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Optimizing Practical Teaching in Secondary Medical Schools

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Abstract
Practical training constitutes an essential part of education in secondary medical schools and serves as the foundation for developing professional competencies in future healthcare workers. When combined with theoretical knowledge, it enables the transformation of abstract concepts into concrete, applicable skills that are crucial for successful integration into the healthcare system. This paper examines strategies for the effective and efficient organization of practical training, placing particular emphasis on modern pedagogical models and their application in medical education. The theoretical section highlights the constructivist approach—which emphasizes the student's active role in the learning process—as well as modern methods such as project-based learning (PBL), team-based learning (TBL), simulation methods, and interdisciplinary collaboration. A comparative analysis outlines the historical evolution of practical training, ranging from the ancient "apprentice-master" model and Renaissance empiricism to the modern digital era, in which virtual laboratories and artificial intelligence play a significant role. The empirical section focuses on the results of surveys and analyses conducted among students and teachers in secondary medical schools, aiming to determine their perceptions regarding the effectiveness of and challenges associated with practical training. The data indicate that the primary benefits relate to the development of clinical skills, improved communication with patients and colleagues, and increased self-confidence and professional maturity. On the other hand, key challenges identified include a lack of resources, limited time for practical training, and insufficient integration of modern technologies. The paper proposes strategies to enhance practical instruction, such as systematic planning and organization, continuous outcome evaluation, active collaboration with healthcare institutions, the use of simulation centers and digital tools, and ongoing faculty training. The conclusions confirm that practical training is an indispensable factor in preparing students for the real-world challenges of the medical profession and that its effectiveness and efficiency depend on the integration of modern strategies, clearly defined goals, and the active involvement of all stakeholders in the educational process.

Keywords: medical education; practical training; nurse.

1. Introduction

A primary goal for teaching staff in vocational schools is ensuring that students understand the work processes associated with their chosen profession. To this end, appropriate institutions are selected where students can acquire the necessary knowledge. With a focus on acquiring professional knowledge, practical training, and developing relevant competencies, the educational process gradually shifts from the classroom to laboratories, companies, and medical facilities; this aims to facilitate smoother and more effective instruction while enhancing the learning process and knowledge acquisition. Terms such as "acquired knowledge," "competence," "activity," "effectiveness," and "efficiency" each represent—by definition and construct—complex processes that will be examined in detail in this paper. In the medical sciences, practical instruction is of particular importance because

purely verbal learning is abstract for students; the transition to active learning—and subsequently to social learning—creates a framework that fosters lasting knowledge and abilities. These evolve into skills that are valuable to society and highly regarded in the labor market. Combining various teaching methods and techniques inevitably presents the greatest challenge for educators seeking to maximize the impact of practical instruction.

According to data from the World Directory of Medical Schools, there are more than 4,100 medical schools worldwide offering comprehensive medical education programs [1], [2]. There are significant differences in the regional and national distribution of these schools. For instance, India has the highest number of medical schools—totaling 661—while Brazil has 348 and the United States has 198. Conversely, there are countries with no medical schools at all, such as certain nations in Africa, Oceania, and Europe.

Data regarding secondary-level medical education—specifically programs offered at the high school level—is less readily available. In countries like Germany, Austria, and Switzerland, there are secondary medical schools that offer training programs for nurses and other healthcare professionals. However, in countries such as the United States and Canada, no such programs exist at the high school level; instead, aspiring nurses and healthcare workers enroll in specialized programs after completing their secondary education.

Due to this diversity, there is no single global standard regarding the existence of secondary medical schools. Nevertheless, many countries—particularly in Europe—do have institutions that provide foundational medical education and training.

1.1. Social and professional significance

Practical training in secondary medical schools holds significant social importance, as it produces the personnel essential for the functioning of the healthcare system. It ensures the provision of high-quality healthcare services, reduces the likelihood of errors, and fosters trust in both educational and healthcare institutions. From an economic perspective, well-trained students reduce the need for additional training and contribute to a more efficient system.

The professional justification lies in the integration of theory with practice and the development of competencies—cognitive, psychomotor, and affective. This aligns with European standards for medical education and ensures the continuous improvement of the teaching and learning process.

Consequently, the topic is both socially and professionally relevant, as it offers solutions for better student preparation and the modernization of education.

1.2. Study motivation

The motivation for developing this study stems from the need to enhance the quality of practical training in secondary medical schools. As a key component of education, practical training serves as the foundation for developing competent and responsible healthcare professionals who are prepared to engage directly in the clinical environment immediately upon completing their education. Numerous challenges arise during practical training—limited resources, a lack of modern teaching methods, overcrowded groups, and a disconnect between theory and practice. These factors affect the effectiveness and efficiency of instruction and diminish students' readiness for work within the healthcare system.

For these reasons, there is a need for a systematic examination of strategies to improve the organization, methods, and evaluation of practical training. Consequently, this paper aims to offer scientifically grounded recommendations and practical solutions that will contribute to the

modernization of the educational process and its alignment with European and global standards in medical education.

1.3. Study objective

The subject of this study is the study of strategies for efficient and effective practical training in secondary medical schools. The focus is placed on how practical training is planned, organized, implemented, and evaluated, as well as on the factors that influence the quality of the educational process. The objective of this paper is to identify and analyze the most appropriate strategies that will ensure:

- better alignment between theoretical and practical instruction,
- the development of professional competencies in students,
- increased efficiency and effectiveness within the teaching process,
- the introduction of modern methods for recording, monitoring, and evaluating student achievement,
- the alignment of instruction with European standards in medical education.

Consequently, this paper aims to offer practical recommendations for improving teaching practice and to contribute to the development of higher-quality, more competitive medical personnel.

1.4. Research hypothesis

"Efficient and effective practical instruction in secondary medical schools can be improved through clearly defined strategies for planning, implementation, recording, monitoring, and evaluation, enabling students to acquire superior knowledge, skills, and professional competencies that are aligned with modern European standards."

2. Theoretical and Practical Background

2.1. Constructivist foundations

2.1.1. Theoretical foundations of constructivism

Constructivism is a pedagogical approach based on the idea that knowledge is not passively transmitted from teacher to student but is actively constructed through personal experience, cognitive activity, and social interaction.

Several significant authors have contributed to the development of this theory:

Jean Piaget – defines learning as the process of creating cognitive structures through assimilation (incorporating new information into existing schemas) and accommodation (modifying schemas based on new experiences).

Lev Vygotsky – introduces the "Zone of Proximal Development" (Zone of Proximal Development (ZPD)), where the learner learns best with the support of a more experienced mentor, who facilitates a gradual transition toward independence.

Jerome Bruner – promotes the concept of "spiral instruction," where the same concepts are studied at different levels with increasing complexity.

David Kolb – develops the theory of "cyclical experiential learning" (Concrete Experience → Reflective Observation → Abstract Conceptualization → Active Experimentation).

2.1.2. Key principles of constructivism in medical education

Active learning – students are not passive recipients but actively perform procedures (measuring vital signs, administering injections, conducting laboratory tests).

Connecting with prior knowledge – new medical content builds upon previously learned theoretical concepts (anatomy, physiology, pharmacology).

Social interaction – group work, teamwork in a hospital setting, and the exchange of experiences and knowledge.

Contextualization – knowledge is developed through real-life situations involving patients and within clinical settings.

Reflection – students keep practice journals, participate in discussions, and engage in self-assessment.

Table 1 summarizes how key constructivist principles can be translated into medical-practice activities.

Table 1. Applications of constructivist principles in medical practice.

Principle	Specific application	An example in medical practice
Active learning	Students perform procedures under supervision	Setting up an infusion
Connecting to prior knowledge	Theory integrated into practice	The knowledge of physiology helps students measure blood pressure
Social interaction	Teamwork and cooperation	Working together to treat a patient
Contextualization	Real application in clinics	Care of patients and application of medicine
Reflection	Analysis of work and self sufficiency	Work journal

2.1.3. Advantages of the constructivist model

• Fosters critical and analytical thinking.
• Increases learning motivation and makes instruction more engaging.
• Ensures lasting knowledge and competencies.
• Prepares students for unpredictable situations in medicine.

