

# Postgraduate Diploma

Clinical Cerebral and Vascular  
Ultrasound in Emergency and  
Critical Care for Nursing





## Postgraduate Diploma

### Clinical Cerebral and Vascular Ultrasound in Emergency and Critical Care for Nursing

- » Modality: online
- » Duration: 6 months
- » Certificate: TECH Global University
- » Accreditation: 18 ECTS
- » Schedule: at your own pace
- » Tests: online

Website: [www.techtute.com/us/nursing/postgraduate-diploma/postgraduate-diploma-clinical-cerebral-vascular-ultrasound-emergency-critical-care-nursing](http://www.techtute.com/us/nursing/postgraduate-diploma/postgraduate-diploma-clinical-cerebral-vascular-ultrasound-emergency-critical-care-nursing)

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# 01

# Introduction

Therapeutic guidelines for cerebral conditions have reached a new level of case-specific precision thanks to techniques such as ultrasound. However, as these techniques have evolved, so too has their complexity—making continuous professional development essential for healthcare providers. This program offers a unique opportunity for nursing professionals to refine their skills in the use of ultrasound devices for managing challenging cerebral and vascular conditions. This expertise is particularly valuable when treating patients in Emergency situations or those requiring Critical Care. Through this 100% online program, students will enhance their careers while gaining advanced, practice-oriented knowledge.





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*All the latest advances in clinical cerebral and vascular ultrasound at your fingertips with this Postgraduate Diploma”*

Transcranial ultrasound plays a key role in evaluating the presence of intracranial pathologies such as hematomas, cerebral edema, and hydrocephalus, among others. It is also highly valuable for assessing cerebral blood flow in real time and for measuring vascular resistance indices. Without a doubt, this technique is extremely useful for monitoring patients with traumatic brain injuries or cerebrovascular diseases.

In this context, Cerebral and Vascular Ultrasound provides immediate and valuable information that supports clinical decision-making in critical care settings. Given its relevance, continuing education in this field is essential. This academic program offers nurses the ideal opportunity to strengthen their skills through high-level, practice-based instruction in the detection of structural abnormalities in the brain and vascular system.

Throughout the Postgraduate Diploma, participants will explore essential topics such as cerebral hemodynamics and the special diagnostic tests available across different ultrasound modalities. The program also focuses oninsonation techniques and the analysis of normal flow curves and velocities.

All of this will be available to students with full academic assurance, requiring only an Internet connection to access the lessons and a wide range of advanced supplementary materials designed to support ongoing academic progress.

This **Postgraduate Diploma in Clinical Cerebral and Vascular Ultrasound in Emergency and Critical Care for Nursing** contains the most complete and up-to-date scientific program on the market. The most important features include:

- ♦ The development of practical case studies presented by experts in Clinical Cerebral and Vascular Ultrasound
- ♦ The graphic, schematic and eminently practical contents with which it is conceived gather scientific and practical information on those disciplines that are indispensable for professional practice
- ♦ Practical exercises where the self-assessment process can be carried out to improve learning
- ♦ Its special emphasis on innovative methodologies
- ♦ Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- ♦ Content that is accessible from any fixed or portable device with an Internet connection



*You will update your knowledge on echo formation and ultrasound emission within the ultrasound imaging sequence”*

“

*You will also explore essential elements of echonavigation, such as transducer movement, which will take your ultrasound technique to the next level”*

The program's teaching staff includes professionals from the field who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to learn in real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise during the course. For this purpose, students will be assisted by an innovative interactive video system created by renowned experts.

*If you are seeking a qualification to update your knowledge of the supra-aortic trunks, this Postgraduate Diploma will enable you to analyze in detail their venous and arterial vascular anatomy.*

*It is the perfect opportunity to master various hemodynamic alterations, with a focus on Hyperdynamic and Hypodynamic conditions.*



# 02 Objectives

Given the demanding professional activity of nurses, it is essential that qualifications designed to elevate their practice offer flexibility. For this reason, TECH has developed a Clinical Cerebral and Vascular Ultrasound program that is fully compatible with work commitments, aiming to provide advanced training for healthcare professionals in just six months. During this academic period, you will benefit from the most comprehensive perspective available in the field.







