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Effectiveness of A Planned Teaching Program on Knowledge and Practice Regarding the Use of Incentive Spirometry Among Patients Undergoing Cardiac Surgery at Apollo Excelcare Hospital

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Abstract

Background: Postoperative pulmonary complications (PPCs), such as atelectasis, pneumonia, and impaired lung expansion, are common among patients undergoing cardiac surgery and contribute significantly to increased morbidity, prolonged hospitalization, and higher healthcare costs. Incentive spirometry is a simple, non-invasive respiratory therapy used to prevent these complications by promoting sustained deep breathing and improving lung expansion. However, its effectiveness depends largely on patients' knowledge and ability to use the device correctly.

Aim: To assess the effectiveness of a planned teaching program on knowledge and practice regarding the use of incentive spirometry among patients undergoing cardiac surgery.

Methods: A quantitative pre-experimental one-group pretest-posttest design was employed. The study was conducted among 50 patients undergoing cardiac surgery in the CTVS unit of Apollo Excelcare Hospital. Participants were selected through convenience sampling. Data were collected using a structured knowledge questionnaire and an observational practice checklist. Following the pretest, a planned teaching program on the use of incentive spirometry was administered. Post test assessments were conducted using the same tools. Data were analyzed using descriptive and inferential statistics, including paired t-test and chi-square test.

Results: In the pretest, 39 (78%) participants had poor knowledge and 46 (92%) demonstrated poor practice regarding incentive spirometry. Following the planned teaching program, 46 (92%) participants achieved good knowledge and 44 (88%) demonstrated good practice. The mean knowledge score

increased from 1.98 ± 2.27 to 9.80 ± 1.17 ($t = 20.83$, $p < 0.001$). The mean practice score increased from 1.08 ± 1.42 to 9.42 ± 1.59 ($t = 30.33$, $p < 0.001$), indicating statistically highly significant improvement.
Conclusion: The planned teaching program was highly effective in improving both knowledge and practice regarding the use of incentive spirometry among patients undergoing cardiac surgery. Incorporating structured nurse-led educational interventions into routine perioperative care may enhance patient participation and help reduce postoperative pulmonary complications.

Keywords: Incentive spirometry, cardiac surgery, planned teaching program, knowledge, practice, patient education, postoperative pulmonary complications.

Introduction

Cardiac surgery is a major surgical intervention performed to treat conditions such as coronary artery disease, valvular heart disease, and congenital cardiac anomalies. Despite remarkable advances in surgical techniques, anesthesia, and perioperative management, postoperative pulmonary complications (PPCs) continue to be a significant cause of morbidity and prolonged hospitalization following cardiac surgery. Common PPCs include atelectasis, pneumonia, bronchospasm, pleural effusion, and respiratory failure, all of which may adversely affect patient recovery and increase healthcare costs. Postoperative pulmonary dysfunction after cardiac surgery results from several factors, including the effects of general anesthesia, cardiopulmonary bypass, median sternotomy, postoperative pain, and reduced chest wall movement. These factors impair effective coughing and deep breathing, leading to decreased lung expansion and retention of pulmonary secretions. Preventive respiratory interventions are therefore essential components of postoperative care. Incentive spirometry is a simple, non-invasive respiratory therapy that encourages sustained maximal inspiration. By promoting deep breathing and alveolar recruitment, it helps prevent atelectasis, improve oxygenation, and facilitate secretion clearance. Because of its ease of use and low cost, incentive spirometry is widely recommended for patients undergoing cardiac surgery as part of standard postoperative respiratory care.

The effectiveness of incentive spirometry depends largely on the patient's understanding of its purpose, technique, and frequency of use. Studies have shown that many patients do not use the device correctly when instructions are inadequate or inconsistent. Improper use may limit the therapeutic benefits and reduce the effectiveness of the intervention in preventing postoperative complications. Nurses play a central role in educating patients about postoperative breathing exercises and in reinforcing correct use of incentive spirometry. Planned teaching programs involving explanation, demonstration, and return demonstration can significantly improve patient knowledge and practice. Enhanced patient education contributes to greater adherence, improved respiratory outcomes, and faster postoperative recovery. Although incentive spirometry is routinely prescribed in cardiac surgical units, limited evidence is available regarding the effectiveness of structured teaching programs in improving patients' knowledge and practice in the local setting. Therefore, the present study was undertaken to assess the effectiveness of a planned teaching program on knowledge and practice regarding the use of incentive spirometry among patients undergoing cardiac surgery at Apollo Excelcare Hospital. The findings are expected to provide evidence for strengthening nurse-led educational interventions in perioperative care.

Need for the Study

Postoperative pulmonary complications (PPCs) are among the most common and clinically significant

complications following cardiac surgery. These complications, including atelectasis, pneumonia, pleural effusion, and respiratory insufficiency, are associated with increased morbidity, prolonged hospital stay, delayed recovery, and higher healthcare costs. Prevention of these complications is therefore a priority in postoperative management. Incentive spirometry is a widely used respiratory therapy that promotes deep breathing, improves lung expansion, and helps prevent alveolar collapse. It is inexpensive, non-invasive, and easy to administer. However, the clinical effectiveness of incentive spirometry is closely related to the patient's understanding of the purpose of the device and the ability to perform the technique correctly and consistently. Evidence from the literature indicates that many surgical patients have inadequate knowledge and poor practice regarding the use of incentive spirometry. Lack of structured instruction often leads to incorrect technique, poor compliance, and suboptimal outcomes. As nurses are primarily responsible for educating patients in the perioperative period, planned teaching programs can play a crucial role in improving patients' competence and adherence. A study by Su Hui et al. (2022) reported that nurse-guided incentive spirometry significantly reduced postoperative atelectasis, dyspnea, and length of hospital stay among patients undergoing cardiac surgery. Similarly, Navya M et al. (2023) found that structured teaching significantly improved postoperative patients' knowledge and practice regarding incentive spirometry.