2.1.4. Limitations and challenges

• Requires more time and resources for preparation and implementation.
• The teacher must act as a mentor rather than merely a "lecturer."
• Large student groups make individual work difficult.
• Not all students are immediately ready for an active role; gradual adaptation is required.

2.1.5. Visualization – experiential learning cycle (after Kolb)

Concrete experience → 2. Reflection → 3. Conceptualization → 4. Active application.

This model is directly applicable to medical practice, where daily experience with patients is analyzed, supplemented with theoretical knowledge, and subsequently applied in practice.

2.2. Historical development of practical training

The history of practical training is closely linked to the development of the educational system and medicine as a science. Since the earliest civilizations, people have learned through experience and observation, and this model of "learning by doing" remains relevant today.

2.2.1. Practical training in the ancient period

In ancient Greece, Socrates (469–399 BC) employed a dialogic method as a form of practical instruction, stimulating critical thinking. Plato founded the Academy, while Aristotle developed the Lyceum, where observation and experimentation were central.

In medicine, Hippocrates (460–370 BC) trained students through hands-on work with patients, laying the foundations of clinical medicine.

2.2.2. The Middle Ages

During the Middle Ages, practical training evolved within monasteries and guild associations. Healthcare was typically part of monastic life. The first medical universities were established in Europe (Bologna, Paris, Oxford), where practical work was limited to dissections and demonstrations.

2.2.3. The Renaissance and early modern era

The Renaissance marked a new stage in education—learning through the senses and experimentation (championed by figures such as John Amos Comenius). In medicine, Andreas Vesalius (1514–1564) revolutionized anatomy through his dissections. Practical training became central to understanding the human body and diseases

2.2.4. Industrial Revolution

The Industrial Revolution saw the establishment of specialized technical and medical schools. Florence Nightingale founded the first nursing school in London (1860), where practical work in hospitals became mandatory.

2.2.5. 20th Century – Institutionalization of Practical Training

John Dewey formulated the "learning by doing" theory, which became the foundation of progressive pedagogy. Medical schools began systematically introducing laboratories, simulations, and clinical practice.

2.2.6. 21st Century – Digitalization and Globalization

The modern era brings new methods: virtual laboratories, simulation centers, digital platforms, and artificial intelligence. Today, practical medical training often utilizes virtual reality (VR) technologies and simulation mannequins, enabling safe and repeatable training.

2.2.7. History of Practical Training in Macedonia

• 1945–1960 – The first secondary medical schools were established in Skopje and Bitola. Practical training took place primarily in hospitals, with nurses acting as mentors.
• 1970–1990 – The system was enhanced through increased practical hours and mandatory work in clinical settings.
• 2000–2020 – Gradual modernization: laboratories, specialized classrooms, and simulation models (phantoms).
• 2020–Present – Integration of digital tools, collaboration with faculties and healthcare institutions, and the emergence of pilot simulation centers.

Table 2 provides an international comparison of practical-training duration and organization.

Table 2. International comparison of practical-training duration.

Country	Duration of practical education in secondary schools	Characteristics
Macedonia	Around 1200 hours in 4 years	Dual training (school + clinical base) and practice in hospitals and health homes, partial simulation
Germany	1500+ hours	Dual training that's integrated with the nurse training system
Switzerland	Around 1200 hours	Training in hospital teams, with mentoring
USA	There are no medical secondary schools	Training begins at college/university

2.3. Objectives, competencies, and learning outcomes

Practical training aims to link theory with actual medical practice and to produce healthcare professionals who are professionally qualified, ethically responsible, and competent to work within the

healthcare system. The objectives can be categorized into three groups based on Bloom's Taxonomy: cognitive, psychomotor, and affective.

2.3.1. Cognitive objectives (knowledge and understanding)

Cognitive objectives focus on the students' intellectual development, enabling them to understand theoretical foundations and apply them in practice.

• Recognizing symptoms and signs of various diseases.
• Understanding the principles of medical ethics and legal regulations.
• Applying knowledge of anatomy, physiology, pathology, and pharmacology in clinical situations.
• Analyzing and interpreting laboratory results.
• Critical thinking and making appropriate decisions in emergency situations.

2.3.2. Psychomotor objectives (skills and performance)

These objectives relate to the acquisition of specific clinical and technical skills through practical work.

• Performing basic medical procedures (measuring vital signs, administering injections, setting up intravenous (IV) infusions).
• Applying aseptic and antiseptic techniques.
• Providing medical care for patients with acute and chronic conditions.
• Using medical equipment (electrocardiography (ECG) machines, laboratory instruments, simulation models). • Preparing patients for diagnostic or therapeutic procedures.

2.3.3. Affective goals (attitudes, values, and behavior)

Affective goals relate to professional development, ethical values, and the attitude towards patients and colleagues.

• Developing empathy and respect for patients.
• Adhering to medical ethics and deontology.
• Professional behavior in a hospital setting.
• Developing responsibility and initiative in the workplace.
• Building communication and teamwork skills.

Table 3 links the three objective domains with expected outcomes and practical examples.

Table 3. Practical-training objective domains, expected outcomes, and examples.

Category	Purpose	Expected outcome	Example
Cognitive	Understanding pathophysiology	Students analyze symptoms and diagnosis	Students analyze Vital Sign Chart
Psychomotor	Acquisition	Students perform medical procedures	Catheter placement
Affective	Development of professional values	Demonstrating empathy and ethical behavior	Working directly with patients

2.3.4. Examples of practical training in medicine:

• Simulated patients (actors portraying symptoms)
• Work in clinics and hospitals
• Laboratory (or classroom-based) instruction and analysis
• Training using phantoms (models for injections, cardiopulmonary resuscitation (CPR), etc.)
• Exercises in medical simulation centers

2.3.5. Definition of terms

In any research, particularly in the fields of education and medicine, it is essential to clearly define key terms to avoid misunderstandings and ensure scientific consistency. Detailed definitions of the most important concepts addressed in this paper are provided below.

2.3.6. Practical training

According to the Law on Secondary Education of the Republic of Macedonia, practical training constitutes a mandatory part of the educational process, enabling the integration of theoretical knowledge with workplace practice.

According to the Center for Vocational Education and Training [3], it is implemented during the second through fourth years of study across all four-year educational profiles, lasting between 2 and 11 hours per week, with the aim of gradually introducing students to the work process.

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), practical training is defined as a "structured work-based learning process that enables students to acquire professional competencies under mentorship in a real or simulated environment."

Conclusion: Practical training is an experiential learning method that bridges theory and practice and develops students' professional competencies.

2.3.7. Practical Training

Practical training is a broad term encompassing various forms of work-based learning.

It includes:

• Practical instruction (within the regular educational process).
• Summer internship/practical training (training conducted after the school year ends, lasting 100 hours/20 days).
• Professional internship (in seasonal or specialized vocational fields).

2.3.8. Summer Internship

The summer internship is a specific form of practical training conducted after the school year ends.

• It lasts 100 hours/20 working days.
• It takes place in healthcare facilities or specialized institutions.
• A work log is maintained, which is checked and evaluated by the mentor.

Example: The Physiotherapy Technician program (2nd year, 2025) includes:

• application of asepsis and antisepsis,
• measurement of vital signs,
• dressings and immobilization,
• application of physical agents (phototherapy, cryotherapy, paraffin therapy),
• manual and mechanical massage.

2.3.9. Effectiveness

Effectiveness refers to the degree to which established goals are achieved.

• In teaching: how well students master the expected knowledge and skills.
• In medicine: whether the student can perform procedures accurately, safely, and professionally.
• Example: If the goal is for the student to perform an intravenous injection, effectiveness is assessed based on accuracy, adherence to protocols, and the success of the procedure.

2.3.10. Efficiency

Efficiency is the ratio between resources invested and results obtained.

• In practical training, this means the optimal use of: time, space, teachers, equipment, and finances.
• Example: Practical training using a simulation phantom for 10 students simultaneously is more efficient than individual work with a patient for each student, provided the outcomes are the same.

2.3.11. Competencies

Competencies are an integrated combination of knowledge, skills, and attitudes that enable the student to perform specific professional activities.