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*TECH's goal aligns with yours:  
to train nurses with broad  
competencies in cerebral and  
vascular ultrasound techniques”*

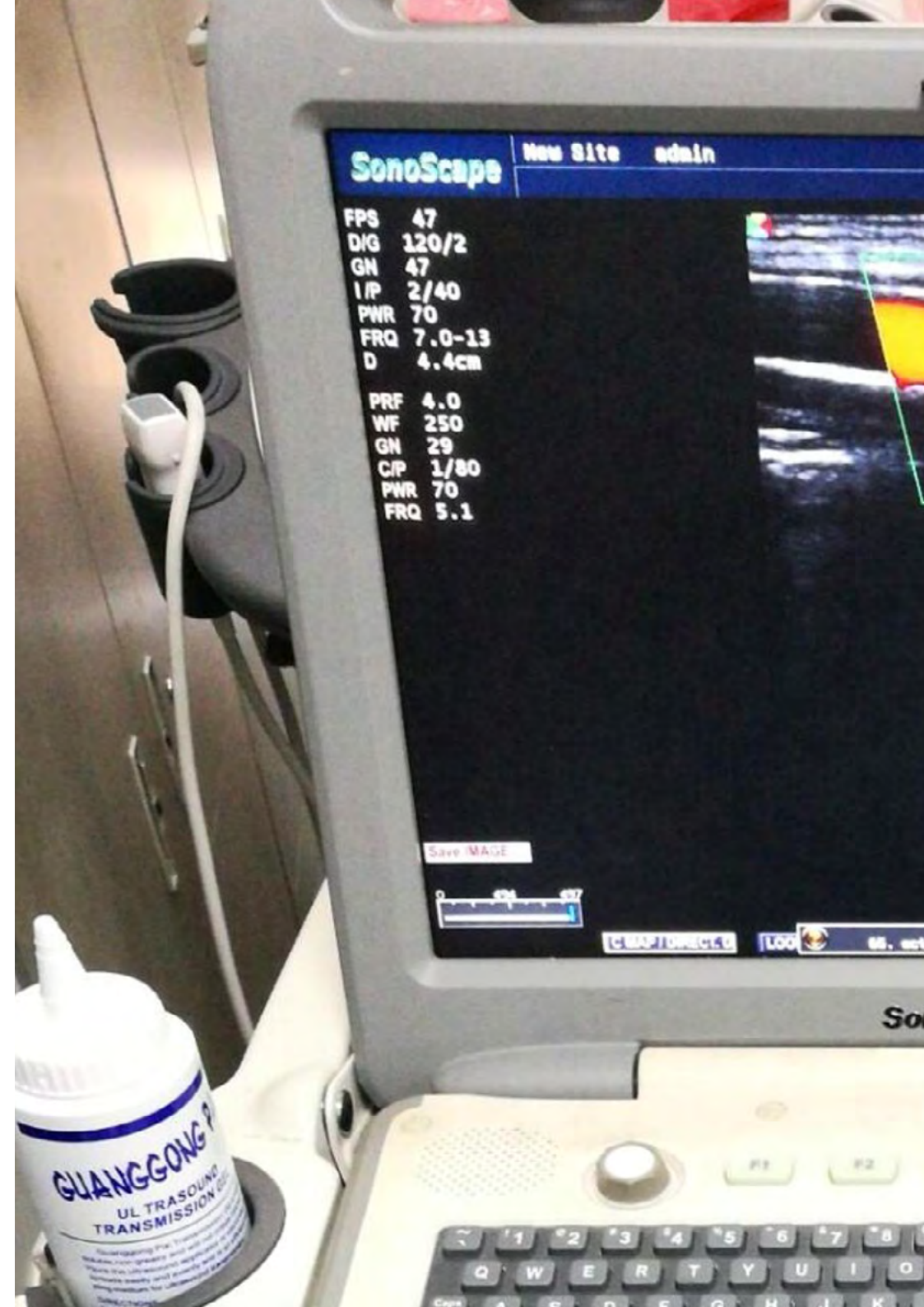


## General Objectives

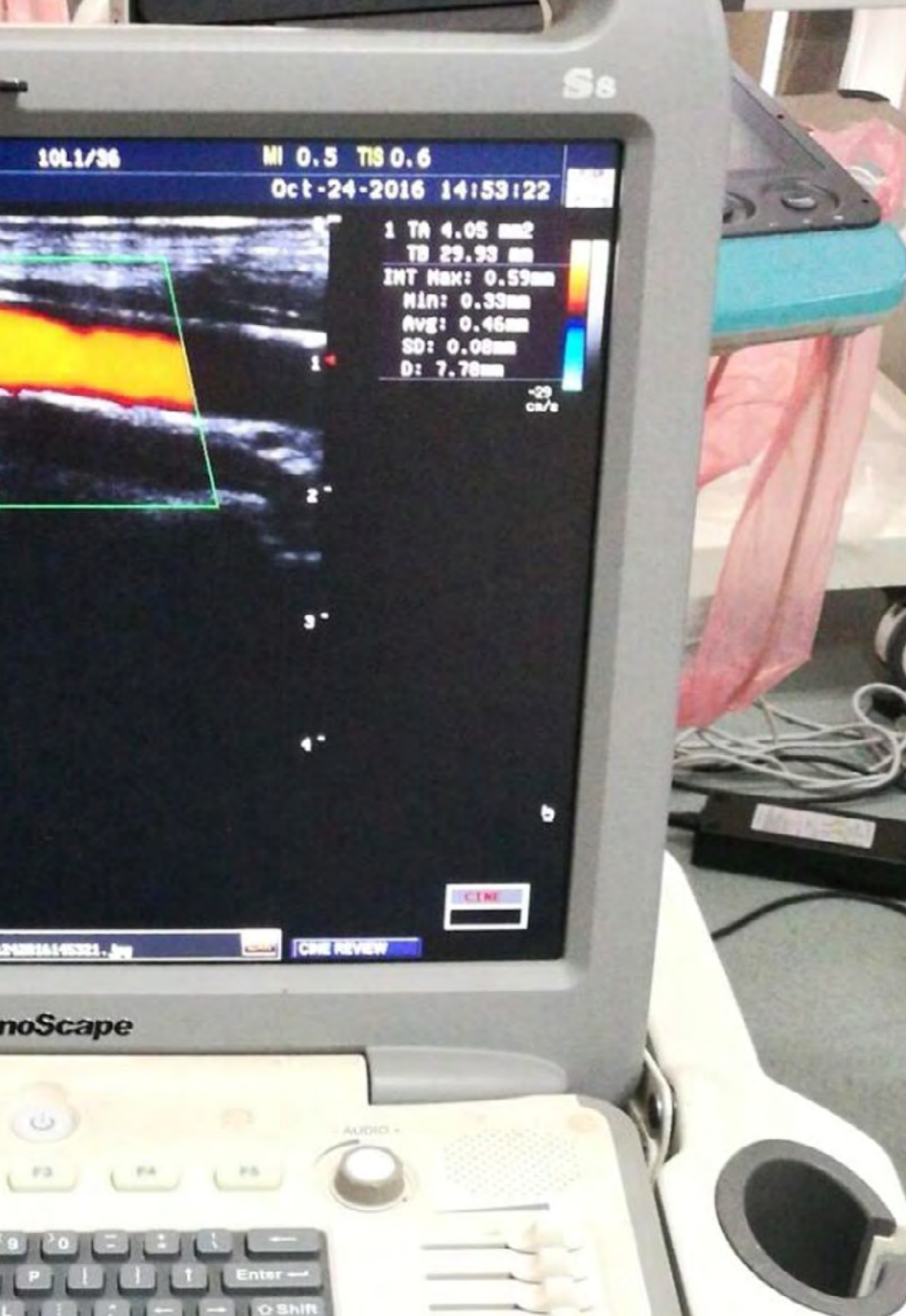
- Provide specialists with the most innovative and specialized information related to the ultrasound assessment of cerebral and vascular abnormalities
- Deliver cutting-edge content enabling graduates to achieve excellent proficiency in this diagnostic tool

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*These objectives will enable you to integrate the latest advances in Ocular Ultrasound into your clinical practice, including the analysis of the optic nerve sheath diameter”*







## Specific Objectives

### Module 1. Ultrasound Imaging

- ♦ Define the physical principles which are involved in ultrasound imaging
- ♦ Establish an appropriate ultrasound sequence for each examination of a patient
- ♦ Explain the different ultrasound modes
- ♦ Define the different types of ultrasound machines and their applications
- ♦ Describe the different ultrasound planes
- ♦ Explain the principles of echonavigation

### Module 2. Clinical Vascular Ultrasound for Emergencies and Primary Care

- ♦ Explain the vascular anatomy
- ♦ Describe the technical requirements of vascular ultrasounds
- ♦ Explain the examination technique for vascular ultrasounds
- ♦ Explain the principles of ultrasound for the main thoracoabdominal vessels
- ♦ Explain the principles of ultrasound of the digestive system
- ♦ Explain the principles of ultrasound of peripheral arterial circulation

### Module 3. Clinical Cerebral Ultrasound

- ♦ Describe cerebral hemodynamics
- ♦ Explain the location and visualization of the windows in cerebral ultrasounds
- ♦ Define the different ultrasound modes in cerebral ultrasounds
- ♦ Explain the principles of ultrasound of the supraaortic trunks
- ♦ Explain the different structural alterations to identify in cerebral ultrasounds
- ♦ Explain the different hemodynamic alterations to identify in cerebral ultrasound
- ♦ Describe the procedure for performing ocular ultrasound

03

# Course Management

To select a teaching team capable of meeting the highest expectations of the students, TECH has sought to bring together distinguished experts in nursing and medicine with outstanding professional experience in ultrasound techniques. Furthermore, the extensive academic background of the faculty reflects their strong commitment to supporting students' academic progress, being dedicated to providing all the key knowledge that will enhance their skills in this field.





