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Effectiveness of Video-Assisted Teaching on Knowledge of Chronic Obstructive Pulmonary Disease and Spirometer Benefits among Hospitalized Patients: A One-Group Pre-Test–Post-Test Study

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ABSTRACT:

Background: Chronic obstructive pulmonary disease (COPD) is a long-term respiratory condition that requires patients to understand their illness, recognize the importance of symptom management, and participate in appropriate respiratory care. Patient education may improve knowledge and support self-management; however, hospitalized patients may have limited information about COPD and the benefits of spirometer-related breathing practices.

Objective: To assess the effectiveness of a video-assisted teaching (VAT) programme on knowledge regarding COPD and spirometer benefits among COPD patients admitted to Adichunchanagiri Hospital and Research Centre, B G Nagara.

Methods: A quantitative evaluative study with a pre-experimental one-group pre-test–post-test design was conducted among 40 hospitalized COPD patients selected by convenience sampling. A 30-item structured knowledge questionnaire was administered before the intervention. Participants then received VAT addressing COPD, breathing exercises, living with COPD, and spirometer-use techniques and benefits. The same questionnaire was administered seven days later. Descriptive statistics, paired *t* test, and chi-square test were used.

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Results: The mean knowledge score increased from 15.05 (SD 1.58) at pre-test to 24.40 (SD 1.46) at post-test, yielding a mean difference of 9.35 points. The reported paired t value was 27.75 ($df = 39$, $p < 0.05$). At pre-test, 15 participants (37.5%) had inadequate knowledge and 25 (62.5%) had moderate knowledge; no participant had adequate knowledge. At post-test, 35 participants (87.5%) had adequate knowledge and 5 (12.5%) had moderate knowledge. Occupation was significantly associated with pre-test knowledge level ($\chi^2 = 7.65$, $df = 2$, $p = 0.02$).

Conclusions: VAT was associated with significantly improved short-term knowledge regarding COPD and spirometer benefits among hospitalized COPD patients. The findings support the use of structured audiovisual education as a nursing strategy, while recognizing that the uncontrolled design does not establish causality or clinical benefit.

1. INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a progressive respiratory disorder characterized by persistent airflow limitation and respiratory symptoms. Common symptoms include breathlessness, chronic cough, sputum production, wheeze, chest tightness, fatigue, and reduced tolerance for daily activity. The condition is commonly associated with exposure to tobacco smoke, biomass fuel, air pollution, occupational dust, and chemical irritants. COPD has substantial effects on the daily lives of patients because symptoms, recurrent exacerbations, treatment burden, and hospital admissions may limit physical function, employment, family roles, and quality of life.

The prevention and long-term management of COPD involve more than pharmacological treatment. Patients need clear and repeated information about the nature of the illness, avoidance of smoking and respiratory irritants, recognition of worsening symptoms, adherence to prescribed treatment, breathing exercises, nutrition, physical activity within individual tolerance, infection prevention, and appropriate use of prescribed respiratory devices. Knowledge is particularly important during hospitalization, when patients may be more receptive to information and nursing staff can reinforce self-care practices before discharge.

Spirometry is an objective test of lung function that measures the amount and flow of air inhaled and exhaled. It is used in the assessment and monitoring of obstructive respiratory conditions. The term "spirometer" is sometimes used broadly by patients to refer to respiratory devices; however, diagnostic spirometry and incentive spirometry have different purposes. Diagnostic spirometry measures pulmonary function, whereas an incentive spirometer is a device used to encourage slow, sustained inspiration and provide visual feedback. The original dissertation refers to "spirometer benefits" and teaching on spirometer-use techniques; this manuscript retains that terminology but recommends that the authors confirm the exact device taught and use the correct term consistently throughout the final submission.

In nursing practice, education is a central component of COPD care. Printed material may not be sufficient for individuals with limited literacy, physical discomfort, anxiety, poor concentration, or limited previous exposure to health information. Audiovisual teaching can combine images, narration, demonstration, and repetition. A video can demonstrate breathing practices and device-use steps in a standardized manner, while the nurse remains available to clarify questions and assess the patient's understanding. This approach may be especially practical in inpatient settings with high patient turnover.

