injuries, bone tumors, and spinal deformities, and acute fracture fixation.

(viii) Otorhinolaryngology focuses on head and neck oncology, sinonasal disease, otorhinolaryngological disorders, and laryngeal pathology. Maxillofacial surgery treats tumors of the oral cavity and jaw, salivary gland diseases, facial trauma, and dentofacial deformities.

(ix) Pediatric surgery encompasses congenital anomalies of the gastrointestinal, thoracic, and urogenital systems, as well as oncology, demanding adaptation of operative techniques to the anatomical plus physiological peculiarities of the growing patient.

(x) Plastic and reconstructive surgery deals with a wide range of cases, from soft tissue defects and burns to post-oncological reconstruction, birth defects, and aesthetic surgery. It requires highly specific micro-skills, particularly in flap design and vascular anastomosis under magnification.

(xi) Thoracic surgery deals with pulmonary neoplasms, mediastinal masses, pleural diseases such as empyema and mesothelioma, esophageal disorders, and chest wall pathology. Video-assisted thoracoscopy is the standard approach for most thoracic resections today.

(xii) Urology encompasses urological oncology (prostate, bladder, kidney, and testicular cancers), urolithiasis, voiding dysfunction, and andrology, with a growing role for robotic-assisted approaches.

(xiii) Vascular surgery focuses on occlusive and aneurysmal diseases of the arterial system, venous insufficiency, and carotid pathology, requiring expertise in both open reconstruction and endovascular techniques.

Emergency and Trauma Expertise

It consists of rapid assessment, patient stabilization, and triaging critical conditions, such as massive hemorrhages, severe trauma, or sepsis. Managing an emergency requires clear communication and leadership to direct patient flow and coordinate seamlessly with the staff [41].

The management of an injured patient follows the Airway Breathing Circulation Disability Exposure (ABCDE) approach: Airway, Breathing, Circulation, Disability, Exposure. First, ensure the airway is clear while protecting the neck. Then, assess breathing to identify any tension pneumothorax or hemothorax. For circulation, look for early signs of shock, treating it as hemorrhagic unless proven otherwise, and perform an Extended Focused Assessment with Sonography for Trauma (eFAST) scan to detect hidden bleeding in the chest, abdomen, or pelvis. Check neurological status quickly with the Glasgow Coma Scale, observing pupil response and motor function. Finally, expose the patient by carefully removing clothing to spot injuries, while immediately beginning warming efforts to prevent hypothermia.

Residents should avoid over-relying on computed tomography (CT) scans. A 'negative' scan in the morning does not mean that the patient's condition will not deteriorate by the afternoon. Moreover, if a patient remains unstable after initial resuscitation, there is no time for imaging, and surgeons must be prepared for an urgent exploratory laparotomy. It is always mandatory in penetrating abdominal trauma with signs of peritonitis and in blunt trauma with persistent hypotension and a positive eFAST [42].

Damage Control Surgery (DCS)

In such critical scenarios, the aim is not definitive anatomical repair but rather the rapid control of potentially fatal hemorrhage, often through "packing", and the containment of gastrointestinal contamination [43].

Head trauma requires careful clinical and radiological evaluation, paying close attention to signs of intracranial hematoma. Be alert if consciousness worsens, neurological deficits appear, pupils become unequal, or there's a lucid

Table 2. SPIGC proposed a skills checklist for trainees/ future surgical residents.