“

*Experts who have distinguished themselves through their work at leading healthcare institutions will be actively involved in your academic journey”*

## Management



### Dr. Álvarez Fernández, Jesús Andrés

- ♦ Head Physician at the Juaneda Miramar Hospital
- ♦ Specialist in Intensive Care Medicine and Burn Patient Management at the University Hospital of Getafe
- ♦ Associate Researcher in the area of Neurochemistry and Neuroimaging at the University of La Laguna

## Professors

### Dr. Flores Herrero, Ángel

- ♦ Coordinator of the Angiology, Vascular and Endovascular Surgery Service of the Quirón Salud Toledo Hospital
- ♦ FEA of Vascular Surgery at the Enova Medical Center
- ♦ Assistant Physician of Vascular Surgery at the Toledo Hospital Complex
- ♦ Member of the American Society of Surgeons
- ♦ Collaborating Professor at the Catholic University San Antonio de Murcia (UCAM)
- ♦ European Board of Vascular Surgery Examiner and Fellow of the American College of Surgeons
- ♦ Doctor of Medicine and Surgery
- ♦ Master's Degree in Hospital Management

### Dr. Palacios Ortega, Francisco de Paula

- ♦ Specialist in Intensive Care Medicine
- ♦ Associate Physician of the Intensive Care Unit at the University Hospital of Getafe
- ♦ Collaborating Physician of the Artificial Intelligence and Knowledge Engineering (AIKE) group, University of Murcia
- ♦ Research collaborator of the WASPSS group, whose objective is the Rational Use of Antibiotics
- ♦ Speaker at the Lecture Series of the Center for Surgical Studies, Complutense University of Madrid

**Dr. Núñez Reiz, Antonio**

- ♦ Intensive Care Medicine Physician at Hospital Clínico Universitario San Carlos
- ♦ Critical Care Unit Physician at the Hospital Universitario Fundación Alcorcón
- ♦ Specialist of the Intensive Care Medicine Unit at the University Hospital Príncipe de Asturias
- ♦ Member of the European Society of Intensive Care Medicine

**Dr. Yus Teruel, Santiago**

- ♦ Transplant Coordinator at the La Paz University Hospital of Madrid
- ♦ Specialist in Intensive Care Medicine
- ♦ Associate Physician of Intensive Care Medicine at the University Hospital Complex La Paz-Carlos III
- ♦ Member of the EcoClub of SOMIAMA
- ♦ Degree in Medicine and Surgery

**Dr. Lamarca Mendoza, María Pilar**

- ♦ Assistant Physician of the Department of Angiology, Vascular and Endovascular Surgery of the Toledo Hospital Complex
- ♦ Medical specialist in SESCAM (Health Service of Castilla-La Mancha)
- ♦ Author of numerous publications and scientific essays at national and international level
- ♦ Degree in Medicine and Surgery from the Autonomous University of Madrid

**Dr. Álvarez González, Manuel**

- ♦ Faculty Specialist at Hospital Clínico San Carlos
- ♦ Specialist in Intensive Care Medicine
- ♦ Founding Member of the Ecoclub of SOMIAMA
- ♦ Degree in Medicine and Surgery

**Dr. Igeño Cano, José Carlos**

- ♦ Head of the Intensive Medicine. and Emergency Department at San Juan de Dios Hospital in from Córdoba
- ♦ Responsible for the Patient Welfare Area in the HUCI Project, Humanizing Intensive Care
- ♦ Coordinator of the Planning and Organization and Management Working Group of the Spanish Society of Intensive Care Medicine, Critical Care and Coronary Units (SEMICYUC)
- ♦ Medical Director of the Resuscitation and Post-Surgical Care Unit of the IDC Salud Virgen de Guadalupe Hospital
- ♦ Attending ICU Physician in the Health Service of Castilla, La Mancha
- ♦ Assistant Physician of the Medicine and Neurotrauma Unit of the Nuestra Señora de la Candelaria Hospital
- ♦ Head of Critical Patient Transport Service in Ambulances Juan Manuel SL
- ♦ Master's Degree in Clinical Administration, Medical and Healthcare Management from the CEU Cardenal Herrera University
- ♦ Member of the Pan-American and Iberian Federation of Critical Medicine and Intensive Care and Spanish Society of Intensive Care Medicine, Critical Care and Coronary Units

**Dr. De la Calle Reviriego, Braulio**

- ♦ Chief of Intensive Care Medicine and Transplant Coordinator at the Gregorio Marañón Hospital
- ♦ Chief of Service at the Hospital Quirón San José
- ♦ Collaborating Professor at the Complutense University of Madrid
- ♦ Trainer in Brain Ultrasound of the National Transplant Organization
- ♦ Member of: Gregorio Marañón Institute of Health Research

04

# Structure and Content

Following the exhaustive indications of the teaching team, TECH has designed a syllabus that provides the student with an individualized educational itinerary on the way to guarantee the correct acquisition of competencies. In this sense, students will enjoy a highly dynamic academic cycle in which resources such as interactive diagrams, video nursing procedures, case studies and much more will come into play. In addition, each and every one of these contents is adjusted to the most recent scientific advances.