The present study was undertaken because the investigator observed a need to improve awareness of COPD and spirometer-related care among hospitalized patients at Adichunchanagiri Hospital and Research Centre, B G Nagara. The study evaluated whether a video-assisted teaching programme could improve patient knowledge over a seven-day period.

Objectives

The study objectives were:

1. To assess the baseline knowledge of COPD patients regarding COPD and spirometer benefits using the mean pre-test score.
2. To develop and implement a video-assisted teaching programme on COPD and spirometer benefits.

3. To determine the effectiveness of VAT by comparing pre-test and post-test knowledge scores.
4. To examine the association between pre-test knowledge level and selected demographic variables.

Hypotheses

H1: The mean post-test knowledge score regarding COPD and spirometer benefits would be significantly higher than the mean pre-test knowledge score among COPD patients.

H2: Pre-test knowledge score would be significantly associated with selected demographic variables of COPD patients.

2. MATERIALS AND METHODS

2.1 Research approach and design

This was a quantitative evaluative study using a pre-experimental one-group pre-test–post-test design. All participants completed a knowledge assessment before the intervention, received the same educational intervention, and completed the knowledge assessment again seven days later. The study design can be represented as:

$$E\ O_1\ X\ O_2$$

where *E* denotes the experimental group, *O*1 denotes the baseline knowledge assessment, *X* denotes VAT, and *O*2 denotes the post-intervention knowledge assessment.

The design was chosen to assess change in knowledge within the same group of hospitalized COPD patients. It is appropriate for preliminary educational evaluation but does not include a comparison group. Therefore, observed score changes cannot be attributed solely to VAT.

2.2 Setting

The study was conducted at Adichunchanagiri Hospital and Research Centre, B G Nagara, Karnataka, India. The site was selected because COPD patients were accessible, the investigator had institutional permission to undertake the study, and the setting was geographically feasible for the researcher.

2.3 Population, sample, and sampling

The target population comprised COPD patients admitted to Adichunchanagiri Hospital and Research Centre. The accessible population included admitted COPD patients who met the study eligibility criteria during the data-collection period.

The sample consisted of 40 COPD patients. Non-probability convenience sampling was used. Convenience sampling enabled the investigator to recruit eligible inpatients available during the study period; however, it limits the representativeness of the sample and restricts generalization of findings to other hospitals or populations.

2.4 Eligibility criteria

Participants were eligible if they:

- Were admitted with COPD at the study hospital during the period of data collection.
- Were available at the time of data collection.
- Included male and female patients.
- Were willing to participate after receiving an explanation of the study.

Participants were excluded if they:

- Did not consent to participate.
- Were seriously ill or had COPD-associated complications that made participation inappropriate.

The dissertation also describes participants as having COPD for more than one year. The authors should verify this criterion using the original protocol and patient records before submission.

2.5 Variables

The independent variable was the video-assisted teaching programme about COPD and spirometer benefits. The dependent variable was participants' knowledge regarding COPD and spirometer benefits, measured through a structured questionnaire.

The selected demographic variables were age, sex, education, occupation, type of family, frequency of hospitalization, prior information regarding spirometer, source of information, nature of the working area, and monthly family income.

2.6 Instrument development

The data-collection instrument had two sections.

Section A: Demographic proforma. This section included 10 demographic items: age, sex, education, occupation, type of family, frequency of hospitalization, previous information about spirometer, source of information, nature of working area, and monthly family income.

Section B: Structured knowledge questionnaire. This section consisted of 30 objective questions on general aspects of COPD and spirometer benefits. Each correct response was assigned a score of 1 and each incorrect response was assigned a score of 0, giving a possible total score of 30. The dissertation categorized knowledge as inadequate, moderate, and adequate; however, the numerical cut-offs are not consistently presented in the dissertation. The original scoring key should be reviewed and the final categories recalculated from participant-level data before journal submission.

The instrument was developed through literature review, consultation with medical-surgical nursing experts, development of a blueprint, construction of items, content validation, pre-testing, and reliability testing. Five experts reviewed the data-collection tool: three postgraduate experts in medical-surgical nursing, one head of medicine, and one duty medical officer. The dissertation reports 100% agreement on most items, with minor revisions incorporated following expert feedback.

Reliability of the questionnaire was established using the test–retest method among four COPD patients who met the inclusion criteria. The reported reliability coefficient was 0.93, indicating high stability of the instrument in the pilot assessment.