In the clinical setting, it has been observed that many patients undergoing cardiac surgery are unfamiliar with incentive spirometry and are unable to use the device effectively without demonstration and reinforcement. This gap in knowledge and practice may compromise postoperative recovery and increase the likelihood of pulmonary complications. Therefore, there is a need to evaluate the effectiveness of a planned teaching program on knowledge and practice regarding the use of incentive spirometry among patients undergoing cardiac surgery. The findings of this study may contribute to evidence-based nursing practice and support the development of standardized educational protocols to improve patient outcomes.

Statement of the Problem

A study to assess the effectiveness of a planned teaching program on knowledge and practice regarding the use of incentive spirometry among patients undergoing cardiac surgery at Apollo Excelcare Hospital.

Objectives of the Study

The objectives of the present study were:

1. To assess the pre-interventional knowledge regarding the use of incentive spirometry among patients undergoing cardiac surgery.
2. To assess the pre-interventional practice regarding the use of incentive spirometry among patients undergoing cardiac surgery.
3. To evaluate the effectiveness of a planned teaching program by comparing pretest and posttest knowledge scores regarding the use of incentive spirometry among patients undergoing cardiac surgery.
4. To evaluate the effectiveness of a planned teaching program by comparing pretest and posttest practice scores regarding the use of incentive spirometry among patients undergoing cardiac surgery.
5. To determine the association between pretest knowledge scores and selected demographic variables.
6. To determine the association between pretest practice scores and selected demographic variables.

Research Hypotheses

The following hypotheses were formulated and tested at the 0.05 level of significance:

H1: The mean posttest knowledge score regarding the use of incentive spirometry among patients undergoing cardiac surgery will be significantly higher than the mean pretest knowledge score.

H2: The mean posttest practice score regarding the use of incentive spirometry among patients undergoing cardiac surgery will be significantly higher than the mean pretest practice score.

H3: There will be a statistically significant association between pretest knowledge scores regarding the use of incentive spirometry and selected demographic variables.

H4: There will be a statistically significant association between pretest practice scores regarding the use of incentive spirometry and selected demographic variables.

Operational Definitions

For the purpose of the present study, the following terms were operationally defined:

Effectiveness

Effectiveness refers to the extent to which the planned teaching program improves the knowledge and practice scores of patients regarding the use of incentive spirometry, as measured by the difference between pretest and posttest scores.

Planned Teaching Program

A planned teaching program refers to a structured educational intervention developed and administered by the investigator, consisting of explanation, demonstration, and return demonstration on the purpose, benefits, steps, frequency, and precautions related to the use of incentive spirometry.

Knowledge

Knowledge refers to the level of understanding of patients regarding the purpose, benefits, indications, technique, and frequency of incentive spirometry, as measured by a structured knowledge questionnaire.

Practice

Practice refers to the ability of patients to correctly perform the steps involved in using an incentive spirometer, as assessed through an observational checklist.

Incentive Spirometry

Incentive spirometry refers to a respiratory therapy device that encourages sustained maximal inspiration to promote lung expansion, prevent atelectasis, and reduce postoperative pulmonary complications.

Cardiac Surgery Patients

Cardiac surgery patients refer to adult individuals admitted for procedures such as coronary artery bypass grafting, valve replacement or repair, and other open-heart surgeries in the CTVS unit of Apollo Excelcare Hospital.

Methodology

This chapter describes the research approach, design, setting, population, sample, sampling technique,

criteria for sample selection, tools and techniques for data collection, procedure for data collection, and plan for data analysis used in the present study.

Research Approach

A quantitative research approach was adopted for the present study to assess the effectiveness of a planned teaching program on knowledge and practice regarding the use of incentive spirometry among patients undergoing cardiac surgery.

Research Design

A pre-experimental one-group pretest-posttest design was used in this study.

Design notation:

$O_1 \rightarrow X \rightarrow O_2$

Where:

- **O_1** = Pretest assessment of knowledge and practice
- **X** = Planned teaching program regarding the use of incentive spirometry
- **O_2** = Posttest assessment of knowledge and practice

Setting of the Study

The study was conducted in the CTVS unit of Apollo Excelcare Hospital.

Population

The target population comprised all patients undergoing cardiac surgery.

Sample

The sample consisted of 50 patients undergoing cardiac surgery who met the inclusion criteria.

Sampling Technique

Convenience sampling technique was used to select the participants.

Criteria for Sample Selection

Inclusion Criteria

- Patients undergoing cardiac surgery.
- Patients who were willing to participate in the study.

Exclusion Criteria

- Patients who were not available during the period of data collection.

Variables of the Study

Independent Variable

Planned teaching program regarding the use of incentive spirometry.

Dependent Variables

Knowledge and practice scores regarding the use of incentive spirometry.