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*Relearning will play a key role in your academic experience, enabling you to master concepts such as the application technique of TCD and Hydrocephalus with precision”*

## Module 1. Ultrasound Imaging

- 1.1. Physical Principles
  - 1.1.1. Sound and Ultrasound
  - 1.1.2. Nature of Ultrasound
  - 1.1.3. Interaction of Ultrasound with Matter
  - 1.1.4. Concept of Ultrasound Imaging
  - 1.1.5. Ultrasound Safety
- 1.2. Ultrasound Sequence
  - 1.2.1. Ultrasound Emission
  - 1.2.2. Interaction with Tissues
  - 1.2.3. Echo Formation
  - 1.2.4. Echo Reception
  - 1.2.5. Generation of the Ultrasound Image
- 1.3. Ultrasound Modes
  - 1.3.1. A-Mode
  - 1.3.2. M-Mode
  - 1.3.3. B-Mode
  - 1.3.4. Color Doppler
  - 1.3.5. Angio-Doppler
  - 1.3.6. Spectral Doppler
  - 1.3.7. Combined Modes
  - 1.3.8. Other Modalities and Techniques
- 1.4. Ultrasound Devices
  - 1.4.1. Console-Based Ultrasound Systems
  - 1.4.2. Portable Ultrasound Devices
  - 1.4.3. Specialized Ultrasound Equipment
  - 1.4.4. Transducers
- 1.5. Ultrasound Planes and Navigation
  - 1.5.1. Sagittal Plane
  - 1.5.2. Transverse plane
  - 1.5.3. Coronal plane
  - 1.5.4. Oblique planes
  - 1.5.5. Ultrasound Orientation Marker
  - 1.5.6. Transducer Movements

## Module 2. Clinical Vascular Ultrasound for Emergencies and Primary Care

- 2.1. Anatomical Review
  - 2.1.1. Venous Vascular Anatomy of the Upper Limbs
  - 2.1.2. Arterial Vascular Anatomy of the Upper Limbs
  - 2.1.3. Venous Vascular Anatomy of the Lower Limbs
  - 2.1.4. Arterial Vascular Anatomy of the Lower Limbs
- 2.2. Technical Requirements
  - 2.2.1. Ultrasound Devices and Probes
  - 2.2.2. Curve Analysis
  - 2.2.3. Color Imaging Media
  - 2.2.4. Ultrasound Contrast Agents
- 2.3. Examination Technique
  - 2.3.1. Patient Positioning
  - 2.3.2. Insonation. Examining Technique
  - 2.3.3. Assessment of Normal Flow Curves and Velocities
- 2.4. Major Thoracoabdominal Vessels
  - 2.4.1. Abdominal Venous Vascular Anatomy
  - 2.4.2. Abdominal Arterial Vascular Anatomy
  - 2.4.3. Abdominopelvic Venous Pathology
  - 2.4.4. Abdominopelvic Arterial Pathology
- 2.5. Supra-Aortic Trunks
  - 2.5.1. Venous Vascular Anatomy of the Supra-Aortic Trunks
  - 2.5.2. Arterial Vascular Anatomy of the Supra-Aortic Trunks
  - 2.5.3. Venous Pathology of the Supra-Aortic Trunks
  - 2.5.4. Arterial Pathology of the Supra-Aortic Trunks
- 2.6. Peripheral Arterial and Venous Circulation
  - 2.6.1. Venous Pathology of Lower and Upper Limbs
  - 2.6.2. Arterial Pathology of Lower and Upper Limbs

### Module 3. Clinical Cerebral Ultrasound

- 3.1. Cerebral Hemodynamics
  - 3.1.1. Carotid Circulation
  - 3.1.2. Vertebrobasilar Circulation
  - 3.1.3. Cerebral Microcirculation
- 3.2. Ultrasound Modalities
  - 3.2.1. Transcranial Doppler
  - 3.2.2. Cerebral Ultrasound
  - 3.2.3. Special Tests (Vascular Reaction, HITS, etc.)
- 3.3. Ultrasound Windows and Examination Technique
  - 3.3.1. Ultrasound Windows
  - 3.3.2. Operator Positioning
  - 3.3.3. Examination Sequence
- 3.4. Structural Abnormalities
  - 3.4.1. Collections and Masses
  - 3.4.2. Vascular Abnormalities
  - 3.4.3. Hydrocephalus
  - 3.4.4. Venous Pathology
- 3.5. Hemodynamic Alterations
  - 3.5.1. Spectral Analysis
  - 3.5.2. Hyperdynamic States
  - 3.5.3. Hypodynamics States
  - 3.5.4. Cerebral Asystole
- 3.6. Ocular Ultrasound
  - 3.6.1. Pupil Size and Reactivity
  - 3.6.2. Optic Nerve Sheath Diameter
- 3.7. Doppler Ultrasound in the Diagnosis of Brain Death
  - 3.7.1. Clinical Diagnosis of Brain Death
  - 3.7.2. Prerequisites for Transcranial Doppler (TCD) Examination in Cerebral Circulatory Arrest Diagnosis
  - 3.7.3. TCD Application Technique
  - 3.7.4. Advantages of TCD
  - 3.7.5. Limitations and Interpretation of TCD
  - 3.7.6. TCD Ultrasound for the Diagnosis of Brain Death
  - 3.7.7. The Role of TCD Ultrasound in the Diagnosis of Brain Death



*You'll see for yourself just how convenient it is to update your skills with TECH, accessing the most advanced digital content from your mobile device or computer"*

# 05 Study Methodology

TECH is the world's first university to combine the **case study** methodology with **Relearning**, a 100% online learning system based on guided repetition.

