



EXPLORING STAKEHOLDERS' PERCEPTION AND EXPERIENCES IN BIOMEDICAL INSTRUMENTATION EDUCATION IN A HEALTH SCIENCES FACULTY

Biomedical Engineering

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ABSTRACT

Biomedical instrumentation is integral to the functioning of medical equipment and directly impacts patient diagnosis and treatment. Ensuring the competence of healthcare professionals is imperative for patient safety (1–5). Inaccurate or inadequate knowledge in this area could lead to incorrect readings, misdiagnoses, or equipment malfunctions, jeopardizing patient well-being (6–8). Feedback of students' studying allied health programs is crucial for creating an effective and engaging learning experience and enhancing educational content, teaching pedagogies and assessment methodologies in education (9). The research paper presents a comprehensive exploration of the training and knowledge assessment of allied healthcare professionals (AHPs) in biomedical instrumentation domain. Approximately 290 study participants provided their experiences, thoughts and insights related to biomedical instrumentation education. Key areas explored were course materials, instructional strategies and methods for evaluating students' knowledge and abilities. In summary, the research highlights the significance of stakeholders' perspectives as a catalyst for positive change in the ongoing development of biomedical instrumentation education.

KEYWORDS

Biomedical Instrumentation Education, Healthcare Professionals Competence, Educational Assessment, Instructional Strategies, Educational Feedback, Program Relevance

INTRODUCTION

Biomedical instrumentation is a dynamic and critical field at the intersection of healthcare, engineering and technology (10). Professionals in this domain play a pivotal role in ensuring the accuracy and reliability of medical equipment, contributing significantly to the healthcare industry's ability to provide accurate diagnostics and safe patient care (11). In a broader context, the success of allied health professionals is intertwined with the efficacy of the healthcare system (12). The standards and security of healthcare services is directly impacted by biomedical instrumentation education and training (7) (13). Healthcare professionals must stay current with the latest advancements to deliver the best patient care (14).

However, biomedical instrumentation knowledge assessment among allied health professionals has yet to be conducted. Assessment research is essential for program enhancement and accreditation (15, 16). Regulatory bodies and accrediting agencies often require healthcare programs to demonstrate that graduates have a proficient understanding of biomedical instrumentation (17, 18). A research assessing knowledge of biomedical instrumentation among allied health professionals is essential for patient safety, educational relevance, accreditation compliance and the overall success of healthcare professionals and the healthcare system (3, 8, 19–20, 22–24). The objective of this research study was to understand the ability of allied healthcare professionals to handle sophisticated biomedical devices and equipment. It supports the continuous improvement of allied health education and contributes to advancing medical technology and patient care (25–28).

METHODOLOGY

The methodology involves gathering and analyzing the responses obtained from the stakeholders' perspectives on four assessment parameters: their experiences, training, courses and preparedness for the work environment. The survey was conducted online through Google Forms in an Online mode. The results obtained were analyzed using the SPSS statistical analysis tool. Chi-square analysis was performed to analyze relationships between categorical variables.

RESULTS

I. Demographics

Allied healthcare professionals, students of Medical Technology program at Symbiosis Institute of Health Sciences (SIHS), alumni and Symbiosis University Hospital & Research Centre (SUHR) employees were involved in this study.

Table 1: Demographic Characteristics Of The Participants

Parameters		n=290	
		Number	%
Sex	Male	74	25.5
	Female	216	74.5

Education	Bachelor's Degree	142	49
	Master's Degree	130	44.8
	Postgraduate Diploma	4	1.4
	Undergraduate Diploma	12	4.1
	Certificate	2	0.7
Enrollment Eligibility	HSC (Twelfth)	156	53.8
	Graduate with a background in Lifesciences	113	39
	Graduate without Lifesciences	11	3.8
	Post Graduate with Lifesciences	7	2.4
	Postgraduate without Life sciences	3	1

II. Evaluating Current Course Status

Regarding didactic training, 46.2% of the respondents strongly agreed that they received effective teaching from faculty during classroom sessions. A similar number of participants reported receiving education and training from hospital technical staff.