• The European Qualifications Framework (EQF) defines competence as follows: "Competence is the proven ability to use knowledge, skills, and personal abilities in a professional context."
• World Health Organization (WHO): "A competent health worker is one who can safely and effectively meet patient needs within a specific health system."

In medical schools, competencies are categorized into:

• Cognitive (knowledge of anatomy, physiology, pathology).
• Psychomotor (ability to perform medical procedures).
• Affective (attitudes, ethical values, communication).

2.3.12. Learning outcomes

These are specific results to be achieved upon completion of the instruction.

• Example of a cognitive outcome: the student is able to explain the symptoms of diabetes.
• Example of a psychomotor outcome: the student performs a surgical wound dressing.
• Example of an affective outcome: the student demonstrates empathy when communicating with patients.

Table 4 distinguishes instructional purposes from observable learning outcomes.

Table 4. Distinction between instructional purposes and learning outcomes.

Category	Purpose	Outcome
Cognitive	To gain knowledge about diabetes	To explain the symptoms of diabetes
Psychomotor	To learn how motor skills are tied to knowledge in a surgical setting	To bandage a surgical wound
Affective	To develop empathy	To show empathy and respect towards a patient

2.4. Preparation and organizational prerequisites

Efficient and effective practical training does not begin with the actual instruction itself, but with systematic and well-planned preparations. Preparation ensures the organizational and pedagogical integrity of the teaching process and enables students to receive the best possible training. International standards (WHO, UNESCO, European Training Foundation) regard preparation as a key prerequisite for quality vocational education.

2.4.1. Organizational Prerequisites

Organizing practical training involves several levels:

• Curriculum and syllabus – a detailed allocation of hours by year and subject (e.g., in Macedonia: 900–1,200 hours of practical training in the 3rd and 4th years).
• Cooperation agreements – official agreements between educational institutions and healthcare facilities (hospitals, community health centers, specialized institutes).
• Scheduling and logistics – forming small student groups, defining departmental rotations, and establishing a calendar for the practical training.
• Summer internship – additional organization of 10–20 days of training during the summer break, where students work in real-world settings with mentors.

Example: In Germany, the dual education system entails a weekly schedule of three days at school and two days at a clinical training site.

2.4.2. Staffing Prerequisites

Practical training cannot be successfully implemented without qualified and trained personnel. This includes:

• Subject instructors – who act as professional organizers and facilitators. • Clinical mentors – nurses, physiotherapists, and physicians who oversee data and activities within the healthcare facility.
• Pedagogical-psychological service – educators and psychologists who provide psychosocial support and assist with student adaptation.
• Mentor training – regular professional development for mentors is required, particularly regarding pedagogical methods and communication with students.

Comparison: In Finland, mentors attend a course on pedagogical competencies to qualify for working with students in a clinical setting.

2.4.3. Material and technical prerequisites

Practical instruction requires specific facilities and equipment:

• Simulation rooms – equipped with manikins, models for intravenous administration, and resuscitation models.
• Laboratories – microbiology, biochemistry, and physiology.
• Clinical departments – those with which the university has signed a cooperation agreement.
• Protective equipment – lab coats, gloves, masks, caps, and disinfectants.

A lack of these resources often diminishes the effectiveness of practical instruction.

2.4.4. Pedagogical prerequisites

Teachers and mentors must prepare:

• Instructional scenarios – detailed descriptions of exercises, simulations, and the steps students are required to perform.
• Work assignments – specific tasks that the student must complete within the clinical setting.
• Individualized plans – for students with lower academic achievement or special educational needs. • Self-assessment and reflection methods – journals, portfolios, discussions.

2.4.5. Administrative prerequisites

• Official documents and agreements with institutions.
• Records and logs of practical exercises performed.
• Achievement assessment forms.
• Insurance for students during practical work.

Table 5 summarizes the principal organizational requirements for practical teaching.

Table 5. Organizational requirements for practical teaching.

Category	What does it include?	Example
Organizational	Curriculum, schedules	Agreement with a medical center
Staff	Teachers, mentors	Mentor from surgical departments
Material-technical	Cabinets, equipment, laboratories	Phantoms for practical teaching
Pedagogical	Teaching scenarios, assignments	Resuscitation simulation
Administrative	Contacts, record, insurance	Journal of practical teaching

2.4.6. Key challenges in preparation

• Insufficient number of mentors for each group of students.
• Limited material resources (shortage of manikins and simulators).
• Inadequate coordination between schools and healthcare institutions.
• Lack of a system for the standardized assessment of practical work.

2.4.7. Benefits of practical training

Practical training is a key component of education in secondary medical schools. Its benefits are multidimensional and encompass: cognitive development (knowledge and logical thinking), psychomotor development (skills and technique), affective development (attitudes, values), interprofessional collaboration, and general systemic benefits for healthcare institutions and society. Below, I elaborate on these categories, providing practical examples, suggestions for measurement, and case studies/illustrations.

2.5. Cognitive benefits (knowledge and clinical reasoning)

2.5.1. Description

Practical training enables the transformation of abstract theoretical concepts into concrete understanding and clinical reasoning. Students learn to synthesize data (medical history, clinical status, laboratory results), formulate a differential diagnosis, and plan interventions.

2.5.2. Mechanisms of development

• Contextualized learning: application of theoretical information to real patients in specific scenarios (e.g., a case of chest pain—anatomy + physiology + pathophysiology + diagnostics). • Problem-Based Learning (PBL): students solve real-life cases, which enhances analytical skills.
• Formative evaluation: feedback provided immediately after task completion (case-based discussion (CBD)).

2.5.3. Practical example

Simulation session: students are presented with a case of a "patient with acute abdominal pain"—following the simulation, they present diagnostic hypotheses and a therapeutic plan. Solutions are subsequently compared against a standards-based checklist.

How to measure

• multiple-choice questions (MCQs) / case-based questions (pre- and post-tests — assessing knowledge acquisition).
• Case-based discussion (CBD) scores.
• Correlation between theoretical results and performance at Objective Structured Clinical Examination (OSCE) stations.

2.6. Psychomotor benefits (skills and technique)

2.6.1. Description

Psychomotor skills form the core of practical training: techniques such as measuring vital signs, using medical equipment, administering therapy, inserting catheters, and performing first aid and CPR.

2.6.2. Development mechanisms

• Repetitive practice (practicing on manikins/models prior to patient contact).
• Structured exercises using checklists (ensuring all critical steps are covered).
• Observation and feedback using Direct Observation of Procedural Skills (DOPS) and the Mini-Clinical Evaluation Exercise (Mini-CEX).

2.6.3. Practical example

Prior to a simulated intramuscular injection exercise: theory (15 min), mentor demonstration (10 min), group practice (repetitions), DOPS evaluation. How to measure

• OSCE stations (Objective Structured Clinical Examination) — standardized tasks with checklists.
• DOPS — observation and assessment during an actual or simulated procedure.

• Percentage of successful first attempts in simulations or clinical settings

2.7. Affective outcomes (attitudes, ethics, and professional identity)

2.7.1. Description

Practical training shapes affective domains—empathy, professional attitude, management of stressful situations, and ethical decision-making. These aspects are essential for person-centered medicine.

2.7.2. Development mechanisms

• Working with real patients—direct experience that fosters empathy and responsibility.
• Reflection and journals—structured reflective entries where the student analyzes emotions, behavior, and learning.
• Supervised communication—role-play with simulated patients, followed by feedback.

2.7.3. Practical example

Discussion following a "bad news" case—students practice how to communicate a diagnosis and receive feedback from the team and the mentor.

How to measure

• Surveys/scales regarding professional ethics and empathy (e.g., Jefferson Scale of Empathy—adapted).
• 360° feedback (mentors, colleagues, patients).

2.8. Social and interprofessional outcomes (teamwork)

2.8.1. Description

Practical training enables learning within multidisciplinary teams—students learn about team roles and tasks, communication, and care coordination.

2.8.2. Examples

• Team-based simulation scenarios (physician + nurse + physiotherapist)—goal: coordination during resuscitation.
• Interprofessional workshops on complementary skills (e.g., patient transport training). How to measure 360° assessment, team-based OSCE, analysis of communication within scenarios.