Description of the Tool

The following tools were used for data collection:

Section A: Demographic Data Sheet

Included variables such as age, gender, educational qualification, history of respiratory conditions, duration of respiratory condition, and prior use of incentive spirometry.

Section B: Structured Knowledge Questionnaire

Used to assess knowledge regarding the purpose, benefits, steps, and frequency of incentive spirometry.

Section C: Observational Practice Checklist

Used to assess the participant's ability to correctly perform the steps of incentive spirometry.

Description of the Planned Teaching Program

The planned teaching program included:

- Introduction to incentive spirometry
- Purpose and benefits
- Indications and contraindications
- Step-by-step procedure
- Recommended frequency and duration
- Common errors and precautions
- Demonstration and return demonstration

Data Collection Procedure

1. Administrative approval and ethical clearance were obtained.
2. Eligible participants were identified.
3. Informed consent was obtained.
4. Pretest knowledge and practice assessments were conducted.
5. Planned teaching was administered individually.
6. Post test assessment was conducted using the same tools.

Plan for Data Analysis

Descriptive Statistics

- Frequency and percentage
- Mean and standard deviation

Inferential Statistics

- Paired t-test to compare pretest and post test scores
- Chi-square test to determine association between scores and demographic variables

Ethical Considerations

- Approval was obtained from the Institutional Ethics Committee of Apollo Excelcare Hospital.
- Written informed consent was obtained from all participants.
- Confidentiality and anonymity were maintained.
- Participants were informed of their right to withdraw at any stage.

Results

Data was Arranged, Organized and Presented as follows:

Section I:

Frequency and Percentage Distribution of Demographic Variables of patients undergoing cardiac surgery .

Section II:

Pre-test and post-test level of knowledge regarding Use of Incentive spirometry among patients undergoing cardiac surgery .

Pre-test and post-test level of practice regarding Use of Incentive spirometry among patients undergoing cardiac surgery

Section III:

Effectiveness of planned teaching program on Knowledge and practice regarding Use of Incentive spirometry among patients undergoing cardiac surgery .

Section IV:

Association between pre-test knowledge regarding Use of Incentive spirometry among patients undergoing cardiac surgery with their selected demographic variables.

Association between pre-test practice regarding Use of Incentive spirometry among patients undergoing cardiac surgery with their selected demographic variables

SECTION – I

Table 1: Frequency and Percentage Distribution of Demographic Variables.

N=50

S. No	Demographic Variables	frequency	percentage
1	Age in years		
	Below 18 years	9	18
	18-30 years	8	16
	31-45 years	22	44
	46-60 years	11	22
2	Gender		
	Male	37	74
	Female	13	26
3	Educational Qualification		
	Primary School	18	36
	Secondary school	22	44
	Intermediate and Graduate	5	10
	post graduate and above	5	10
4	Do you have a history of respiratory of conditions?		
	Yes	29	58
	No	21	42
5	How long have you been managing your respiratory condition?		
	Less 1 year		

	1-3 years 3 – 5 years Above 5 years	16 16 18 0	32 32 36 0
6	Have you ever use incentive spirometer before your doctor recommended it? Yes No	 1 49	 2 98