Regarding pedagogical assessment, only 41.9% of respondents reported the use of models, simulators and manikins for training. Higher ratings were attributed to didactic lectures, PowerPoint presentations, videos, animations, team skills training, workshops and seminars.

IV. Competency Assessment

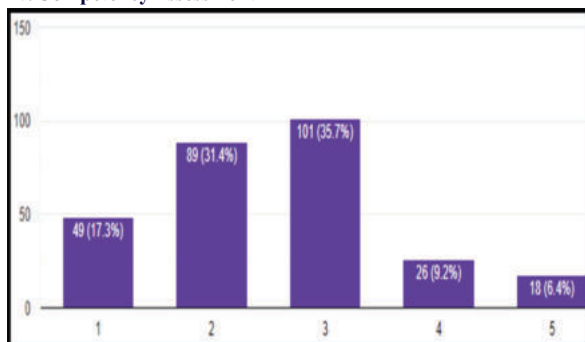


Figure 1: Responses To Possessing Enough Technical Skills For Work Engagement.

Approximately 48.7% of the respondents expressed confidence in the technical skills they had acquired in biomedical instrumentation. Moreover, approximately 55% of participants believed they understood the principles, usage and maintenance of instruments required for medical procedures.

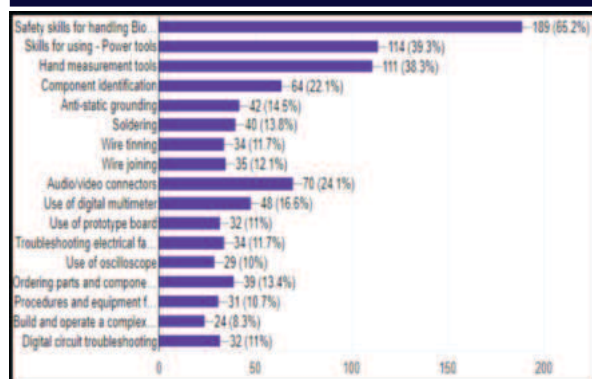


Figure 2: Responses To The Skills Possessed By Allied Healthcare Professionals.

In contrast, 65.2% of participants exhibited greater confidence in safety skills for handling biomedical instruments and using hand measurement tools.

Regarding test equipment, participants demonstrated knowledge of electrical safety testing, pulse oximeter testing, microscope maintenance and colorimeter maintenance. However, telemetry inspection, heart-lung machine operation, infant radiant warmer usage and infusion pump inspection received lower ratings.

The findings from this study provide valuable insights into the perspectives and experiences of various stakeholders, offering a basis for future improvements in biomedical instrumentation education and training programs.

DISCUSSION

This study comprehensively explored the perspectives and experiences of various stakeholders involved in biomedical instrumentation education. The research delved into areas of paramount importance, including the core courses, teaching pedagogies, approaches used to assess knowledge and skills and factors influencing students' preferences and the effectiveness of their learning experiences.

Approximately 77.5% of respondents recognized the need for a structured training program in biomedical instrumentation education. This insight highlights the need for more structured and comprehensive training in the field, which is a critical aspect given its direct impact on patient safety and the effectiveness of healthcare services (1–3).

One key aspect assessed was the adequacy of core subjects and practical training. Although some respondents acknowledged the coverage of core subjects in the curriculum, only about 50.7% thought that core courses included adequate practical training content.

CONCLUSION

The research results shed light on stakeholders' perspectives and experiences in biomedical instrumentation education. Insights obtained serve as a valuable resource for educators, institutions and policymakers in the field. The findings suggest the training has to be more organized and comprehensive. Crucial aspects of training were hands-on practical skills experience and interactive/engaging learning pedagogies.

The study bridges the aspirations of students and the development of a more robust, relevant, effective and responsive educational system in the biomedical instrumentation field. Regular training and a benchmarked curriculum can help develop industry-ready healthcare professionals. Thus, the findings will ultimately contribute to the safety and quality of healthcare technologies and patient care.

Declarations

Ethical Approval: Since the article does not include any identifiable living person's medical information, ethics approval was not necessary.

Funding: No funding was received for the study.

Conflict of Interest: No conflicts of interest in the study.

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