2.7 Development of VAT

The VAT programme was prepared after review of the literature and discussion with relevant experts. Its development included preparation of a first draft, development of visual aids, assessment of content validity, incorporation of expert suggestions, and preparation of the final version. Seven experts reviewed the video-assisted teaching content; the dissertation reports 100% agreement on its content.

The programme included four main content areas:

1. General aspects of COPD, including the meaning of COPD, common symptoms, risk factors, and the importance of medical follow-up.
2. Breathing exercises for COPD patients, with emphasis on practices that may support comfortable and controlled breathing.
3. Living with COPD, including lifestyle measures and day-to-day self-care.
4. Spirometer-use techniques and benefits, including the purpose of the device and correct-use information as included in the teaching programme.

The dissertation does not clearly report the duration of the video, language used, whether it was shown individually or in groups, whether device demonstration was included, or how fidelity of delivery was monitored. These details should be added from the original lesson plan and data-collection records before submission.

2.8 Pilot study

A pilot study was conducted among four COPD patients selected through convenience sampling. Written permission was obtained from the hospital administration, and consent was obtained from participants. The pre-test was administered on day 1, VAT was delivered on the same day, and the post-test was conducted on day 7. The dissertation reports that each post-test required approximately 20–30 minutes.

The reported mean pre-test knowledge score in the pilot study was 16.25 and the mean post-test score was 24.00. The investigator considered the intervention and procedures feasible and used the finalized tool and VAT programme for the main study. Pilot participants should not be included in the main study sample; this should be confirmed by the authors.

2.9 Data-collection procedure

Formal written permission was obtained from the Medical Superintendent of Adichunchanagiri Hospital, B G Nagara. According to the dissertation, permission was dated 08 August 2022. The investigator explained the purpose of the study to potential participants, obtained consent, and assured confidentiality.

Data collection occurred in three phases:

1. **Pre-test:** Demographic information and baseline knowledge were collected from 40 participants using the structured questionnaire. Participants received instructions, and questions were clarified as needed. The dissertation reports that completion required approximately 20–30 minutes per participant.
2. **Intervention:** VAT on COPD and spirometer benefits was administered after baseline assessment. Participants were given an opportunity to ask questions, which were clarified by the investigator.
3. **Post-test:** On the seventh day following VAT, the same structured questionnaire was administered to assess post-intervention knowledge.

2.10 Statistical analysis

Data were compiled and analyzed using descriptive and inferential statistics. Frequencies and percentages were used to describe demographic characteristics and knowledge categories. Mean scores, mean percentages, standard deviations, and coefficients of variation were used to summarize pre-test and post-test knowledge scores.

A paired *t* test was used to compare mean pre-test and post-test knowledge scores. Chi-square tests were used to explore the association between pre-test knowledge category and selected demographic variables. The dissertation used a significance threshold of $p < 0.05$.

The dissertation text contains calculation and reporting discrepancies. For example, it describes a 30-item questionnaire but presents a mean score of 15.05 as 37.63%, whereas 15.05/30 equals 50.17%. Similarly, 24.40/30 equals 81.33%, not 61.00%. Therefore, all statistics in the final manuscript must be recomputed from the master datasheet by an independent statistician or the authors using verified raw data.

2.11 Ethical considerations

The dissertation states that administrative permission was obtained and that consent and confidentiality procedures were followed. It also includes an ethical committee certificate in its annexures. The final manuscript must state the approving ethics committee, approval reference number, approval date, consent method, and measures used to protect participant confidentiality. No identifying patient information should be included in the manuscript.

3. RESULTS AND DISCUSSION

3.1 Participant characteristics

A total of 40 COPD patients participated in the study. Most participants were aged 30–35 years (18, 45.0%), followed by 24–29 years (16, 40.0%) and 35 years or older (6, 15.0%). The reported age distribution is unusual for a COPD inpatient sample and should be verified against the master data and source documents.

Twenty-two participants (55.0%) were female and 18 (45.0%) were male. Regarding education, 23 participants (57.5%) had primary education, 15 (37.5%) had secondary education, and two (5.0%) were illiterate. No participant was recorded as a graduate.