Fig 1: Distribution of age of patients undergoing cardiac surgery

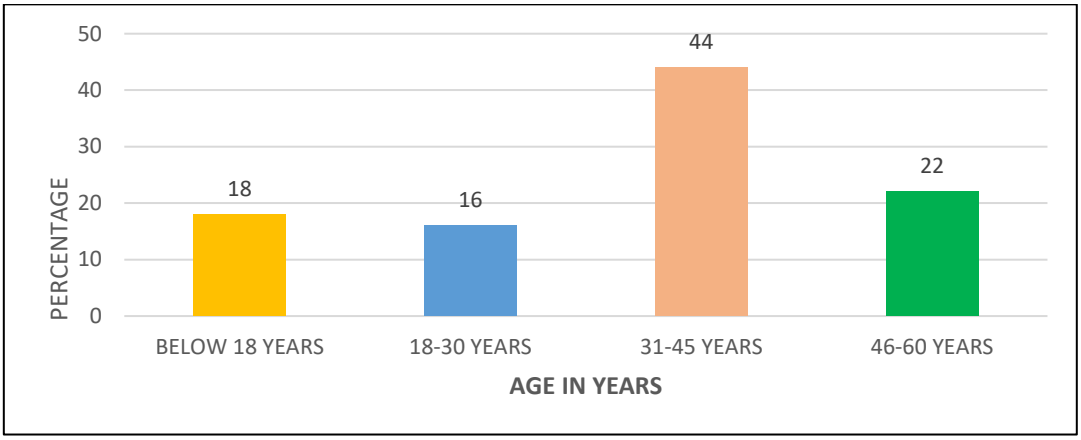


Fig 2: Distribution of gender of patients undergoing cardiac surgery

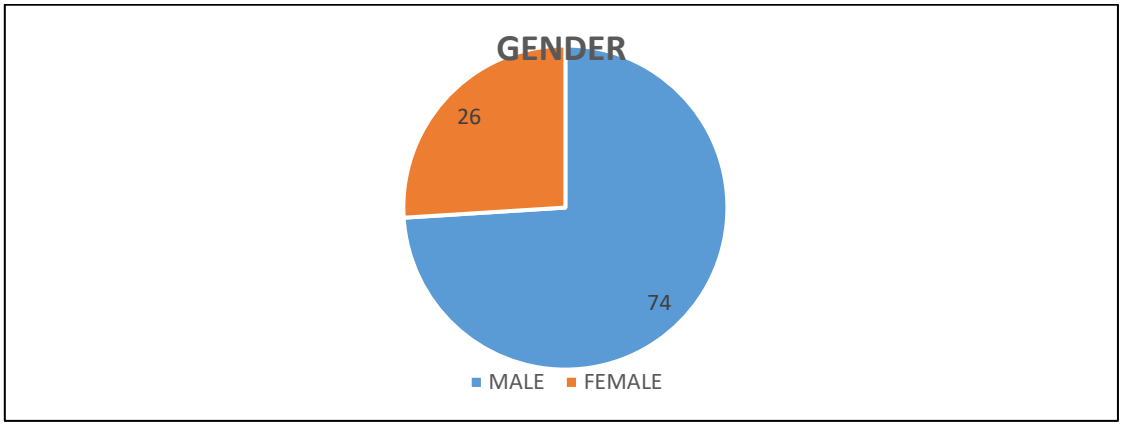


Fig 3: Distribution of educational qualification of patients undergoing cardiac surgery

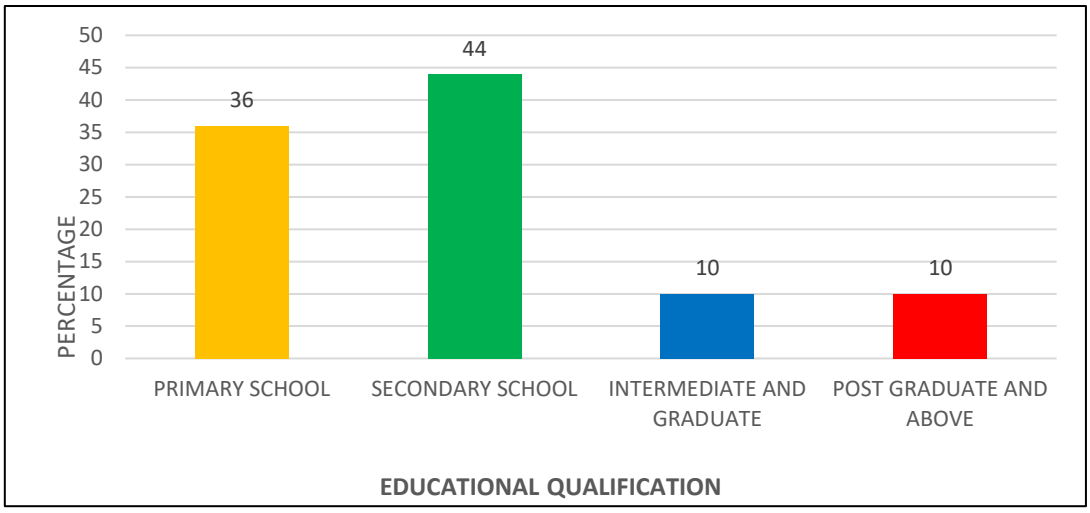


Fig 4: Distribution of history of respiratory of conditions of patients undergoing cardiac surgery

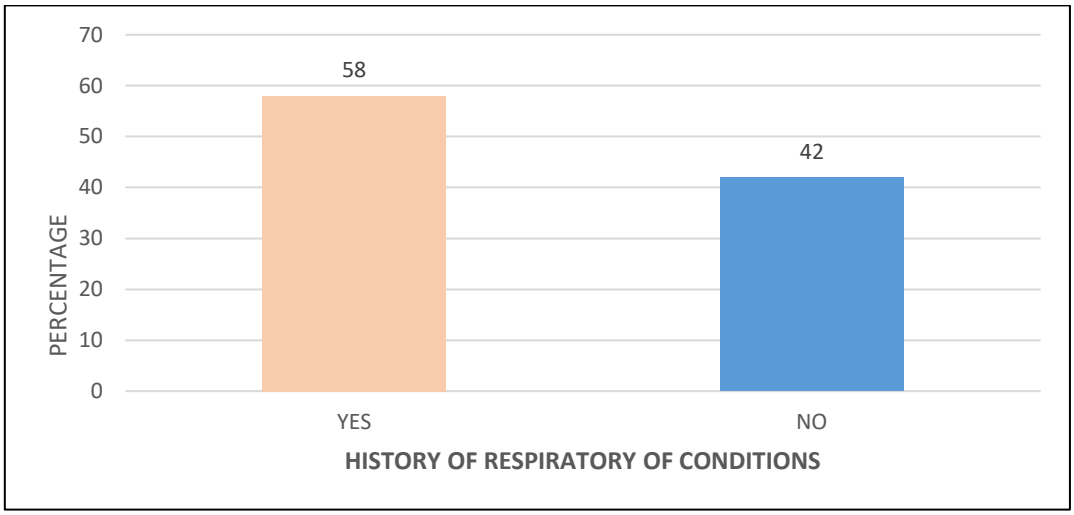


Fig 5: Distribution of How long have you been managing your respiratory condition of patients undergoing cardiac surgery