2.9. Institutional and systemic benefits

2.9.1. Description

Well-organized practical training yields benefits for both healthcare institutions and the educational system: improved quality of healthcare services, workforce preparation, protocol enhancements, and innovation.

2.9.2. Examples

• Hospital partners gain a steady influx of trained young staff; educational institutions receive feedback regarding practical needs within clinical settings.
• Collaborative programs between schools and clinics (dual model) often facilitate a smoother transition to employment.

How to measure

Employer satisfaction assessments, employment rates after 12 months, safety metrics and incident rates before and after employment.

2.10. Benefits for patients

2.10.1. Description

Well-trained students/trainees working under supervision can contribute to improved team-based care, better patient information, and the seamless execution of procedures—all of which positively impact the quality of care and patient satisfaction.

2.10.2. Measures

• Patient feedback (satisfaction score analysis).
• Reduced waiting times through the involvement of trained support staff.

2.11. Risks, limitations, and mitigation measures

2.11.1. Potential risks

• Risk to patient safety if students work without appropriate supervision.
• Inconsistency in the quality of mentorship.
• Undue burden on clinical facilities (logistics/staffing).

2.11.2. Mitigation measures

• Simulation prior to patient contact (ensuring basic skills before practical work).
• Mentorship standards and periodic training for mentors.
• Continuous monitoring and evaluation using workplace-based assessment (WBA), OSCE, and logbooks.

Table 6 presents suggested indicators and measurement methods for practical-training outcomes.

Table 6. Suggested outcome indicators and measurement methods.

Outcome	KPI/Metric	Measurement Method
Communication Skills	Average Communication Station Score	OSCE + Patient Satisfaction Questionnaire
Clinical Skills Quality	Average OSCE Score (0–100)	OSCE using standardized checklist
Self-Confidence / Self-Efficacy	Change in Pre-/Post-Training Self-Efficacy Score	Standardized self-efficacy scale administered before and after the clinical rotation
Employment Outcomes	Percentage employed in the profession within 12 months	Graduate survey / employment registry
Teamwork	360° Assessment / Team OSCE Score	360° feedback + Team OSCE
Professionalism	Number of complaints and professional incidents	Workplace-Based Assessment (WBA) + Mentor Reports

2.12. Duration of practical training

2.12.1. National context

Practical training is an integral part of the curriculum in secondary medical schools and is conducted continuously from the second to the fourth year. It is a mandatory form of instruction, running parallel to theoretical subjects, and aims to gradually introduce students to the clinical environment. The duration varies depending on the year of study:

1st year – summer internship only, 20 days / 100 hours

2nd year – an average of 6 hours per week, focused on basic medical procedures (measuring vital signs, hygiene care, asepsis).

3rd year – an average of 10–11 hours per week, during which students acquire a wider range of manual and laboratory skills (dressing wounds, administering injections, microbiological techniques).

4th year – reaches 15 hours per week, representing the longest duration within the curriculum. These hours typically take place in healthcare facilities, with an emphasis on direct patient care under the supervision of a mentor.

Additionally, the guidelines mandate that practical training also be conducted in the form of a summer internship, lasting between 10 and 20 working days during the summer break.

2.12.2. Summer internship program

The summer internship program for 2nd-year physiotherapy technician students details the tasks and competencies that students are expected to acquire during this training. The duration is strictly defined:

• Minimum 10 days, maximum 20 days;
• 6–8 hours of practical activity per day;

The practical training takes place in physiotherapy departments, community health centers, and specialized centers.

The program requires each student to keep a practical work log, which the mentor reviews and signs. Tasks include: measuring vital signs and administering phototherapy, cryotherapy, paraffin therapy, and various massage techniques. This means that the vacation-period practical training complements regular weekly instruction and provides genuine exposure to real-world working conditions.

2.12.3. International Comparison

In most European countries, practical training lasts significantly longer:

• In Germany, students in healthcare specializations complete over 2,000 hours of practical training during their education.
• In Finland, practical training is organized in blocks of 6–10 weeks, meaning the total duration can reach 1,200–1,400 hours.
• In Slovenia, practical training amounts to 1,200 hours, including summer placements.

Compared to these standards, the Macedonian model provides between 750 and 800 hours of regular practical training plus 60–160 hours during vacation periods—totaling approximately 850–950 hours—with the possibility of expansion.

2.12.4. Benefits of the gradual increase in duration

2nd Year – Students establish a routine in basic medical procedures without becoming overwhelmed.

3rd Year – With increased instructional hours, they gradually progress to more complex procedures and laboratory analyses.

4th Year – With the highest number of hours, students gain real-world clinical exposure and the opportunity to work independently under supervision.

Summer Internship – Intensive summer training enables them to connect the knowledge they have acquired with real-life situations and to develop a sense of responsibility and professionalism.

Table 7 summarizes the duration, focus, and location of practical training across the program years.

Table 7. Practical-training duration and focus by year.

Year	Average duration	Focus on training	Location
II year	One school day (6 hours) per week	Basic medical training on procedures	Cabinets (Special classrooms for practical teaching)
III year	10 hours a week, divided into 2 days	More complex skills, learning procedures firsthand	Cabinets and different clinics, hospitals, etc
IV year	10 hours a week, divided into 2 days	Executing complex procedures	Clinics, hospitals and cabinets

Year	Average duration	Focus on training	Location
		with minimal help	
Ferial practice	100 hours, divided into 20 days	Real exposure to a hospital setting	Hospitals, clinics, and health centres

2.13. Implementation of practical training

2.13.1. Basic principles of implementation

The implementation of practical training should follow several paradigms:

• Gradual progression and phasing — moving from simulations to controlled clinical work and finally to independent clinical exposure (internship/practical placement).
• Transition from "demonstration" to "independent practice" (scaffolded learning).
• Standards and documentation — every activity must be recorded in a standardized student logbook/dossier.
• Patient safety — supervised exposure, clearly defined limits for student autonomy, and prerequisites (vaccinations, health certificates, insurance).

2.13.2. Pre-start steps (preparation for implementation)

2.13.2.1. Administrative and legal preparation

Signing cooperation agreements/memoranda between the school and clinical partners (hospitals, health centers, private facilities). The agreement defines: the number of placements, working hours, mentor responsibilities, insurance, and record-keeping methods.

Insurance and health requirements for students: requirement for a medical certificate, mandatory immunizations/check-ups, and potentially professional liability insurance — these measures are also recommended in the practical training guide/student dossier.

2.13.2.2. Student Orientation and Preparation

Orientation sessions (1–2 days) prior to each rotation: rules of conduct, code of ethics, protective equipment and hygiene, documentation (logbook/portfolio).

Short training sessions: asepsis/antisepsis, basic skills (measuring vital signs, basic procedures), use of simulators. (This is a prerequisite for direct patient contact.)

2.13.2.3. Preparation of Mentors/Teaching Staff

Mentor training: expected roles (observation, instruction, evaluation), use of rubrics and checklists, providing constructive feedback. The guidelines emphasize the roles of the teacher and mentor, as well as their obligation to maintain student records.

2.13.3. Implementation Models

The guidelines provide for various settings: school classrooms/training rooms, laboratories, partner workplaces, and summer/intensive practical training. Implementation should combine:

• Simulation phase (school classrooms/training rooms).
• Controlled clinical rotation (supervised work in hospital wards/departments).
• Summer/intensive practical training (10–20 days; real-world conditions in accordance with the curriculum).

Scheduling principle: theoretical preparation must always precede practical sessions, and a brief reflection/debriefing with the mentor must follow every clinical activity.

2.13.4. Records and documents (mandatory forms)

• Student logbook / practical training logbook

Standardized forms where the student records: date, location, task, duration, mentor's signature, and a reflective entry. The logbook is mandatory and becomes part of the student's file/portfolio upon completion.

• Student file (portfolio)

The practical training instructor maintains a file for each student—including logbooks, verified activities, and formative and summative evaluations. The student file serves as the basis for decisions regarding progression to the next year.

• Evaluation forms

Standard rubrics for basic procedures (OSCE/DOPS checklists), a 360° feedback form, and minimum requirements for practical training confirmations.

2.13.5. Instructional activities — strategy by level

2nd Year (introductory/basic practice)

Format: short sessions (2–3 hours/week), simulations, demonstrations.

