



Review Article **Cardiology**

## Cardiac Catheterization Education for Paramedical Courses in India: Does the Cardiovascular Technology Course Curriculum Need to Be Updated?

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### ABSTRACT

The onus of providing healthcare is no longer solely on physicians and nurses but also on paramedical staff, paraprofessionals, and health technicians, who all have an essential role to play in delivering health services. However, unlike medical and dental programs in the country, paramedical courses lack a uniform syllabus. Consequently, some universities or colleges offer cardiac catheterization education to Bachelor of Science in Cardiovascular Technology students, while others do not. So, it is essential that paramedical students receive a comprehensive cardiac catheterization curriculum to equip them with the knowledge and skills necessary to deliver services proficiently in both hospital and community settings.

### INTRODUCTION

The healthcare sector has encountered numerous hurdles due to the rapid evolution of technology. Nonetheless, by working together, both clinical and non-clinical personnel have made significant strides in enhancing the quality of medical care over the past few decades. The onus of providing healthcare is no longer solely on physicians and nurses but also on paramedical staff, para-professionals, and health technicians, who all have an essential role to play in delivering health services.<sup>[1,2]</sup> In today's healthcare landscape, the demand for professionals who possess the necessary qualifications and skills to perform therapeutic, diagnostic, curative, preventive, and rehabilitative interventions is higher than ever. Allied and healthcare professionals (AHPs) are at the forefront of this demand, utilizing sophisticated tools and cutting-edge protocols to deliver quality healthcare services. AHPs collaborate in multidisciplinary teams with doctors (physicians and specialists), nurses, and public health officials in various healthcare settings to promote, protect, treat, and manage a person's physical, mental, social, emotional, environmental, and holistic health. Their contribution to the field is crucial, particularly as technology plays an increasingly important role in diagnosis.<sup>[3]</sup> To address this need, the Indian Government implemented a national health policy in 2002 to ensure that education standards for AHPs are maintained.<sup>[4]</sup> However, unlike medical and dental programs in the country, paramedical courses lack a uniform syllabus. Consequently, some universities or colleges offer cardiac catheterization education to Bachelor of Science in Cardiovascular Technology students, while others do not.<sup>[5,6]</sup>

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## THE INFLUENCE OF CONTEMPORARY COURSES ON THE PRESENT-DAY LANDSCAPE

Cardiac catheterization courses have evolved into essential components of modern cardiology, significantly influencing both diagnostic and therapeutic approaches. These courses provide healthcare professionals with crucial proficiencies for accurately diagnosing coronary artery disease and other cardiac ailments using advanced imaging and procedural methods. In addition to diagnosis, they also instruct specialists in conducting therapeutic interventions such as angioplasty, stent placement, and complex structural heart procedures like valve replacements. In response to technological progress, these courses integrate advanced catheter-based tools and imaging technologies to promote procedural precision and safety. Ultimately, they contribute to enhanced patient outcomes by enabling efficient treatments, minimizing complications, and facilitating ongoing research and development in cardiovascular medicine on a global scale. As a result, cardiac catheterization courses elevate care standards and play a pivotal role in advancing the field and improving cardiovascular health outcomes worldwide.<sup>[7]</sup>

## WHAT ARE THE PERSPECTIVES OF THE INDIVIDUALS WHO DEVISE THESE CURRICULA?

Cardiac catheterization courses significantly impact the development of educational programs, influencing healthcare professionals to prioritize ongoing learning and integrate advancements in cardiovascular medicine. These courses focus on evidence-based practices and encourage the incorporation of the latest research findings and technological innovations into curriculum updates. Practical components, such as simulations and workshops, promote a hands-on learning approach to enhance participants' confidence and competence in clinical settings. The courses also foster interdisciplinary collaboration by bringing together experts from various specialties, contributing to a comprehensive understanding of cardiovascular diseases and treatment strategies. In addition, they advocate for patient-centered care by prompting the inclusion of modules on communication skills and ethical considerations. Ultimately, cardiac catheterization courses are crucial in shaping a healthcare workforce skilled at delivering personalized, high-quality care to patients with cardiovascular conditions.<sup>[8-12]</sup> As such, we have developed a model of the cardiac catheterization curriculum, which outlines the key components and areas of focus that are critical in ensuring medical professionals are adequately trained and prepared to handle cardiac catheterization procedures.