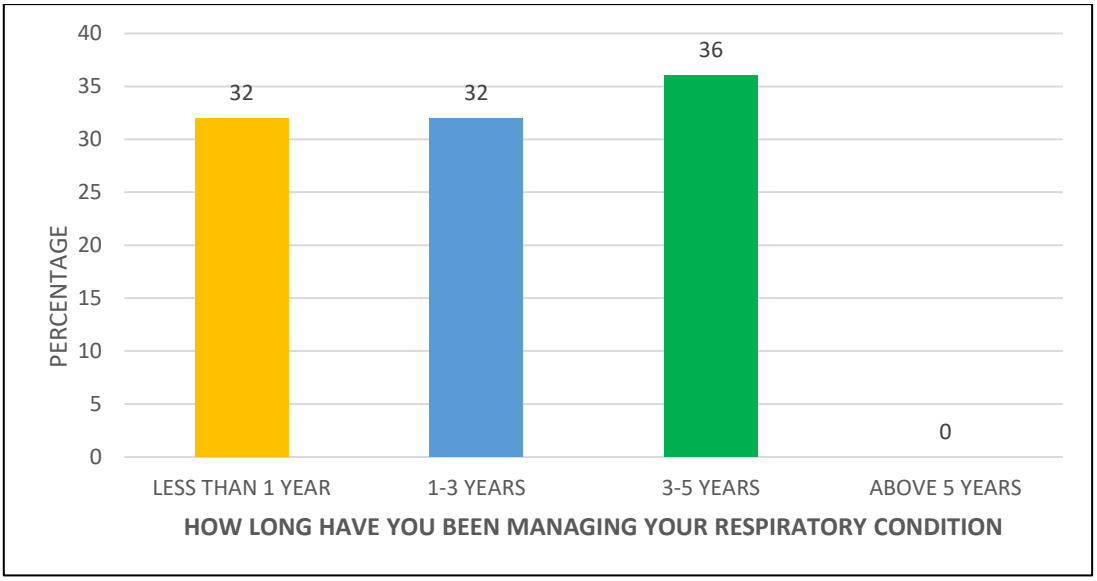
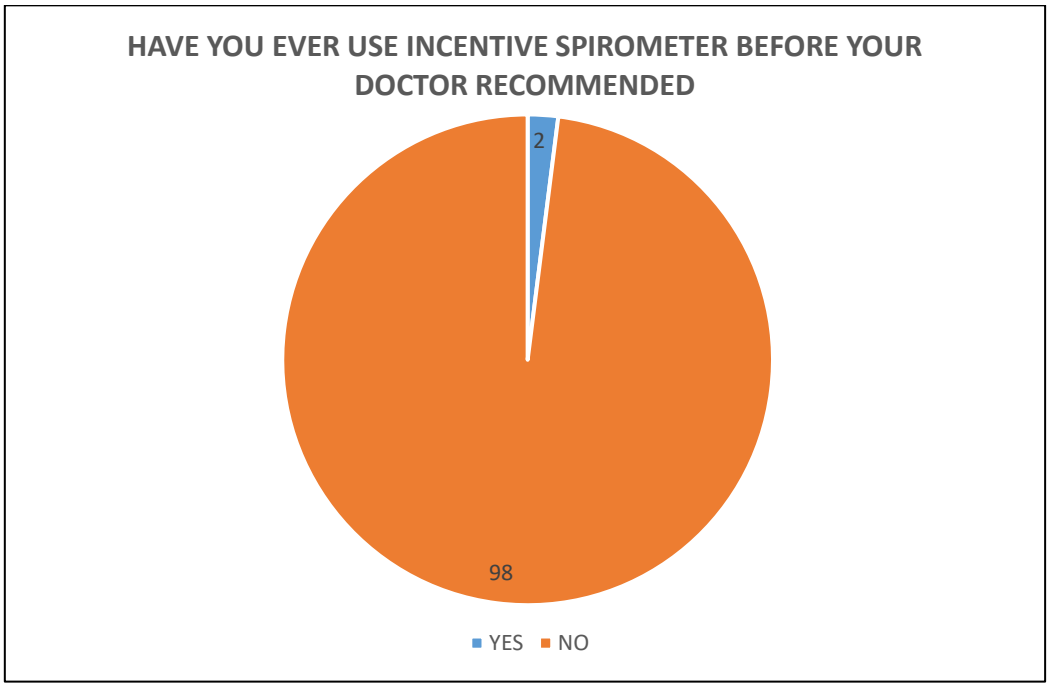


Fig 6: Distribution of Have you ever use incentive spirometer before your doctor recommended of patients undergoing cardiac surgery



SECTION – II

Table 2: Pre-test and post-test level of knowledge regarding Use of Incentive spirometry among patients undergoing cardiac surgery .

N=50

LEVEL OF KNOWLEDGE	Pre-Test		Post-Test	
	f	%	f	%
Poor knowledge	39	78	0	0
Moderate knowledge	11	22	4	8
Good knowledge	0	0	46	92

Fig 7: Pre-test and post-test level of knowledge regarding Use of Incentive spirometry among patients undergoing cardiac surgery .