Sections	Key-points	Learning objectives	Teaching methods	Competency standard
Soft skills and scientific research	Ethics	Ethical fundamentals should be systematically taught and prioritized.	Course on bioethics and medical ethics as part of the medical degree programme.	Knowledge of the major legislation on patients' rights.
	Informed consent	It is a communication process; be able to explain risks, benefits, and alternatives.	Debates, forums, and schemes suggested by societies (e.g., Italian Society of Surgery, SIC).	Editing consent in a transparent and comprehensible manner, respecting a patient's refusal of treatment.
	Communication	Practice repeating orders back in emergencies to prevent errors.	Participate in medical briefings, attending tumor or emergency boards.	Presentation of a clinical case.
	Humility and teamwork	Respect the experience of nurses, anesthetists, and technicians; surgery is a team sport. <i>"No one is big enough to be independent of others"</i> - Dr. William W. Mayo.	Internship in surgical wards, observership, and clinical rotations.	Promoting active collaboration, free from abusive behaviour.
	Guidelines and recommendations	Update your knowledge yearly.	Literature review and platforms, such as UpToDate.	Identification main international guidelines.
Theoretical skills	Evidence-based medicine	Know how to formulate a clinical question using the PICO method; distinguish the hierarchy of evidence.	Reading reviews, systematic reviews and meta-analyses.	A critical reading of a scientific article and consultation of the main medical databases.
	Healthcare system	Knowledge of the Italian healthcare system and the essential levels of care.	Medical degree and achieve qualifying training with the general practitioner.	Identification of the services guaranteed by the Italian National Health Service (SSN); clinical appropriateness and the avoidance of waste in medical prescriptions.
	Digital literacy	Learn from surgical videos and online courses.	Online videos and courses from recognized institutions.	Knowledge of surgical steps for each procedure.
	AI literacy	Be aware of the limitations of artificial intelligence and know how to verify information using primary sources.	Entering webinars, congresses, conferences.	Ability to maintain exclusive human oversight over diagnosis and treatment.
Clinical skills and emergency surgery	ABCDE	Master the ATLS sequence for trauma.	Attending specific BLS and ATLS courses.	Recognition of patients' vital priorities and to be skilled in the main life-saving procedures.
	Head-chest- abdomen trauma	Be able to perform a systematic physical examination.	Attending an internship in surgery during the last years of medical degree.	Assessment of pathognomonic signs for surgical emergencies.
	eFAST	Understand the basics of emergency ultrasound for identifying occult free fluid/effusions.	Supervised simulation.	A quick overview and practice with the ultrasonography windows.
	Examinations	Understand the vital importance of clinically reassessing the patient every 4–6 hours (<i>"clinical judgment over CT scans"</i>).	Supervised clinical practice.	Monitor a patient and fill out the clinical chart.

Table 2. Continued.

Sections	Key-points	Learning objectives	Teaching methods	Competency standard
Technical skills	Hand hygiene and PPE	Understand the main rules of sterility in a surgical setting.	Attending the operating room before graduation;	Master the “ <i>Rub, don’t scrub</i> ” and equipment.
	Diathermy physics	Understand the difference between energy devices.	webinars and courses promoted by medical	A general overview of the technical principles.
	Sutures and knots	Knowledge of tissue characteristics, surgical techniques, and materials.	companies.	Manual knots (one-handed and two-handed) and instrument ties.
Perioperative management	ERAS protocols	Early nutrition, carbohydrate loading, mobilization.	Looking at ERAS guidelines and nutritional societies.	Understanding of the principles of pre- and re-habilitation.
	Nutritional assessment	Be able to interpret weight loss as a surgical risk factor.	Understanding nutritional and frailty scales.	Identification of malnutrition through screening forms and tools.
	Morbidities	Learn to recognize complications early.	Knowing main surgical complications.	Early and late complications, with main grade scales (e.g., Clavien-Dindo classification).

SPIGC, Italian Polispecialistic Society of Young Surgeons; PICO, Population Intervention Comparison and Outcome; AI, artificial intelligence; ABCDE, Airway Breathing Circulation Disability Exposure; ATLS, Advanced Trauma Life Support; BLS, basic life support; eFAST, Extended Focused Assessment with Sonography for Trauma; CT, computed tomography; PPE, personal protective equipment; ERAS, Enhanced Recovery After Surgery.

interval followed by deterioration, which is often seen in epidural hematoma [44].

Thoracic trauma is mostly managed initially with tube thoracostomy. This procedure provides rapid decompression of the pleural space and allows evacuation of air or blood in cases such as pneumothorax or hemothorax. The chest drain is typically inserted in the “safe triangle”, bounded by the lateral border of the pectoralis major, the anterior border of the latissimus dorsi, and a line superior to the nipple level (approximately the 5th intercostal space), and connected to an underwater seal.

The abdomen is frequently explored through a midline laparotomy incision. This approach ensures excellent visualization of most of the abdominal cavity and can be easily extended when additional access is required [45].

Never consider a trauma patient “stable” without performing a log-roll to inspect the back.

Perioperative Management

Perioperative course consists of optimizing the prehabilitation program and controlling potential postoperative complications.

