

Knowledge Enhancement on Cardiogenic Shock Following Self-Instructional Module among Rwandan Nurses: A Quasi-Experimental Study

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Abstract

Background

Cardiogenic shock is a life-threatening condition requiring early recognition and immediate intervention. Nurses, often the first responders in hospitals and communities, need adequate knowledge to manage such emergencies effectively. This study assessed the effectiveness of a self-instructional module (SIM) in improving nurses' knowledge about cardiogenic shock at a level-two teaching hospital in Rwanda.

Methods

A quasi-experimental design was used involving 113 nurses. Structured multiple-choice questionnaires were administered before and after exposure to the SIM. Data were analyzed using SPSS version 25, χ^2 and paired t-tests were used to assess changes in knowledge levels.

Results

The study revealed a significant improvement in post-test scores following the SIM intervention. The proportion of nurses with adequate knowledge increased from 10.6% to 60.2%, while those with inadequate or moderate knowledge dropped from 32.7% to 4.4% ($\chi^2 = 92.4$; $p < 0.001$). Demographic variables such as age, gender, marital status, education level, and experience did not significantly influence the knowledge gain.

Conclusion

The SIM proved to be an effective educational tool for enhancing nurses' knowledge of cardiogenic shock. Its implementation can be a valuable strategy for improving clinical preparedness among nursing staff.

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Keywords: Cardiogenic shock, Medical education, Nurses, Pathophysiology, Self-instructional module

Introduction

Cardiogenic shock (CS) is a heart disease characterized by the inability of the heart to pump blood to the remaining parts of the body for their needs, leading to organ hypoperfusion, hypoxia, ischemia, and even death within 24 hours if not detected and managed.[1–3] Despite the recent advances in Medical care, CS still has a mortality rate of about 80% and remains the leading cause of death among patients with myocardial infarction.[1, 2] Between 2 and 4 million individuals are thought to be affected by CS annually, and the condition is becoming more common at a 9% compound annual growth rate.[3] While there is no reliable estimate of the number of cardiogenic patients in Africa, an Ethiopian study found that the hospital case fatality rate for patients with heart failure in Africa typically ranges from 9% to 12.5%.[4]

There is no doubt that nurses need proper information about cardiogenic shock, given the crucial role they play in providing patients with healthcare services and education, either at the hospital or community level. However, a huge knowledge gap about cardiogenic shock among nurses has been identified and reported. For instance, the degree of practice of nurses caring for cardiogenic shock patients in the coronary care unit was reported to be inadequate. [2] The study recommended that nurses should take specific courses to improve their understanding and experience in caring for patients with cardiogenic shock. [2] Cardiogenic shock is not restricted to a particular region or location; it can affect people all over the world in different geographical areas. Cardiogenic shock can afflict persons of all ages and races in both industrialized and developing nations. It can also affect people with diabetes, kidney disease, preexisting heart conditions, acute myocardial infarction, and hypertensive patients.[4]

Despite global studies on cardiogenic shock, there is currently no research conducted in

Rwanda on nurses' knowledge of cardiogenic shock. Effective management of cardiogenic shock is influenced by multiple factors, including early recognition, timely diagnosis, availability of advanced monitoring and therapeutic resources, multidisciplinary collaboration, institutional protocols, and the overall capacity of the healthcare system. Among these factors, nurses play a critical role because they are often the first to recognize clinical deterioration, initiate emergency interventions, and provide continuous monitoring. However, nurses' knowledge regarding cardiogenic shock has not been assessed among those working at Kabgayi Level 2 Teaching Hospital. Therefore, this study aimed to assess nurses' knowledge regarding the definition of cardiogenic shock, its causes and risk factors, pathophysiology, management, complications, and prevention among nurses working at Kabgayi Level 2 Teaching Hospital, before and after the implementation of a self-instructional module (SIM). The study also aimed to compare the knowledge before and after training, to better test the effectiveness of the SIM.

Methods

Study design

This study used a quasi-experimental design involving a pre and post-intervention to assess the effectiveness of SIM.[5] This design method is a quantitative approach that finds cause-and-effect links by comparing groups under various conditions or treatments.

Study setting

This study was conducted at Kabgayi level two teaching hospital, located in Muhanga district, Southern province of the Republic of Rwanda, which is about 54 kilometers (about 33.55 mi) away from Kigali, the capital city of Rwanda. The hospital was established in 1937 with about 50 beds, but now has about 248 beds. The hospital has 115 nurses and serves 11 health centers and a prison clinic in its catchment areas.