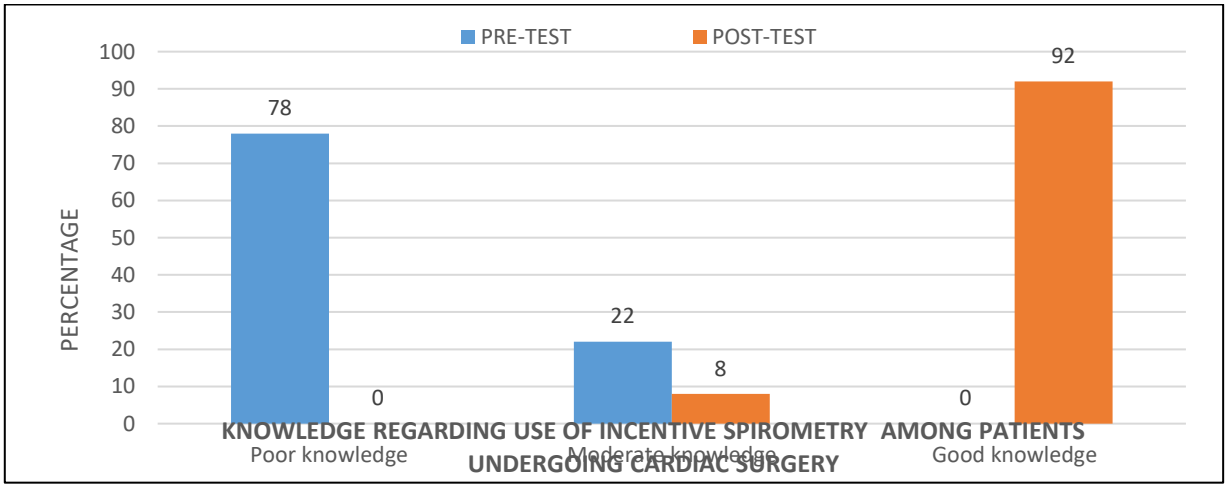
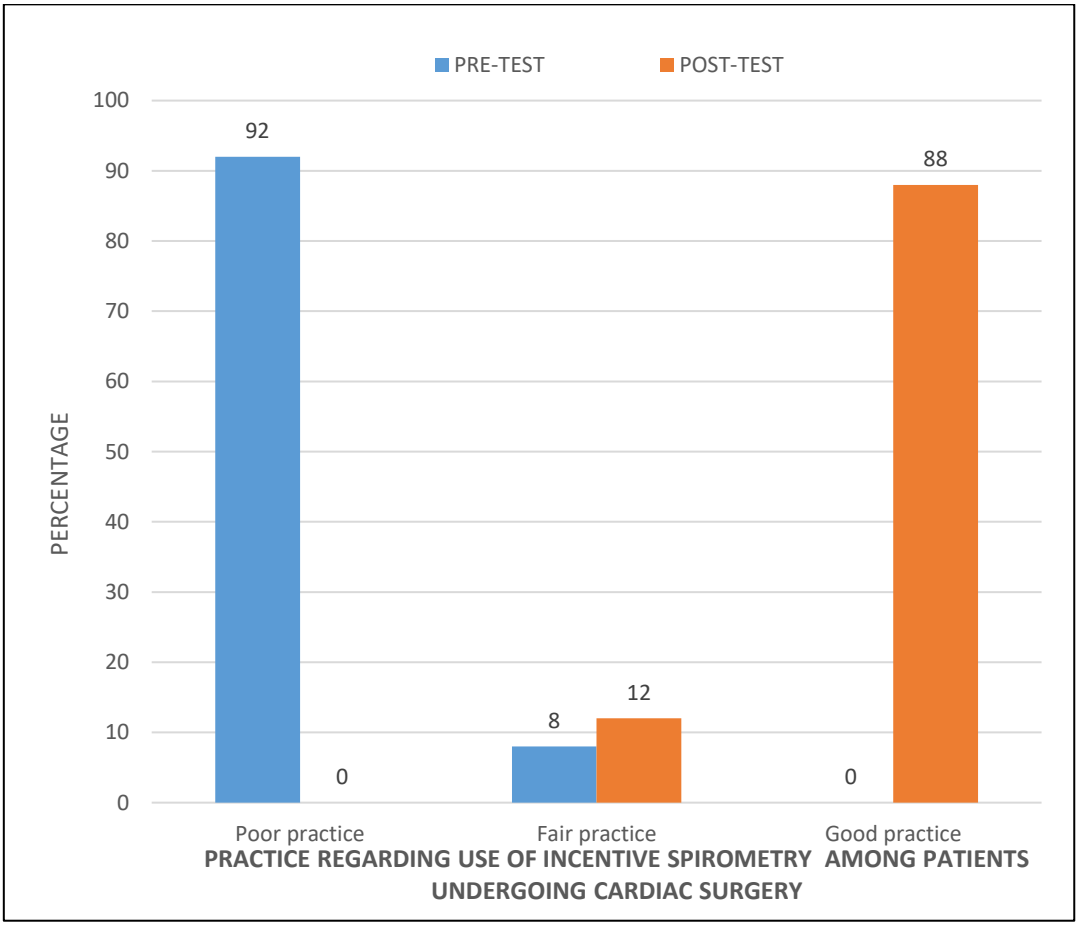


Table 3: Pre-test and post-test level of practice regarding Use of Incentive spirometry among patients undergoing cardiac surgery .

N=50

LEVEL OF PRACTICE	Pre-Test		Post-Test	
	f	%	f	%
Poor practice	46	92	0	0
Fair practice	4	8	6	12
Good practice	0	0	44	88

Fig 8: Pre-test and post-test level of practice regarding Use of Incentive spirometry among patients undergoing cardiac surgery .