The most common occupation was coolie work (19, 47.5%), followed by business (16, 40.0%) and homemaking (5, 12.5%). Twenty-one participants (52.5%) reported living in a nuclear family and 19 (47.5%) in a joint family. These characteristics indicate that the study involved participants with diverse social and occupational backgrounds, many of whom may have had limited formal educational exposure.

Twenty-six participants (65.0%) reported being hospitalized three times in a year, while 14 (35.0%) reported hospitalization twice in a year. Twenty-three participants (57.5%) reported no prior information regarding spirometer use, suggesting a need for structured education. In the reported source-of-information categories, hospital was the main source for 28 participants (70.0%), followed by friends for seven (17.5%), media for four (10.0%), and family for one (2.5%).

Regarding work environment, 23 participants (57.5%) reported working in a mud-area environment, 15 (37.5%) in a dusty environment, and two (5.0%) in a crowded environment. Twenty-five participants (62.5%) reported a monthly family income of ₹5,000–10,000, 14 (35.0%) reported ₹10,000–15,000, and one (2.5%) reported more than ₹15,000. These findings should be interpreted descriptively and should not be used to infer causal relationships between occupational exposures, income, and COPD because the study was not designed for that purpose.

Table 1. Participant demographic characteristics (N = 40).

Variable	Category	n	%
Age	18–23 years	0	0.0
	24–29 years	16	40.0
	30–35 years	18	45.0
	≥35 years	6	15.0
Sex	Male	18	45.0
	Female	22	55.0
Education	Illiterate	2	5.0
	Primary education	23	57.5
	Secondary education	15	37.5
Occupation	Homemaker	5	12.5
	Coolie worker	19	47.5
	Business	16	40.0
Type of family	Joint family	19	47.5
	Nuclear family	21	52.5
Hospitalization frequency	Second time/year	14	35.0
	Third time/year	26	65.0
Prior spirometer information	Yes	17	42.5

	No	23	57.5
Source of information	Family	1	2.5
	Media	4	10.0
	Hospital	28	70.0
	Friend	7	17.5
Nature of working area	Crowded area	2	5.0
	Dusty area	15	37.5
	Mud area	23	57.5
Monthly family income	₹5,000–10,000	25	62.5
	₹10,000–15,000	14	35.0
	>₹15,000	1	2.5

3.2 Pre-test knowledge

Before the educational intervention, none of the participants was categorized as having adequate knowledge. Fifteen participants (37.5%) had inadequate knowledge and 25 (62.5%) had moderate knowledge. The reported mean pre-test score was 15.05, with a standard deviation of 1.58 and observed scores ranging from 11 to 18.

This pattern suggests that, before VAT, participants had important information gaps regarding COPD and the stated benefits of spirometer-related care. The baseline distribution is consistent with the practical rationale for a structured teaching intervention: most participants had either inadequate or moderate knowledge, and more than half reported no previous spirometer information.

Table 2. Pre-test knowledge category regarding COPD and spirometer benefits (N = 40).

Knowledge category	n	%
Inadequate	15	37.5
Moderate	25	62.5
Adequate	0	0.0
Total	40	100.0

3.3 Post-test knowledge

Seven days after VAT, no participant was categorized as having inadequate knowledge. Five participants (12.5%) had moderate knowledge, and 35 participants (87.5%) had adequate knowledge. The reported mean post-test score was 24.40, with a standard deviation of 1.46 and observed scores ranging from 22 to 28.

The change in category distribution indicates that most participants moved into the adequate-knowledge category by the post-test. This shift may reflect the accessibility of the audiovisual format, the relevance of content to the participants' immediate health condition, or the additional clarification provided during teaching. However, the absence of a control group means that a direct causal effect cannot be concluded.

Table 3. Post-test knowledge category regarding COPD and spirometer benefits (N = 40).

Knowledge category	n	%
Inadequate	0	0.0
Moderate	5	12.5
Adequate	35	87.5
Total	40	100.0

3.4 Effect of VAT on knowledge scores

The mean knowledge score increased from 15.05 at baseline to 24.40 after VAT. The reported mean increase was 9.35 points. The paired *t* statistic was 27.75 with 39 degrees of freedom, which was reported as statistically significant at the 0.05 level. The study therefore accepted the first hypothesis that post-test knowledge would be greater than pre-test knowledge.