This disruptive pedagogical strategy has been conceived to offer professionals the opportunity to update their knowledge and develop their skills in an intensive and rigorous way. A learning model that places students at the center of the educational process giving them the leading role, adapting to their needs and leaving aside more conventional methodologies.





“

*TECH will prepare you to face new challenges in uncertain environments and achieve success in your career”*

## The student: the priority of all TECH programs

In TECH's study methodology, the student is the main protagonist.

The teaching tools of each program have been selected taking into account the demands of time, availability and academic rigor that, today, not only students demand but also the most competitive positions in the market.

With TECH's asynchronous educational model, it is students who choose the time they dedicate to study, how they decide to establish their routines, and all this from the comfort of the electronic device of their choice. The student will not have to participate in live classes, which in many cases they will not be able to attend. The learning activities will be done when it is convenient for them. They can always decide when and from where they want to study.

“

*At TECH you will NOT have live classes  
(which you might not be able to attend)”*



### The most comprehensive study plans at the international level

TECH is distinguished by offering the most complete academic itineraries on the university scene. This comprehensiveness is achieved through the creation of syllabi that not only cover the essential knowledge, but also the most recent innovations in each area.

By being constantly up to date, these programs allow students to keep up with market changes and acquire the skills most valued by employers. In this way, those who complete their studies at TECH receive a comprehensive education that provides them with a notable competitive advantage to further their careers.

And what's more, they will be able to do so from any device, pc, tablet or smartphone.

“

*TECH's model is asynchronous, so it allows you to study with your pc, tablet or your smartphone wherever you want, whenever you want and for as long as you want”*



## Case Studies and Case Method

The case method has been the learning system most used by the world's best business schools. Developed in 1912 so that law students would not only learn the law based on theoretical content, its function was also to present them with real complex situations. In this way, they could make informed decisions and value judgments about how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

With this teaching model, it is students themselves who build their professional competence through strategies such as Learning by Doing or Design Thinking, used by other renowned institutions such as Yale or Stanford.

This action-oriented method will be applied throughout the entire academic itinerary that the student undertakes with TECH. Students will be confronted with multiple real-life situations and will have to integrate knowledge, research, discuss and defend their ideas and decisions. All this with the premise of answering the question of how they would act when facing specific events of complexity in their daily work.





## Relearning Methodology

At TECH, case studies are enhanced with the best 100% online teaching method: Relearning.

This method breaks with traditional teaching techniques to put the student at the center of the equation, providing the best content in different formats. In this way, it manages to review and reiterate the key concepts of each subject and learn to apply them in a real context.

In the same line, and according to multiple scientific researches, reiteration is the best way to learn. For this reason, TECH offers between 8 and 16 repetitions of each key concept within the same lesson, presented in a different way, with the objective of ensuring that the knowledge is completely consolidated during the study process.

*Relearning will allow you to learn with less effort and better performance, involving you more in your specialization, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation to success.*



## A 100% online Virtual Campus with the best teaching resources

In order to apply its methodology effectively, TECH focuses on providing graduates with teaching materials in different formats: texts, interactive videos, illustrations and knowledge maps, among others. All of them are designed by qualified teachers who focus their work on combining real cases with the resolution of complex situations through simulation, the study of contexts applied to each professional career and learning based on repetition, through audios, presentations, animations, images, etc.

The latest scientific evidence in the field of Neuroscience points to the importance of taking into account the place and context where the content is accessed before starting a new learning process. Being able to adjust these variables in a personalized way helps people to remember and store knowledge in the hippocampus to retain it in the long term. This is a model called Neurocognitive context-dependent e-learning that is consciously applied in this university qualification.

In order to facilitate tutor-student contact as much as possible, you will have a wide range of communication possibilities, both in real time and delayed (internal messaging, telephone answering service, email contact with the technical secretary, chat and videoconferences).

Likewise, this very complete Virtual Campus will allow TECH students to organize their study schedules according to their personal availability or work obligations. In this way, they will have global control of the academic content and teaching tools, based on their fast-paced professional update.



*The online study mode of this program will allow you to organize your time and learning pace, adapting it to your schedule”*

### The effectiveness of the method is justified by four fundamental achievements:

1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that assess real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.

### The university methodology top-rated by its students

The results of this innovative teaching model can be seen in the overall satisfaction levels of TECH graduates.

The students' assessment of the teaching quality, the quality of the materials, the structure of the program and its objectives is excellent. Not surprisingly, the institution became the top-rated university by its students according to the global score index, obtaining a 4.9 out of 5.