SECTION - III

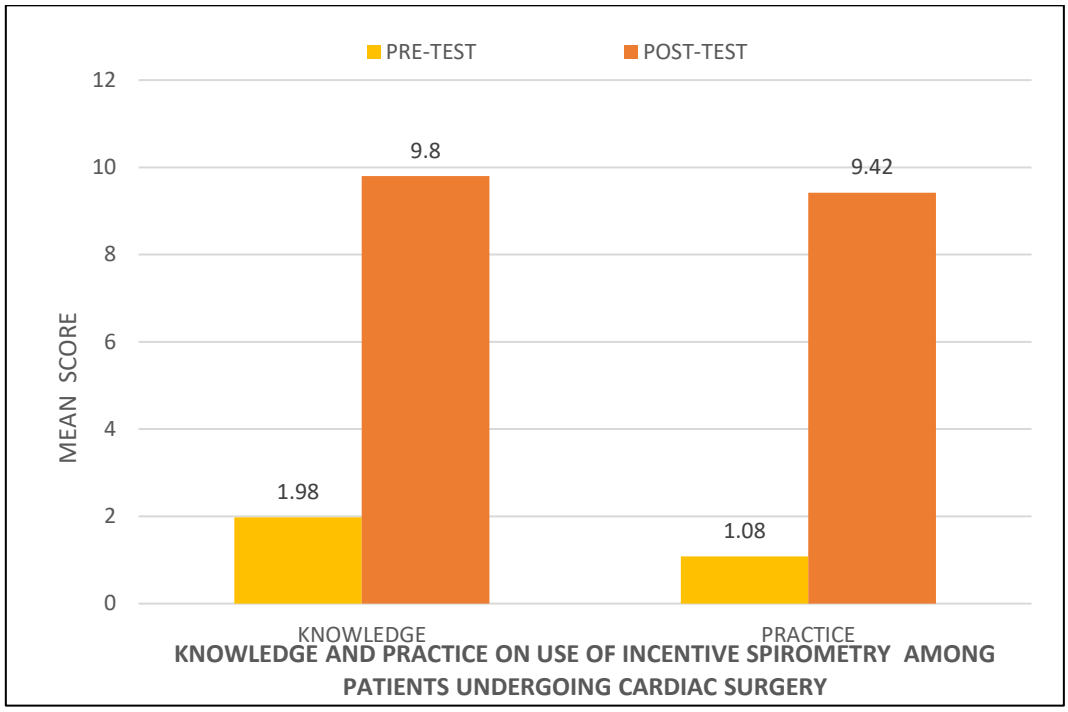
Table 4: Effectiveness of planned teaching program on Knowledge and practice on Use of Incentive spirometry among patients undergoing cardiac surgery .

N=50

Effectiveness	Pre-test Mean (SD)	Post-test Mean (SD)	Mean D	t value	df	P value
Knowledge	1.98 (2.27)	9.80 (1.17)	7.62	20.83	49	0.001*
Practice	1.08 (1.42)	9.42 (1.59)	8.34	30.33	49	0.001*

***p<0.05 level of significance**

Fig 9: Mean and SD of pre-test and post-test Knowledge and practice on Use of Incentive spirometry among patients undergoing cardiac surgery .



SECTION - IV

Table 5. Association between pre-test Knowledge on Use of Incentive spirometry among patients undergoing cardiac surgery with their selected demographic variables

N=50

S. No	Demographic Variables	Post-test knowledge		χ2 value	df	p value
		Poor	Moderate			
1	Age in years					
	Below 18 years	6	3	3.177	3	0.386^{NS}
	18-30 years	8	0			
	31-45 years	17	5			
	46-60 years	8	3			
2	Gender					
	Male	29	8	0.012	1	0.914^{NS}
	Female	10	3			
3	Educational Qualification					
	Primary School	13	5	2.661	3	0.419^{NS}
	Secondary school	18	4			
	Intermediate and Graduate	5	0			
	post graduate and above	3	2			
4	Do you have a history of respiratory of conditions?			0.911	1	0.340^{NS}
	Yes	24	5			
	No	15	6			

5	How long have you been managing your respiratory condition?					
	Less 1 year	12	4	3.3797	2	0.153^{NS}
	1-3 years	15	1			
	3 – 5 years	12	6			
	Above 5 years	--	--			
6	Have you ever use incentive spirometer before your doctor recommended it?					
	Yes	1	0	0.288	1	0.592^{NS}
	No	38	11			

***p value < 0.05 level of significance NS-Non Significant**

Table 6. Association between pre-test practice on Use of Incentive spirometry among patients undergoing cardiac surgery with their selected demographic variables

N=50

S. No	Demographic Variables	Post-test practice		χ2 value	df	p value
		Poor	Fair			
1	Age in years					
	Below 18 years	9	0	2.255	3	0.5131^{NS}
	18-30 years	8	0			
	31-45 years	20	2			
	46-60 years	9	2			
2	Gender					
	Male	33	4	2.529	1	0.336^{NS}
	Female	13	0			
3	Educational Qualification					
	Primary School	17	1	5.152	3	0.119^{NS}
	Secondary school	21	1			
	Intermediate and Graduate	5	0			
	post graduate and above	3	2			
4	Do you have a history of respiratory of conditions?					
	Yes	27	2	0.113	1	0.737^{NS}
	No	19	2			
5	How long have you been managing your respiratory condition?					

	a.. Less 1 year b.. 1-3 years c.. 3 – 5 years d.. Above 5 years	15 15 16 --	1 1 2 --	0.562	2	0.837^{NS}
6	Have you ever use incentive spirometer before your doctor recommended it? Yes No	 0 46	 1 3	 5.305	 1	 0.021*

***p value < 0.05 level of significance NS-Non Significant**

Section I: Distribution of Participants According to Demographic Variables

A total of 50 patients undergoing cardiac surgery participated in the study.