Objectives: hygiene, aseptic techniques, measuring vital signs, basic patient communication.

3rd Year (transition to clinical setting)

Format: longer and more frequent sessions (5–7 hours/week), a mix of simulations and clinical rotations.

Objectives: DOPS-appropriate procedures (injections, dressings), laboratory skills, initiation of WBA observations. Year 4 (clinical proficiency)

Format: intensive clinical rotations (10–11 hours/week), focusing on independent and team-based work under supervision.

Objectives: integrated clinical tasks, application of knowledge in real-world practice, preparation for employment.

Summer internship (10–20 days)

Intensive exposure to and integration of all program modules: administrative intake, hygiene protocols, application of physical agents, massage, and other procedures; mandatory maintenance and signing of a logbook.

2.13.6. Supervision, roles, and responsibilities

2.13.6.1. Teacher-coordinator (school)

Organizes the schedule, maintains student records, coordinates contact with clinical sites, and manages administrative procedures (contracts, insurance, notifications).

2.13.6.2. Clinical mentor

Supervises, demonstrates, and evaluates; signs logbooks; provides formative and summative feedback; has the authority to halt the independent performance of high-risk procedures. Guidelines clearly state that the mentor is responsible for recording and monitoring student achievements.

2.13.6.3. Student responsibilities

Timely completion of the logbook, adherence to ethical and hygiene standards, and seeking supervision for uncertain or high-risk procedures. Proof of completed summer internship (certificate) is a mandatory requirement for continuing education.

2.14. Ongoing evaluation (formative and summative)

2.14.1. Forms of evaluation

• Ongoing observation (WBA): Mini-CEX, DOPS — records are kept and included in the trainee's portfolio.
• Logbook/portfolio: reflective entries, signatures, and confirmations.
• Practical exam / OSCE: summative assessment of key skills (suggested timing: end of Year 3 and second half of Year 4).
• Internship/placement assessment: the mentor/employer completes a report and confirmation; the internship is not graded numerically, but the confirmation is a prerequisite for progression/enrollment in the next academic year.

Rubrics and checklists (example)

• Rubric — Intramuscular injection (10 points)
• Preparation of materials (2) — complete/partial/none.
• Aseptic technique (2).
• Injection technique (4).
• Patient instructions and communication (2). "Pass" threshold = ≥ 7/10. (This is an example rubric for standards and validation of a DOPS checklist.)

2.15. Safety, ethics, and patient rights

Before any clinical activity, the student must have a clearly defined role and an assigned supervisor. For high-risk procedures, the student may participate only after receiving prior authorization using an Entrustable Professional Activities (EPA) approach.

All activities must comply with confidentiality rules, codes of ethics, and local hospital protocols.

2.16. Practical templates

Daily log entry (columns)

Date | Location | Task/Procedure | Time (hrs) | Mentor (name) | Signature | Reflection (2–3 sentences)

Student clinical check-in checklist (orientation)

Medical certificate submitted (yes/no)

Immunizations/preventive measures verified (yes/no)

Protective equipment prepared (yes/no)

Consent form/code of conduct signed (yes/no)

Common implementation issues and practical solutions

Problem: Overcrowded groups → Solution: rotating schedule, using private-sector partners for some practical exercises.

Problem: Inconsistent record-keeping (incomplete logs) → Solution: electronic logbook with reminders and mandatory signatures.

Problem: Unreliable mentors → Solution: strategic training programs and an incentive system (certificates, commendations).

2.17. Methods in practical instruction

Teaching methods are essential elements in the delivery of practical training in secondary medical schools. A "method" is understood as a systematic way of organizing and conducting instructional

activities, through which the teacher and mentor guide the student from being a passive observer to an active performer of medical procedures. The choice of methods depends on:

the students' age and prior knowledge,

the objectives of the teaching module,

technical and material resources,

availability of a real clinical environment.

2.17.1. Classification of Methods

The following methods are most commonly used:

Demonstration-Illustration Method

The teacher or mentor performs the procedure (e.g., bandaging, injection, physiotherapy procedure) while explaining each step, and the students observe.

Benefits: Students gain a clear visual model.

Drawbacks: Students act as passive observers.

Hands-on Practice Method

Students perform the procedure independently—initially on a simulator or model, and subsequently in a real clinical setting under supervision.

Benefits: Develops motor skills and confidence.

Drawbacks: Requires time, materials, and careful supervision.

Simulation Method

Utilizes simulators, phantoms, virtual technologies, and case study scenarios.

The practical training program emphasizes that these methods are particularly important during the second year, when students lack sufficient experience for direct patient care.

Clinical Rotation Method

Students are assigned to hospital wards, where they observe and perform procedures daily under the supervision of a mentor.

This method is most prevalent in the fourth year, when practical training can reach up to 15 hours per week. Problem-Based Learning (PBL) method

Students are presented with a specific clinical case (e.g., a patient with hypertension) and independently propose diagnostic and therapeutic steps under the guidance of an expert instructor.

Research-based learning method

Students conduct mini-research projects: keeping logs, analyzing patient data, or comparing methods.

2.17.2. Modern methods in medical practice

OSCE (Objective Structured Clinical Examination) – simulated stations featuring a standardized patient and a standardized set of tasks.

DOPS – the instructor directly observes and evaluates the procedure.

e-Learning and blended learning – combining online resources and simulations with hands-on practice.

Interprofessional learning – joint practice with students from other medical disciplines (pharmacy, physiotherapy, laboratory science).

2.18. Techniques in practical instruction

While methods represent broader approaches to the implementation of instruction, techniques are specific procedures, steps, or "tools" used by the teacher, mentor, and student to carry out practical activities. In medical education, techniques are of essential importance, as they provide the link between theoretical knowledge and its actual application in a clinical setting.

2.18.1. Basic Instructional Techniques

Step-by-Step Demonstration Technique

• The teacher performs the procedure, clearly explaining each step.
• Students observe and take notes in a logbook simultaneously.
• Used in the second year for basic activities (e.g., measuring blood pressure, patient hygiene).

Imitation and Repetition Technique

• Following the demonstration, the student repeats the procedure—first on a simulator, and subsequently on a real patient under supervision.
• E.g., administering an intramuscular injection or setting up an IV infusion.

Modeling and Scenario-Based Technique

• Simulators and models are used for clinical cases (case-based scenarios).
• Students work through a scenario: "A patient with difficulty breathing—what steps should be taken next?"

Discussion and Reflection Technique

• Each practical activity is followed by a brief discussion.
• Students articulate what they have learned, the challenges they encountered, and what they might do differently.

2.18.2. Specific Medical Techniques

These are concrete medical procedures covered in practical training, which students must master:

• Measurement of vital signs – blood pressure, pulse, respiration, temperature.
• Patient care and nutrition.
• Aseptic techniques – sterile preparation of materials, surgical hand-washing.
• Administration of medication – intramuscular, subcutaneous, and intradermal injections.
• Wound dressing and treatment – using sterile kits and materials.
• Laboratory techniques – sample preparation, microscopy.
• Physiotherapy techniques: phototherapy, cryotherapy, paraffin therapy, manual and mechanical massage.

2.18.3. Modern Teaching Techniques

• OSCE (Objective Structured Clinical Examination): the student moves through stations, each involving specific tasks.
• DOPS: the mentor directly evaluates the technique performed by the student.
• Video feedback technique: recording the performance, followed by analysis and correction.
• Checklist technique: using a standardized list of steps for a procedure (e.g., administering an injection).

Table 8 distinguishes broad teaching methods from specific instructional techniques.

Table 8. Distinction between teaching methods and techniques.

Term	Definition	Example
Method	A broad approach to teaching implementation	Clinical rotation
Technique	A particular way or procedure	Intramuscular injection

2.19. Strategies for efficient and effective practical training

According to the Guidelines for Practical Training issued by the Center for Vocational Education and Training [4], practical training is an integral part of the educational process and is implemented during the second, third, and fourth years of study. It consists of 2 to 11 hours per week, depending on the specific track and subject. Organization involves the development of an annual plan, a class schedule, and cooperation agreements with healthcare institutions. This model ensures a gradual introduction for students: starting from simulated conditions in school classrooms, moving through controlled work in laboratories, and progressing to direct contact with patients in hospitals and clinics.