Kabgayi Level 2 Teaching Hospital was selected as the study area because it is a large referral and teaching hospital with wide geographical accessibility and a high patient volume. The hospital manages patients with diverse medical conditions, including cardiovascular diseases, and frequently admits patients with cardiogenic conditions as well as those at risk of developing cardiogenic shock. This makes Kabgayi Level 2 Teaching Hospital an appropriate setting for assessing nurses' knowledge related to cardiogenic shock.

Study population

In this study, the population was the nurses who worked at Kabgayi hospital during the period of data collection. All nurses from all units were considered in the study

Sample size and Sampling procedure

This study applied a census survey (total population sampling method) to collect information from each and every nurse who works at Kabgayi Hospital. Accordingly, this study enrolled 113 out of 115 nurses of the hospital who consented to participate as respondents. A census survey is a method of data collection that gathers information from every member of a specific group, rather than a sample or subset of that population.[6]

Data collection, instruments, procedures, and quality controls

Permission was obtained from the study participants, who were contacted at their service stations. The study details were explained, including the study objectives, inclusion criteria, and the procedure. Informed consent was obtained from consenting participants.

The intervention was implemented in a unit-based manner to accommodate nurses' work schedules and ensure continuity of patient care. After obtaining ethical approval and permission from the hospital, the researcher requested permission from the matron of the different units to meet nurses during morning staff meetings. During these meetings, the researcher explained the purpose of the study, study procedures,

and the voluntary nature of participation, and obtained informed consent from willing participants.

Baseline (pre-intervention) knowledge was assessed using a structured questionnaire. [7] Following this assessment, a brief PowerPoint presentation was delivered during the morning staff meetings as a simplified overview of the SIM, highlighting key aspects of cardiogenic shock, including its definition, causes and risk factors, pathophysiology, management, complications, and prevention. Thereafter, the SIM was distributed to consenting nurses in their respective units on the same day for individual study at their convenience. The SIM was developed based on the Rwanda Standard Treatment Guidelines issued by the Rwanda Ministry of Health to enhance nurses' understanding of cardiogenic shock. After an interval of fifteen days, post-intervention knowledge was assessed using the same questionnaire to determine the effectiveness of the intervention.[8]

The questionnaire had two sections - section one sought demographic information of the nurses, while section two asked questions on cardiogenic shock under 10 domains as follow: (i) definition; (ii) physiology of the heart; (iii) pathophysiology (iv) prevention; (v) causes and risk factors; (vi) clinical manifestations; (vii) diagnosis; (viii) medical management; (ix) nursing management; and (x) complications; of cardiogenic shock. The contents partly align with the learning outcomes of the cardiovascular system contained in the Physiology Curriculum Guideline for African Universities.[9,10]

Before the main study, a pilot study was conducted to assess the clarity, relevance, and reliability of the questionnaire in the local context. This allowed the researcher to identify and correct any ambiguities or difficulties in understanding the questions, ensuring that the instrument was appropriate for assessing nurses' knowledge of cardiogenic shock at Kabgayi Level 2 Teaching Hospital.

Data processing, study variables, and statistical analysis

The data were analyzed using IBM SPSS Statistics for Windows version 25.0 (IBM Corp, Armonk, NY, USA). Both descriptive and inferential statistics were applied to analyze the data. The demographic data of the subjects were reported as frequency and percentage distribution. In this study, the dependent variable was the knowledge of cardiogenic shock, and the independent variables were the use of SIM and demographic characteristics. Knowledge score on cardiogenic score was considered inadequate when the score was <50 %, moderate (between 51 to 75 %), and adequate (> 75 %) as previously categorized.[11, 12] Paired t-test and Chi-square test were used to ascertain the statistical significance of any observed variation. Statistical significance was set as $p < 0.05$.

Ethical consideration

Ethical approval to conduct this study was granted by the Institutional Review Board of the University of Rwanda (CMHS/IRB/117/2024). The hospital issued an acceptance letter (186/HOP/MJB) permitting the study to be conducted in its facility.