*Access the study contents from any device with an Internet connection (computer, tablet, smartphone) thanks to the fact that TECH is at the forefront of technology and teaching.*

*You will be able to learn with the advantages that come with having access to simulated learning environments and the learning by observation approach, that is, Learning from an expert.*





As such, the best educational materials, thoroughly prepared, will be available in this program:



#### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

This content is then adapted in an audiovisual format that will create our way of working online, with the latest techniques that allow us to offer you high quality in all of the material that we provide you with.



#### Practicing Skills and Abilities

You will carry out activities to develop specific competencies and skills in each thematic field. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop within the framework of the globalization we live in.



#### Interactive Summaries

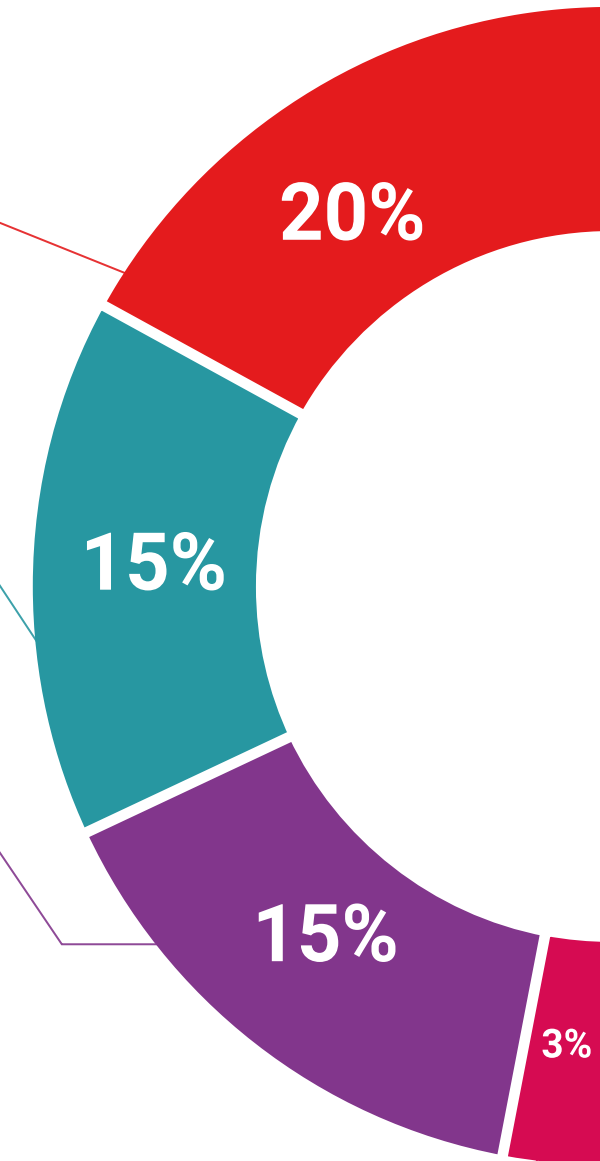
We present the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