In European countries such as Germany and Austria, the "dual model" prevails, where the week is divided between school (theory) and a healthcare institution (practice). In these systems, students spend approximately 50% of their time in practical training, which is considered optimal for healthcare-related profiles. In Finland, practical training is modular—each module lasts 6–10 weeks and focuses on a specific professional area (e.g., elderly care, physiotherapy, or surgical care).

Effective organization allows for an even distribution of practical work, helps prevent student overload, and ensures continuity in learning. However, the most common challenge in Macedonia is the limited number of clinical training sites and insufficient coordination between schools and healthcare institutions. This often results in overcrowding within groups, which reduces the effectiveness of instruction.

2.19.1. Strategy for Staff Readiness

The Guidelines emphasize that practical training cannot be implemented without trained teachers and clinical mentors. Teachers act as organizers, while mentors from the institutions (nurses, physiotherapists, physicians) serve as direct supervisors. The practical training program requires the presence of a professional mentor for every group of students; this mentor signs the logbook documenting the activities performed.

In Finland and the Netherlands, mentors are required to complete courses in pedagogical skills before they begin working with students. In the United Kingdom, there is the concept of a "clinical educator"—a healthcare professional with specialized certification for educating students.

In Macedonia, the challenges include a shortage of mentors with pedagogical experience, an excessive number of students per mentor (sometimes 10–15), and the absence of a system for rewards or recognition. It is recommended to establish a continuous education program and provide incentives for mentors.

2.19.2. Strategy for Material and Technical Support

The Guidelines stipulate that every medical school must have well-equipped classrooms and laboratories, including resuscitation manikins, injection training models, and microbiology and biochemistry laboratories. The work-based learning program [5], [6] identifies a need for equipment for phototherapy, cryotherapy, paraffin therapy, and massage.

In Norway and Denmark, every school has a simulation center that includes a fully equipped hospital room with real equipment. There, students can practice using realistic scenarios before interacting with patients.

Table 9 summarizes the phases of practical education, settings, equipment, and typical assignments.

Table 9. Phases of practical education and required equipment.

Phase	Location	Needed equipment	Types of assignments
I. Simulation	Cabinet	Phantoms, pressure devices	Using theoretical knowledge to learn everyday medical procedures

Phase	Location	Needed equipment	Types of assignments
II. Controlled practice	Clinic under the close mentorship of a teacher	Sterile instruments, help of a nurse/practitioner	Being a small part of everyday medical procedures, learning under a mentor
III. Ferial practice	A real uncontrolled environment	Sterile instruments	Execute everyday medical procedures without help

2.19.3. Pedagogical Methodology Strategy

The guidelines require students to maintain a practical training logbook in which all activities are recorded. Within the curriculum, each exercise is structured with a specific objective, tasks, and an expected outcome. In Canada and Australia, the OSCE (Objective Structured Clinical Examination) is used to assess clinical skills, while in the USA, electronic logbooks and portfolios are utilized. These approaches foster critical thinking, self-assessment, and objectivity in evaluation.

2.19.4. Evaluation and Monitoring Strategy

The guidelines stipulate assessment through logbooks, questioning, and practical examinations. Modern methods include the OSCE, DOPS, and 360° feedback. In Macedonia, a primary challenge is that assessment is often subjective. A solution lies in the introduction of standardized rubrics and the involvement of multiple evaluators.

2.19.5. Strategy for Integrating Clinical Placement (Internship)

Clinical placement provides authentic clinical exposure. The curriculum defines tasks by module, such as measuring vital signs, massage, and the application of physical agents. To ensure effectiveness, a combination of a logbook and a competency rubric is used. In many European countries, completing a clinical placement is a mandatory requirement for obtaining a diploma.

2.19.6. Integrated Strategies for Effectiveness

• Resource optimization – utilizing simulations prior to patient interaction.
• Coordination between educational institutions and clinical settings – establishing joint committees. • Electronic visualization – electronic logbooks, applications for tracking competencies.
• Continuous improvement – annual reports, key performance indicator (KPI) analysis (OSCE average, percentage of successfully completed practical exercises, employment rate).

2.20. Planning practical instruction

Planning practical instruction is a fundamental prerequisite for its successful implementation. It is a process of systematically organizing objectives, content, methods, techniques, locations for implementation, and assessment methods. In secondary medical schools, planning is regulated through curricula and syllabi.

2.20.1. Levels of Planning

Annual Planning

The teacher develops an annual plan for practical instruction, which specifies:

• the number of hours per week,
• thematic units,
• locations for implementation (school classrooms/labs, laboratories, hospitals, centers),
• the methods and techniques to be applied.

This plan must be aligned with the curriculum and syllabus approved by the Ministry of Education and Science.

Thematic Planning

This refers to the scheduling of specific instructional topics (for example: "Asepsis and Antisepsis," "Measuring Vital Signs," "Application Techniques").

• It encompasses clearly defined objectives, expected outcomes, and duration. • For each topic, specific methods (demonstration, practical exercise, simulation) and required materials are determined.

Weekly and Daily Planning

The teacher prepares detailed daily lesson plans for each session, which include:

• an introductory part (orientation and theoretical preparation),
• demonstration and execution of the technique,
• practice by the students,
• reflection and assessment.

2.20.2. Elements of Planning

According to the Guidelines for Practical Training, planning must include the following elements:

• Objectives: cognitive, psychomotor, and affective (development of knowledge, skills, and attitudes).
• Content: topics and subtopics covering specific medical procedures.
• Methods and techniques: selection of appropriate teaching approaches.
• Organizational formats: individual, group, or team work.
• Resources: medical equipment, simulators, laboratories, partner clinical sites.
• Evaluation: criteria for formative and summative assessment.

2.20.3. Integration with Clinical Internship (Ferial Practice)

Planning extends beyond regular weekly instruction. It also includes:

- a schedule for the clinical internship (10–20 days, 6–8 hours per day);
- the placement of students in healthcare institutions; -defining tasks (for example: in the 2nd year – measuring vital signs and basic hygiene;
-in the 4th year – applying physical procedures, massage, working with patients).

2.20.4. The role of the teacher and the mentor in planning

• The teacher prepares plans, organizes training, aligns objectives with the curriculum, and provides resources.
• The mentor in the clinical setting implements the plan, monitors the student's progress, and completes evaluation documentation.

Collaboration between the teacher and the mentor is a prerequisite for successful implementation.

Table 10 provides examples of practical-training topics and their instructional objectives.

Table 10. Example practical-training topics and objectives.

Topic	Objectives
Asepsis and antisepsis	Development of hygiene and sterility habits
Measuring vital parameters	Mastering basic techniques
Injection techniques	Development of motor skills and knowledge
Massage and physiotherapy	Advancing clinical knowledge and motor skills

2.21. Recording, monitoring, and evaluation

2.21.1. Recording

Student Logbook

Each student is required to maintain a logbook in which the following are recorded: date, location, type of activity, number of hours, and the mentor’s signature.

The logbook serves as evidence of the activities performed and is a prerequisite for the verification of practical training.

The Program for Vacation/Summer Internship specifies that a student cannot receive credit for the internship without a verified logbook.

Student File (Portfolio)

The teacher maintains a file for each student, containing: logbooks, records of hours, evaluation sheets, reports from mentors, and certificates of internship completion.

The file is kept at the school and constitutes an official document.

Electronic Recording

A contemporary trend involves the introduction of electronic logbooks and portfolios.

Benefits:

• reduction of administrative errors,
• transparency for the student, teacher, and institution,
• easier tracking of quality indicators.

2.21.2. Monitoring

Monitoring is a continuous process of tracking student achievements and the quality of instruction.

Role of the Teacher

• verifies that logbooks are filled out regularly,
• attends practical activities,
• provides formative feedback. Role of the Mentor
• directly observes the performance of procedures (e.g., injections, dressing changes),
• completes evaluation forms,
• approves activities recorded in the logbook.

Monitoring Indicators

• hours completed according to the plan,
• number and type of procedures mastered,
• quality of performance (based on rubrics),
• discipline and conduct in the clinical environment.

2.21.3. Assessment

Assessment (evaluation) is the final phase, but also a continuous process that takes place throughout the entire training period.