Table 1. Demographic characteristics of the respondents

Demographic characteristics		Frequency	Percentage
Gender	Female	83	73.5
	Male	30	26.5
Age group	25-30	26	23.0
	>30	87	77.0
Marital status	Single	23	20.4
	Married	84	74.3
	Divorced	3	2.7
Education level	Widow	3	2.7
	Associate nurse	0	0
	Advanced diploma	45	39.8
Years of experience	Bachelor’s degree	68	60.2
	Master’s Holder	0	0
	0-5 years	46	40.7
	6-10 years	14	12.4
	>10 years	53	46.9

Participation was voluntary, and participants were informed that they could withdraw from the study at any time without any consequences. For anonymity purposes, we used initials on the questionnaire. To ensure confidentiality and data protection, all data were stored securely in a locked cupboard, with access restricted to the principal investigator only.

Results

Demographic characteristics of the respondents

Table 1 shows the demographic characteristics of the staff nurses at Kabgayi hospital who participated in the study, the respondents were 113 nurses, and the majority was female. This indicated a gender disparity with a higher representation of female nurses in the study. In terms of age distribution, most of the nurses were over the age of 30, while the remaining 26 nurses were within the 25-30 age group, suggesting the maturity of the respondents. Data on marital status show that most of the nurses were married, while some of them were single, divorced, or widowed.

The high percentage of married nurses could imply a stable personal life, which might positively affect their professional responsibilities and performance. Regarding educational qualifications, 68 nurses (60.2%) had a bachelor's degree, while 45 nurses (39.8%) held an advanced diploma, indicating a well-educated nursing staff with a high level of professional training and competence. Experience levels among the nurses varied, with nearly half of them (53 nurses, 46.9%) having more than 10 years of experience. Nurses with 0-5 years of experience were 46 (40.7%), while those with 6-10 years of experience were 14 (12.4%). The considerable proportion of highly experienced nurses suggests that the workforce is well-versed in clinical practices, which may enhance the effectiveness of the SIM.

Table 2 shows the assessment of staff nurses' knowledge on cardiogenic shock at Kabgayi hospital before and after the introduction of SIM, revealing a significant improvement after training with SIM. Initially, the percentage of nurses with adequate knowledge of cardiogenic shock (scoring above 75%) was just 10.60%. Training of nurses with SIM significantly increased this proportion to 60.20%. This led to a corresponding decrease in the proportion of nurses with inadequate and moderate knowledge of cardiogenic shock from 32.70% to 4.40% and from 56.60% to 35.40%, respectively, suggesting that many nurses transitioned to a higher knowledge level ($\chi^2 = 92.4$; $p < 0.001$).

Table 2. Effect of SIM on the level of knowledge of cardiogenic shock among nurses

Level of knowledge	Scores from questions on cardiogenic shock	Before SIM training	After SIM training	Chi-square	p-value
		(n = 113)	(n = 113)		
		Frequency (%)	Frequency (%)		
Inadequate	<50%	37 (32.7)	5 (4.4%)	92.4	<0.001
Moderate	50-75%	64 (56.6)	40 (35.4%)		
Adequate	>75%	12 (10.6)	68 (60.2%)		

Table 3 shows the effect of SIM on the knowledge of nurses about different domains of cardiogenic shock. Overall, SIM increased the mean score of nurses' knowledge from 57.74 ± 0.83 to 77.56 ± 0.66 , reflecting an average enhancement of 19.86 ± 1.06 points ($p < 0.001$). Detailed analysis of specific knowledge domains revealed substantial improvements in all areas.

For instance, SIM statistically significantly increased the knowledge of: definitions, heart, pathophysiology, prevention, causes and risk factors, clinical manifestations, diagnosis, medical management, nursing management, and complications.

Table 3. Effect of SIM on the knowledge of nurses about domains of cardiogenic shock