Prehabilitation

Preoperative management focuses on risk stratification and optimization of patient’s outcomes. A thorough history and physical examination are fundamental. Nutritional status assessment is crucial, as malnutrition (weight loss and serum albumin levels) significantly affects outcomes.

Enhanced Recovery After Surgery (ERAS) principles are described to minimize the surgical stress response and accelerate patients’ functional recovery, ultimately reducing overall costs [46]. By combining targeted nutrition, exercise, and lifestyle changes like quitting smoking and alcohol, prehabilitation enhances patient’s physiological reserve and transforms the “waiting period” before surgery into a form of “athletic training” for surgery [47].

Postoperative Complications

Postoperative care centers on close monitoring of vital signs, multiple pain-relief methods, and early mobilization to help prevent blood clots. Wounds should be checked regularly. Above all, preventing sepsis and surgical site infections, whether superficial in the skin and fat, deep in the fascia and muscle, or involving internal organs, is crucial to lowering the risk of complications [48].

The transition to sepsis (SIRS plus infection) or septic shock (persistent hypotension despite fluid resuscitation) requires immediate intervention via the sepsis 6 (BUFALO) bundle within the first hour: Blood cultures (at least 2 sets aerobic/anaerobic before antibiotics); Urine output (monitoring renal perfusion, target >0.5 mL/kg/h- urinary catheter); Fluids (crystalloid resuscitation); Antibiotics (site-specific broad-spectrum empirical therapy); Lactate (assessing tissue ischemia, <2 mmol/L); Oxygen (maintaining organ saturation, target SpO₂ 94–98%) [49].

Research and Evidence-based Guidelines

Modern surgeons must move beyond following protocols or guidelines to become evidence-based practitioners.

Engaging with a research paper requires actively questioning the author's claims from introduction and hypothesis to determine the unmet clinical need. The study design is not less important: randomized controlled trials are the gold standard for demonstrating efficacy, whereas observational studies or case series may offer deeper, real-world insights into rare complications and technical outcomes. When evaluating the results, clinicians should look beyond the "*p*-value culture". While the *p*-value indicates statistical significance, clinical relevance should be assessed by considering effect size, absolute risk reduction, and other clinically meaningful outcomes [50].

Searching solid scientific evidence requires a structured search methodology rather than simply entering random keywords into a search bar. The use of the Population Intervention Comparison and Outcome (PICO) allows the surgeon to structure highly specific queries in common databases such as PubMed, the Cochrane Library.

Surgical Readiness Checklist

Table 2 presents a checklist, summarizing the competencies that aspiring surgeons should acquire before completing their medical degree and starting residency in surgery.

Conclusions

Both surgical education during medical course and post-graduate surgical training remain highly fragmented in Italy. Medical students intending to pursue a surgical career often encounter substantial gaps compared with their international colleagues.

A curriculum specifically designed for undergraduate medical students could provide a timely and structured response to these deficiencies. By integrating technical skills, theoretical knowledge, and soft competencies, this model aims to align students' education in surgery with international standards while remaining adaptable to the Italian scenario. Scientific societies play a pivotal role in driving this transformation. The adoption of a competency-based curriculum could better prepare surgical residents, improve patient care, and make "surgery" an attractive career choice for future generations at a time when the specialty is facing a profound vocational crisis.

Nonetheless, prospective data supporting its effectiveness in improving trainee competency and patient outcomes, as well as a formal, structured consensus process among Institutional experts, should be considered in future studies.

Availability of Data and Materials

Not applicable.

Author Contributions

Conceptualization: GEP, LC, MM, GG, APi, APa. Methodology: GEP, MP, MGA, ACa, GE, GMi, GR, FG, DS, LC. Investigation: ML, EB, GGI, GMe, RC, MA, MRM, ACo. Data curation: ML, EB, GGI, GMe, RC. Formal analysis: GEP, MP, MA, LC. Writing – original draft: GEP, MP, MGA, ACa, GE, GMi, GR, FG, DS, LC. Supervision: MM, GG, APi, APa. Project administration: GEP, LC. All authors have been involved in revising the manuscript critically for important intellectual content. All authors gave final approval of the version to be published. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

Ethics Approval and Consent to Participate

Not applicable.

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Conflict of Interest

The authors declare no conflict of interest.

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