Formative Assessment

• ongoing monitoring and evaluation of skills,
• real-time feedback,
• motivation and guidance for improvement.

Summative Assessment

• final evaluation of achievements,
• includes practical examinations (OSCE), final evaluations by mentors, and results from logbooks.

Assessment Criteria

• Quantitative: number of hours, number of procedures performed, number of tasks completed.
• Qualitative: accuracy of technique, adherence to ethical standards, communication with the patient, level of autonomy.

Table 11 summarizes instruments used for recording, monitoring, and assessment.

Table 11. Recording, monitoring, and assessment instruments.

Element	Instrument	Frequency
Logging	Student journal	Everyday
Tracking	Monitoring forms and reports	Non-stop
Valuation	Practical example	At the end of the module

2.21.4. Problems and Recommendations

Problem: Incomplete logs → Solution: Mandatory weekly checks.

Problem: Insufficient transparency → Solution: Electronic portfolio.

Problem: Subjectivity in assessment → Solution: Standardized rubrics and OSCE.

2.22. Effectiveness of practical training

The effectiveness of practical training serves as a measure of how successfully the educational process in secondary medical schools achieves its established goals and standards. It is not limited merely to the completion of the prescribed number of hours, but also encompasses:

The degree to which knowledge and skills are acquired,

The development of professional attitudes,

The quality of procedures performed,

The level of satisfaction among students and mentors,

Alignment with national standards and international practices.

2.22.1. Key Aspects of Effectiveness

Pedagogical Aspect

Teaching effectiveness depends on whether the educational content is adapted to the students' age, prior knowledge, and psychophysical capabilities.

In the 2nd year, effectiveness is measured by the acquisition of basic medical techniques (measuring vital signs, aseptic technique).

In the 3rd year, it is measured by the mastery of more complex procedures (dressings, laboratory analyses).

In the 4th year, the criterion is the ability to work independently and responsibly with patients. Professional Aspect

Students must demonstrate competence in:

psychomotor skills (precise execution of procedures),

cognitive skills (theoretical grounding and critical thinking),

affective skills (ethics, empathy, communication).

Organizational Aspect

Effectiveness depends on how well the school and clinical institutions provide:

an adequate number of mentors,

modern facilities and equipment,

an optimal schedule of classes and rotations.

Societal Aspect

Practical training is effective only if it results in competent healthcare professionals who meet the needs of the healthcare system and the expectations of the community.

2.22.2. Indicators of Effectiveness

Cognitive Indicators

percentage of correct answers to theoretical questions;

success in resolving clinical scenarios (PBL).

Psychomotor Indicators

accuracy in administering therapy,

use of sterile technique during dressing changes,

correct application of physiotherapeutic procedures (phototherapy, cryotherapy, massage).

Affective Indicators

interaction with patients,

adherence to a code of conduct,

ability to work in a team.

Organizational Indicators

classes conducted according to the annual plan,

number of successfully completed clinical placements (internships),

proper maintenance of logs and records.

2.22.3. Methods for Measuring Effectiveness

Formative methods: ongoing observation, keeping logs/diaries, reflection.

Summative methods: OSCE (Objective Structured Clinical Examination), DOPS, final practical examinations.

Subjective methods: surveys and interviews regarding the satisfaction of students and mentors.

Documentary methods: analysis of records, portfolios, and reports on clinical/practical training.

2.22.4. Factors that Increase or Decrease Effectiveness

Positive factors

good planning (annual and thematic),

small groups of students during clinical rotations,

use of simulators for preparation,

engaged and motivated mentors,

integrated cooperation between schools and healthcare institutions.

Negative factors

lack of equipment and space,

overcrowded groups,

mismatch between plans and actual conditions,

insufficient preparedness of the teaching staff.

2.23. Efficiency in the practical-training workflow

While effectiveness measures the achievement of goals, efficiency refers to the manner in which those goals are achieved through the optimal use of resources: time, personnel, space, and equipment. In the context of practical training in secondary medical schools, efficiency entails:

• maximizing the utilization of instructional hours;

• rational allocation of mentors and students;
• functional use of medical equipment and simulators;
• organization of the process with minimal waste.

In other words, effectiveness addresses the question, "Have we achieved our goals?" whereas efficiency addresses, "With what resources—and in what manner—have we achieved them?"

2.23.1. Efficiency Indicators

Time Efficiency

• Percentage of hours actually conducted versus those planned;
• Ratio of time spent on theory versus practice;
• Timely commencement and conclusion of rotations.

Spatial and Organizational Efficiency

• Rational use of school classrooms and laboratories;
• Optimal student-to-mentor ratio (target: ≤ 6:1);
• Reduction of downtime caused by equipment shortages.

Financial Efficiency

• Ratio between the costs of practical training (equipment, consumables, transport) and the outcomes;
• Use of simulators to reduce costs compared to repeated procedures performed on patients.

Pedagogical Efficiency

• Minimal time required to achieve maximum results;
• A combination of methods that facilitates the faster acquisition of competencies (simulation + clinical practice);
• Formative assessment, which reduces the need for subsequent corrections.

2.23.2. Factors Enhancing Efficiency

• Effective planning – annual and thematic plans with precise objectives.

• Student grouping – optimal group size to avoid wasting time and resources.

• Modern technologies – the use of simulation laboratories and digital logbooks.

• Trained mentors – capable of providing prompt guidance and corrections.

• Practical training (internships) – a concentrated format that allows for the intensive mastery of tasks within a short period.

2.23.3. Obstacles to Efficiency

• An insufficient number of mentors in clinical practice settings.
• Overcrowded student groups (10–15 students per mentor).
• A lack of modern equipment and simulators.
• Poor coordination between schools and healthcare institutions.
• Insufficient student motivation (indiscipline, failure to keep logbooks up to date).

2.23.4. Methods for Measuring Efficiency

• Resource analysis – comparing the number of teachers/mentors to the number of students.
• Time analysis – the percentage of hours lost due to organizational issues.

2.23.5. Key performance indicators (KPIs):

• Hours delivered / Hours planned (target: ≥ 95%); • Students / Mentor (target: ≤ 6:1);
• Cost per student for practical training / achieved result;
• Percentage of students who acquired competencies within the designated timeframe.

3. Materials and Methods

3.1. Study design and methodological approach

A combination of theoretical and empirical methods was employed in the preparation of this paper.

• Theoretical methods: analysis and synthesis of professional literature and didactic sources [7], [8], [9], curricula, and national and European documents; comparative analysis of various models of practical instruction.
• Empirical methods: surveys and interviews with students, teachers, and mentors. • Observation of the implementation of practical training in school and clinical settings.
• Methods of analysis: qualitative and quantitative data processing, presented through tables and charts.

This methodology enables a comprehensive analysis and the formulation of strategies for more efficient and effective practical training.

3.2. Study setting and data sources

The empirical component incorporates data from practical training conducted at the “Dr. Panche Karagjozov” Secondary Medical School (Dr. Panche Karagjozov Secondary Medical School (SMUGS)) in Skopje, within the healthcare vocational stream (nursing program).

The empirical analysis presents and analyzes data collected through curricula (2021–2026), work-based learning programs (at employer sites) and practical training, surveys involving students and teachers from the "Dr. Panche Karagjozov" Secondary Medical School (healthcare stream, nursing program), and observations of the practical training process. The data are used to test hypotheses and provide recommendations.

3.3. Data analysis and presentation

The source manuscript reports qualitative and quantitative processing of curriculum data, practical-training records, survey responses, interviews, and observations. Quantitative findings are presented descriptively through hours and percentages; no inferential statistical analysis is reported.

4. Results

4.1. Duration of practical training

Total practical training hours (cumulative for years I–IV): 1,422 hours.

Table 12 summarizes the distribution of practical-training hours across the four program years.

Table 12. Distribution of practical-training hours by grade.