Variables	Knowledge before SIM	Knowledge after SIM	Knowledge Enhancement	T-test	p-value
	training				
	Mean (SD)	Mean (SD)	Mean (SD)		
Heart physiology	40.3 ± 0.8	79.2 ± 0.6	38.9 ± 0.1	40.10	<0.001
Definitions	74.3 ± 0.6	90.3 ± 0.4	16 ± 0.7	22.22	<0.001
Causes & risk factors	58.1 ± 0.8	73.5 ± 0.7	15.4 ± 1.1	14.53	<0.001
Clinical manifestation	56.3 ± 0.9	78.8 ± 0.6	22.5 ± 1.1	20.83	<0.001
Pathophysiology	60.6 ± 1.1	78.5 ± 0.8	17.9 ± 1.3	13.36	<0.001
Diagnosis	42.8 ± 0.7	59.6 ± 0.6	16.8 ± 0.9	18.26	<0.001
Medical management	58.8 ± 1.2	78.9 ± 1.0	20.1 ± 1.6	12.72	<0.001
Complications	56.6 ± 0.6	77.9 ± 0.5	21.3 ± 0.8	27.66	<0.001
Nursing management	53.5 ± 1.2	73.1 ± 1.0	19.6 ± 1.6	12.41	<0.001
Prevention	76.1 ± 0.4	85.8 ± 0.4	9.7 ± 0.6	17.02	<0.001
Overall Knowledge	57.74± 0.8	77.56 ± 0.7	19.86 ± 1.1	17.98	<0.001

Table 4 presents the relationship between the demographic characteristics of the nurses and their knowledge of cardiogenic shock before and after training with SIM. Demonstration of adequate knowledge after SIM training increased among males and females, though the gender difference was not statistically significant. The SIM also remarkably increased the proportion of nurses with adequate knowledge of cardiogenic shock among those aged between 25 and 30 and those above 30 years, but the age difference was also not statistically significant. A similarly insignificant effect of marital status on the demonstration of adequate knowledge gained after SIM training was observed, though it increased among nurses who were married, divorced, and widowed.

The Level of education and years of experience did not have an overall effect on the nurses' demonstration of adequate knowledge on cardiogenic shock following SIM training. For instance, the proportion of nurses with adequate knowledge of cardiogenic shock increased among those with an advanced diploma (from 6.7% to 53.3%) and a bachelor's degree (from 13.2% to 64.7%), though the effect of their educational differences was not statistically significant. Lastly, SIM increased the proportion of nurses with adequate knowledge of cardiogenic shock among those who had 0 to 5 years (from 13.3% to 68.9%), 6 to 10 years (from 0% to 50%), and above 10 years (from 11.3% to 54.7%) of experience, but the differences across the years of experience were not statistically significant.

Table 4. Effect of demographic characteristics on nurses' knowledge of cardiogenic shock following SIM training

Demographic characteristics	Knowledge before SIM training			Knowledge after SIM training			Chi-Square	p-value
	Inadequate	Moderate	Adequate	Inadequate	Moderate	Adequate		
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)		
Gender								
Female	30 (36.1%)	45 (54.2%)	8 (9.6%)	4 (4.8%)	27 (32.5%)	52 (62.7%)	1.711	0.425
Male	7 (23.3%)	19 (63.3%)	4 (13.3%)	1 (3.3%)	13 (43.3%)	16 (53.3%)		

Table 4. Continued

Demographic characteristics	Knowledge before SIM training			Knowledge after SIM training			Chi-Square	p-value
	Inadequate	Moderate	Adequate	Inadequate	Moderate	Adequate		
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)		
Age- Group								
25-30	6 (23.1%)	16 (61.5%)	4 (15.4%)	1 (3.8%)	8 (30.8%)	17 (65.4%)	1.829	0.401
>30	31 (39.7%)	48 (61.5%)	8 (10.3%)	4 (5.1%)	32 (41.0%)	51 (65.4%)		
Marital status								
Single	6 (26.1%)	15 (65.2%)	2 (8.7%)	0 (0.0%)	8 (34.8%)	15 (65.2%)	4.158	0.655
Married	27 (32.1%)	47 (56.0%)	10 (11.9%)	5 (6.0%)	29 (34.5%)	50 (59.5%)		
Divorced	2 (66.7%)	1 (33.3%)	0 (0.0%)	0(0.0%)	1 (33.3%)	2 (66.7%)		
Widow	2 (66.7%)	1 (33.3%)	0 (0.0%)	0 (0.0%)	2 (66.7%)	1(33.3%)		
Educational level								
Advanced diploma	14 (31.1%)	28 (62.2%)	3 (6.7%)	2 (4.4%)	19 (42.2%)	24 (53.3%)	1.573	0.455
Bachelor's	23 (33.8%)	36 (52.9%)	9 (13.2%)	3 (4.4%)	21 (30.9%)	44 (64.7%)		
Years of experience								
0-5	13 (28.9%)	26 (57.8%)	6 (13.3%)	2 (4.4%)	12 (26.7%)	31 (68.9%)	5.054	0.282
6-10	3 (21.4%)	11 (78.6%)	0 (0.0%)	0 (0.0%)	7 (50.0%)	7 (50.0%)		
>10	21 (39.6%)	26 (49.1%)	6 (11.3%)	3 (5.7%)	21 (39.6%)	29 (54.7%)		