### Module-1: Introduction to cardiac catheterization

- Basics of X-ray (X-ray production and X-ray theory)
- Fluoroscopy, movement of gantry, and cath table
- Angiographic projections
- Radiation exposure and safety measures
- Contrast media (types and complications)
- Power injector.

### Module-2: Cardiac catheterization hardware

- Hardwares – Guidewires, balloon catheters and catheters (Diagnostic and Intervention procedures)
- Sheath – French size, Universal Color coding, Allens Test and Seldinger technique for introducing sheath
- Vascular access (advantages and disadvantages of radial and femoral artery)
- Sterilization techniques (Hardware cleaning and packing).

### Module-3: Monitoring system in cardiac catheterization laboratory

- Transducers (types)
- Electrocardiogram (ECG) (electrode placement, ECG interpretation for common arrhythmias)
- Non-invasive blood pressure (start/stop)
- Intra-aortic pressure (IAP) waveforms (IAP zeroing, start/stop)
- Basic pressure waveforms in common disease conditions.

### Module-4: Intracardiac pressure

- Errors and corrective measures in pressure measurements
- Right heart pressure waveforms
- Left heart pressure waveforms.

### Module-5: Diagnostic procedures in cardiac catheterization laboratory

- Coronary angiogram – (Indication, contraindication, procedure – preparation, medication and sedation, angiographic projection used and interpretation, American Heart Association (AHA) lesion classification, and complications)
- Grading system – (Gensini Score, Syntax Score, and Thrombolysis in Myocardial Infarction-Score)
- Bypass graft angiogram – (Indication, contraindication, procedure – preparation, medication and sedation, angiographic projection used and interpretation, and complications)
- Peripheral angiogram and renal artery angiogram - (Indication, contraindication, procedure – preparation, medication and sedation, angiographic

- projection used and interpretation, and complications)
- Carotid angiogram – (indication, contraindication, procedure – preparation, medication and sedation, angiographic projection used and interpretation, and complications)
- Aortography – (Indication, contraindication, procedure – preparation, medication and sedation, angiographic projection used and interpretation, and complications)
- Cath study – (Oximetry run, normal oxygen saturation range, and criteria for step up and step down oxygen saturation).

#### Module-6: Interventional procedures in cardiac catheterization laboratory

- Percutaneous coronary intervention
- Percutaneous closure of septal defects
- Percutaneous valve repair and replacement
- Pacemaker, implantable cardioverter-defibrillator, and cardiac resynchronization therapy with a defibrillator (Device implantation)
- Inferior vena cava filter.

#### Module-7: Other equipment used in cardiac catheterization laboratory

- Intravascular ultrasound
- Optical coherence tomography
- Fractional flow reserve.

#### Module-8: Cardiac pharmacology

- Beta-blockers
- Calcium channel blockers
- Diuretics
- Nitrates
- Vasodilators.

### CONCLUSION

In the realm of medical care, advancements in technology have brought about higher standards of care while presenting new challenges for healthcare professionals. The provision of quality healthcare services relies heavily on the effectiveness of education, training, teamwork, and a commitment to community health. With significant responsibility placed on cardiac technologists who serve as cath laboratory technologists or managers under the supervision of cardiologists, it is essential that paramedical students receive a comprehensive cardiac catheterization curriculum to equip them with the knowledge and skills necessary to deliver services proficiently in both hospital and community settings.

### Ethical approval

The Institutional Review Board approval is not required.

### Declaration of patient consent

Patient consent not required as there are no patients in this study.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

### Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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