Grade	Cabinet studies (h)	Clinical studies (h)	Learning through work (h)	Ferial practice (h)	Total (h)
I	/	/	/	100	100
II	216	/	/	100	316
III	/	252	144	100	496
IV	/	306	204	/	510

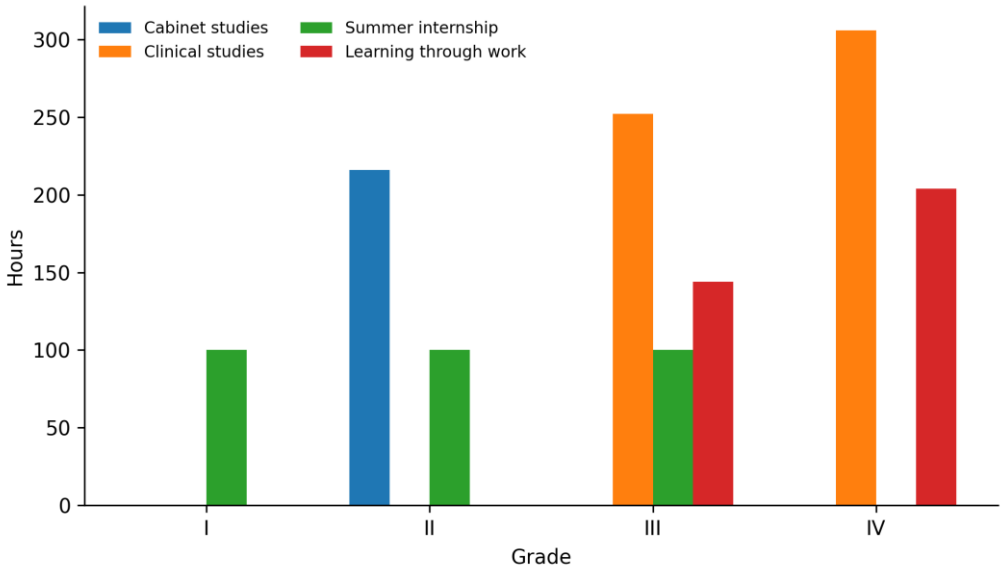


Figure 1. Distribution of practical-training hours by grade.

The duration of practical training is well distributed across the academic years, with a sufficient number of instructional hours delivered throughout the program. The structure is designed to effectively support student development, ensuring a strong correlation between clinical instruction and work-based learning with employers.

4.2. Student perceptions

Student responses are summarized in Table 13. The original manuscript presented each item as both a small table and a pie chart; the duplicated displays have been consolidated here to preserve the reported percentages without redundant graphics.

Table 13. Student perceptions of practical training.

Survey item	Yes (%)	No (%)	Partly (%)
Practical training is key	85	5	10
The equipment is sufficient	28	62	10
The number of mentees per mentor is optimal	32	48	20
Summer internship is very useful	71	9	20

Importance of practical training.

The results indicate that 85% of the students consider practical training to be crucial in medical education. The students' recognition of the importance of practical training is highly significant for the complete and effective delivery of instruction.

Availability of equipment.

Regarding the equipment and materials available for the educational process, it can be concluded that there is a shortage. There is a need for the continuous renewal of educational materials and resources, in terms of both quality and quantity. The economic aspect plays a significant role in the teaching process—manifesting as this lack of working materials—and presents a constant challenge in the delivery of instruction.

Student-to-mentor ratio.

Given that there are 10–12 students per mentor, it is impossible—in a real-world clinical setting—to carry out any procedure where the mentor can work with the entire group simultaneously. This necessitates that the mentor divide the group and, at any given time, work individually with a smaller

number of students. It can be concluded that the size of the student group per mentor poses a challenge for the mentor regarding the organization and continuity of the students' education.

Summer internship.

Practical training is beneficial as it allows students to participate continuously in the work process. It involves them in teamwork and helps them develop skills related to communication, understanding organizational hierarchy, and assuming responsibility, while also enabling them to gain experience. According to a survey, 71% of students agree that practical training is extremely useful; for the 20% who expressed a more qualified opinion, the reasons for their perspective lie within the specific institution where they completed their training. The challenge remains in securing suitable institutions for all students to undertake their practical training—a task that largely depends on the availability of such placements in relation to where the students live.

4.3. Teacher and mentor perceptions

Teacher and mentor responses are summarized in Table 14. As with the student survey, duplicate pie charts and item-level tables have been consolidated into one analytical table.

Table 14. Teacher and mentor perceptions of curriculum and mentoring conditions.

Survey item	Agree (%)	Disagree (%)	Partly agree (%)
The curriculum is appropriate	90	5	5
More training is needed for mentors	76	12	12
The number of mentees per mentor is optimal	30	68	2

Curriculum appropriateness.

Regarding the curriculum, it can be concluded that the vast majority agree it is appropriate, thoroughly thought out, and yields the expected results.

Need for mentor training.

Continuous training for mentors is necessary; 76% of respondents agree on the need for this type of ongoing education for mentors. Training and the continuous professional development of mentors directly impact the quality of the educational process.

Student-to-mentor ratio.

There is a discrepancy between the actual number of students and the optimal number; as previously discussed, this type of instruction requires each mentor to work with a smaller group of students—especially when training takes place within healthcare facilities under real-world conditions. Therefore, collaboration between the instructor-mentor and the mentors at the healthcare facility is crucial for enhancing the effectiveness of the instruction.

5. Discussion

The analysis shows a continuous increase in practical training hours from the second to the fourth year, facilitating the progressive acquisition of skills. Survey data indicate that students highly value practical training (85%); however, they also report significant issues regarding equipment (62% state that equipment is insufficient) and the number of students per mentor (48% consider this number to be too high).

While teachers generally view the curriculum structure as appropriate (90%), they highlight a need for additional mentor training (76%). These findings underscore the necessity for strategic interventions: reducing the student-to-mentor ratio, investing in equipment, and introducing evaluation standards (OSCE/DOPS).

6. Conclusion and Recommendations

Practical training in secondary medical schools serves as a cornerstone of medical education, enabling the acquisition of the knowledge, skills, and attitudes essential for the professional and responsible performance of healthcare activities. It provides practical preparation that complements and expands upon theoretical knowledge, transforming students from passive recipients of information into active participants in the educational process—and, ultimately, in the healthcare system.

Research indicates that practical training is well-structured and continuous, with a gradual increase in hours from the second to the fourth year, alongside a significant role for clinical practice during school breaks. This progressive approach is beneficial, as it facilitates a gradual introduction to clinical practice and helps build professional confidence. A large number of students recognize the importance of practical training, viewing it as the foundation of their professional readiness. Teachers and mentors also acknowledge its vital role, yet they point to a range of challenges that diminish its effectiveness. Among the most significant weaknesses identified in the research are:

a lack of modern equipment and simulators for performing procedures,

an excessive number of students per mentor (sometimes 10–12 per instructor),

limited resources and spatial constraints within healthcare facilities,

insufficient alignment of the curriculum with modern medical technologies.

These shortcomings diminish the quality of practical training and limit the students' ability to gain sufficient confidence and competence before entering the actual healthcare system. In the European context, countries such as Germany, Finland, and Slovenia apply higher standards, including OSCE assessments, electronic portfolios, and mandatory simulation laboratories. This demonstrates that the modernization and standardization of practical training are not merely desirable, but essential for ensuring the competitiveness and mobility of medical personnel.

We conclude that the efficiency and effectiveness of practical training in Macedonian medical schools could be significantly improved if the following measures are taken:

1. Reducing the student-to-mentor ratio (to no more than 6:1) to ensure higher-quality supervision.

2. Investing in equipment and simulation facilities, which would allow for safe preparation prior to working with patients.

3. Introduction of OSCE and DOPS as a standard component of practical skills assessment.

4. Continuous training for teachers and mentors, ensuring they stay abreast of modern trends and apply innovative teaching methods.

5. Digitization of records through electronic registers and portfolios, thereby ensuring transparency and systematic organization.

6. Enhanced cooperation between schools and healthcare institutions to provide better conditions for the implementation of practical training.

By implementing these strategies, practical training can be aligned with European educational standards, producing generations of medical professionals prepared for the contemporary challenges of the healthcare sector.

Ultimately, it can be concluded that the topic of strategies for efficient and effective practical training is not merely a theoretical or academic discussion, but a societal investment in the health, safety, and well-being of citizens. Investing in high-quality practical training is an investment in the future of the healthcare system and the quality of life for the entire community.

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