- **Age:** The largest proportion of participants, 22 (44%), were in the 31–45 years age group, followed by 11 (22%) in the 46–60 years age group, 9 (18%) below 18 years, and 8 (16%) in the 18–30 years age group.
- **Gender:** Most participants were male (37, 74%), while 13 (26%) were female.
- **Educational Qualification:** Twenty-two participants (44%) had secondary school education, 18 (36%) had primary education, and 5 (10%) each had intermediate/graduate and postgraduate education.
- **History of Respiratory Conditions:** Twenty-nine participants (58%) reported a history of respiratory conditions, whereas 21 (42%) did not.
- **Duration of Respiratory Condition:** Among those with respiratory conditions, 18 (36%) had the condition for 3–5 years, 16 (32%) for less than 1 year, and 16 (32%) for 1–3 years.
- **Previous Use of Incentive Spirometer:** Only 1 participant (2%) had used an incentive spirometer previously, while 49 (98%) had never used one.

Section II: Pretest and Posttest Levels of Knowledge and Practice

Knowledge Regarding Incentive Spirometry

In the pretest, 39 participants (78%) had poor knowledge and 11 (22%) had moderate knowledge. None had good knowledge.

Following the planned teaching program, 46 participants (92%) had good knowledge and 4 (8%) had moderate knowledge. No participant remained in the poor knowledge category.

Practice Regarding Incentive Spirometry

In the pretest, 46 participants (92%) demonstrated poor practice and 4 (8%) demonstrated fair practice. None had good practice.

In the posttest, 44 participants (88%) demonstrated good practice and 6 (12%) demonstrated fair practice. No participant remained in the poor practice category.

Section III: Effectiveness of the Planned Teaching Program

The effectiveness of the planned teaching program was assessed using the paired t-test.

Knowledge Scores

- Pretest mean ± SD: 1.98 ± 2.27
- Posttest mean ± SD: 9.80 ± 1.17

- Mean difference: 7.62
- t-value: 20.83
- p-value: < 0.001

Practice Scores

- Pretest mean ± SD: 1.08 ± 1.42
- Posttest mean ± SD: 9.42 ± 1.59
- Mean difference: 8.34
- t-value: 30.33
- p-value: < 0.001

The highly significant p-values indicate that the planned teaching program was effective in improving both knowledge and practice regarding the use of incentive spirometry.

Section IV: Association Between Scores and Demographic Variables

Chi-square analysis revealed that there was no statistically significant association between most demographic variables and knowledge or practice scores.

However, previous use of incentive spirometry was significantly associated with practice scores (χ^2 = 5.305, p = 0.021)

Summary of Findings

The study findings demonstrated that:

- Most participants had inadequate knowledge and poor practice regarding incentive spirometry before the intervention.
- Following the planned teaching program, substantial improvements were observed in both knowledge and practice.
- The increase in mean scores was statistically highly significant.
- Most demographic variables were not associated with the study outcomes.

These results confirm that the planned teaching program was highly effective in improving the knowledge and practice of patients undergoing cardiac surgery regarding the use of incentive spirometry.

Recommendations

Based on the findings of the present study, the following recommendations are proposed:

1. Similar studies may be conducted with larger sample sizes to enhance the generalizability of the findings.
2. Multi-center studies may be undertaken in different hospitals and clinical settings to compare outcomes across institutions.
3. Randomized controlled trials may be conducted to compare the effectiveness of various teaching strategies, such as individual teaching, group teaching, and audiovisual methods.
4. Longitudinal studies may be carried out to assess long-term retention of knowledge and sustained adherence to incentive spirometry.
5. Future research may evaluate the effect of planned teaching programs on clinical outcomes such as incidence of postoperative pulmonary complications, duration of hospital stay, and patient satisfaction.
6. Educational materials such as videos, illustrated booklets, and multilingual handouts may be developed and tested to improve patient understanding and engagement.

7. Similar interventions may be evaluated among patients undergoing other major surgeries, such as thoracic, abdominal, and orthopedic procedures.

Conclusion

The present study was conducted to assess the effectiveness of a planned teaching program on knowledge and practice regarding the use of incentive spirometry among patients undergoing cardiac surgery at Apollo Excelcare Hospital. The findings revealed that most participants had inadequate knowledge and poor practice regarding incentive spirometry before the intervention. Following the planned teaching program, there was a marked improvement in both knowledge and practice scores. The increase in mean scores was statistically highly significant, demonstrating the effectiveness of the educational intervention. These findings indicate that structured teaching, supported by demonstration and return demonstration, is an effective nursing strategy for enhancing patients' understanding and performance of incentive spirometry.

The study highlights the vital role of nurses in perioperative patient education and supports the integration of standardized teaching programs into routine clinical practice. Effective nurse-led education can improve patient participation in postoperative respiratory care, contribute to the prevention of pulmonary complications, and promote faster and safer recovery following cardiac surgery.

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