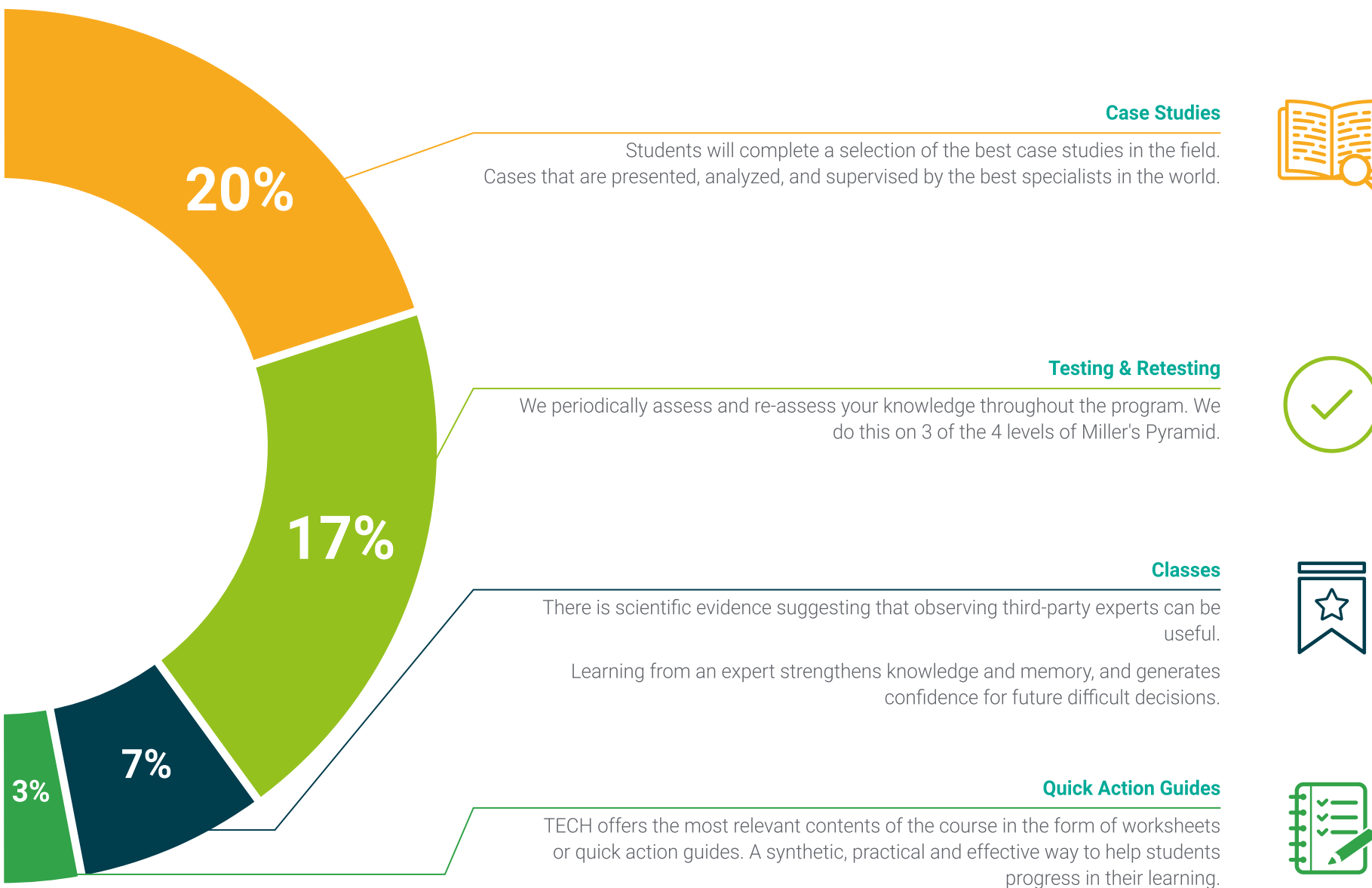
This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



#### Additional Reading

Recent articles, consensus documents, international guides... In our virtual library you will have access to everything you need to complete your education.





# 06 Certificate

This Postgraduate Diploma in Clinical Cerebral and Vascular Ultrasound in Emergency and Critical Care for Nursing guarantees students, in addition to the most rigorous and up-to-date education, access to a diploma for the Postgraduate Diploma issued by TECH Global University.





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*Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork”*



This private qualification will allow you to obtain a diploma for the **Postgraduate Diploma in Clinical Cerebral and Vascular Ultrasound in Emergency and Critical Care for Nursing** endorsed by TECH Global University, the world's largest online university.

**TECH Global University**, is an official European University publicly recognized by the Government of Andorra ([official bulletin](#)). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

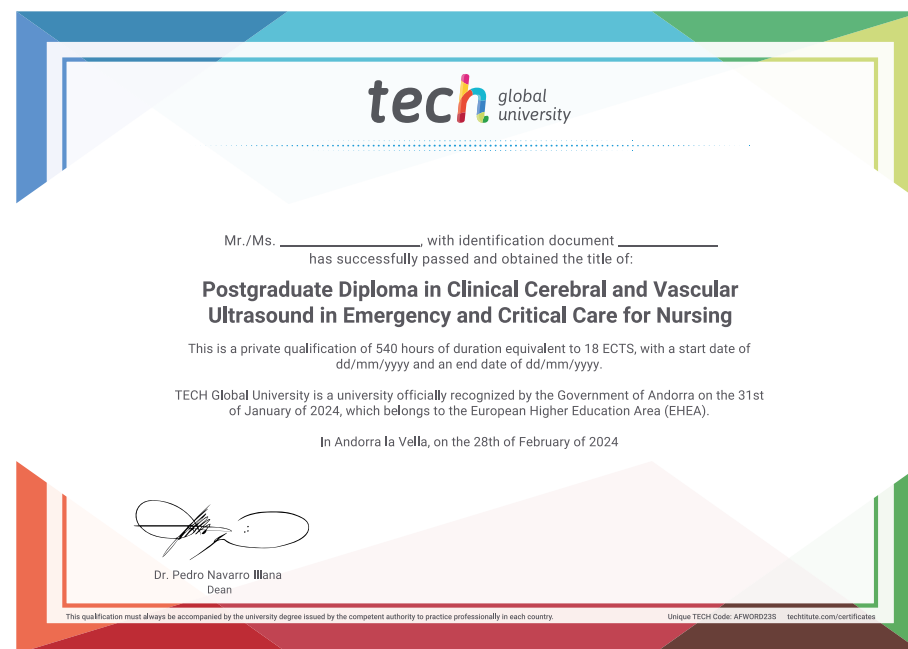
This **TECH Global University** private qualification, is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

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