Discussion

This study assessed the effectiveness of a self-instructional module (SIM) on nurses' knowledge of cardiogenic shock. The majority of participants were married females over the age of 30, held a bachelor's degree in nursing, and had more than 10 years of professional experience. The predominance of female participants aligns with previous studies,[13,14] reflecting the historical gender imbalance in the nursing profession. As noted by Prosen,[15] the long-standing dominance of women in nursing likely contributes to their higher representation in studies related to the field. Similarly, the finding that most respondents were over 30 years old and married is consistent with earlier research. [7,13,14] Furthermore, individuals in this age group are more likely to participate in academic studies due to personality traits such as conscientiousness, openness, and extraversion.[14]

The high proportion of bachelor's degree holders with over a decade of experience also mirrors the findings, emphasizing

the value of advanced education in building a competent and respected nursing workforce.[16–18] Higher educational level among nurses has been associated with improved patient outcomes, enhanced care quality and safety, and greater professional satisfaction, benefiting both healthcare systems and society at large.[13,15]

Before administering the SIM training, nurses' baseline knowledge of cardiogenic shock was assessed and found to be limited. This finding aligns with previous research, which reported inadequate knowledge regarding myocardial infarction management in pre-intervention assessments.[1,2] Similarly, other studies have observed insufficient knowledge and poor standards of practice among nurses before training interventions, for example, in the prevention of ventilator-associated pneumonia.[19] Given the identified knowledge gap, a training session was conducted using SIM. Post-training, the nurses' knowledge was reassessed using the same questionnaire administered during the baseline evaluation.

The results showed a substantial improvement: the proportion of nurses with adequate knowledge of cardiogenic shock increased significantly from 10.6% to 60.2% following the SIM intervention. These findings are consistent with those of other studies, which also reported significant gains in clinical knowledge among nurses following SIM-based training.[1,2,12]

Some studies suggest that male learners may experience reduced concentration and comprehension when seated near female learners, potentially explaining the lower knowledge scores observed among male participants.[16,17] Additionally, research has shown that both single and married individuals may adapt more readily to new knowledge and practices.[16,18] Another study reported that nurses with fewer years of experience tend to gain more from SIM-based training, as they are often more open to new learning methods, more motivated to acquire new skills, and more flexible in absorbing new information.[14] Interestingly, pre-university level participants were also found to demonstrate greater improvement in understanding after SIM exposure compared to university degree holders.[5, 11,17,20] Consistent with these findings, this study also showed that demographic characteristics influence the improvement in nurses' knowledge of cardiogenic shock following SIM intervention.

Strengths and Limitations of the Study

The strength is that the study was conducted at one of the largest hospitals in the country, thereby making the results generalizable more widely, though cautiously. However, there were limitations faced. First, there was a lack of relevant literature specifically addressing the effectiveness of SIM in improving nurses' knowledge about cardiogenic shock, which limited comparative analysis. Despite its limitations, this study contributes to the growing knowledge about physiology education in Rwanda.[21]

Conclusions

In conclusion, Rwandan nurses demonstrated inadequate baseline knowledge of cardiogenic shock. However, training using SIM significantly increased the proportion of nurses with adequate knowledge on the topic. This study highlights the importance of on-the-job training as an effective strategy to enhance nurses' knowledge, which in turn can contribute to improved quality of healthcare service delivery and better patient outcomes. Future research is recommended to assess the long-term retention of knowledge, evaluate the impact of such training interventions on clinical practice and patient outcomes, and replicate the study in other healthcare settings to improve generalizability.

Competing interests

The authors declare no conflicts of interest to disclose

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Author contributions

ME, YA, and AIA contributed to the conceptualization and design of the study. ME was responsible for data collection in addition to study design. ME, YA, and AIA collaboratively performed data analysis and drafted the results. All three authors contributed to writing the manuscript. Finally, all authors reviewed and approved the final version of the manuscript.

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