The magnitude of the reported difference indicates a strong within-group change. Nevertheless, interpretation requires caution. A one-group pre-test–post-test design is vulnerable to testing effects because participants may perform better at follow-up partly because they have previously seen the questions. It is also vulnerable to history effects, such as information received from staff, relatives, or other patients during the seven-day period. The study did not measure retention beyond day 7, practical device-use skill, medication adherence, exacerbations, or readmission. Thus, the findings should be presented as evidence of improved short-term questionnaire-based knowledge rather than improved clinical outcomes.

Table 4. Comparison of pre-test and post-test knowledge scores (N = 40).

Variable	Pre-test	Post-test	Mean difference	Paired *t*	df	Reported significance
Mean score	15.05	24.40	9.35	27.75	39	$p < 0.05$
Standard deviation	1.58	1.46	—	—	—	—
Reported mean percentage	37.63	61.00	23.37	—	—	—

Important statistical note: The "reported mean percentage" values in the dissertation are not consistent with a 30-item scoring scale. If the maximum score was 30, the corresponding percentages are 50.17% for the pre-test and 81.33% for the post-test. This table reproduces the dissertation's reported values for transparency, but the final paper must contain recalculated and internally consistent statistics.

3.5 Association between baseline knowledge and demographics

The dissertation reports a statistically significant association between pre-test knowledge level and occupation ($\chi^2 = 7.65$, $df = 2$, $p = 0.02$). Participants working as coolies had 11 inadequate and eight moderate pre-test knowledge classifications; those in business had two inadequate and 14 moderate classifications; and homemakers had two inadequate and three moderate classifications.

No statistically significant association was reported for age, sex, education, type of family, frequency of hospitalization, prior spirometer information, source of information, nature of working area, or family income. However, several cells had zero values and some reported chi-square degrees of freedom do not appear to match the categories shown. Chi-square assumptions may therefore have been violated. The association analyses should be repeated from the raw data; Fisher's exact test or category collapsing may be more appropriate where expected cell counts are small.

Table 5. Reported association of pre-test knowledge with selected demographic variables.

Variable	Reported χ^2	df	Reported p value	Interpretation
Age	0.05	2	0.97	Not significant
Sex	0.67	1	0.41	Not significant
Education	4.11	2	0.12	Not significant
Occupation	7.65	2	0.02	Significant
Type of family	0.006	1	0.93	Not significant
Hospitalization frequency	0.26	1	0.60	Not significant
Prior spirometer information	0.82	1	0.36	Not significant
Source of information	2.36	3	0.50	Not significant
Nature of working area	2.71	3	0.43	Not significant
Family income	0.79	2	0.67	Not significant

3.6 Interpretation of findings

The findings indicate that hospitalized COPD patients in this sample had limited baseline knowledge and demonstrated higher post-test knowledge after receiving VAT. This is important for nursing practice because patient education is often delivered during short clinical encounters and must be understandable, relevant, and feasible for patients with varying educational backgrounds.

The results also suggest that video-based instruction may be useful as a standardized component of patient education. The visual format can help explain disease concepts and demonstrate actions that may be difficult to communicate through verbal instruction alone. It can also support repeated delivery of consistent content. Yet video should not replace individualized nursing education: patients should be able to ask questions, demonstrate understanding, receive correction of misconceptions, and obtain advice tailored to their clinical status.

The study has methodological strengths. It used a clearly defined pre-test–post-test sequence, a structured tool, reported expert review of both the questionnaire and VAT content, and a reliability coefficient of 0.93. The intervention content was relevant to the needs of COPD patients and was assessed within a clinically meaningful inpatient period.

The study also has important limitations. It had a small sample of 40 participants from one hospital and used convenience sampling. There was no control group, no random allocation, and no blinding. The study evaluated knowledge only and did not evaluate device technique, health behavior, adherence, quality of life, pulmonary-function outcomes, emergency visits, readmissions, or exacerbations. A seven-day follow-up cannot show whether knowledge was retained. Finally, the inconsistencies in reported score percentages, knowledge cut-offs, and some contingency-table statistics require careful verification before the study can be submitted as a journal article.

4. CONCLUSIONS

Among 40 hospitalized COPD patients, knowledge regarding COPD and spirometer benefits increased significantly after participation in a video-assisted teaching programme. The mean score increased from 15.05 to 24.40, and the proportion categorized as having adequate knowledge increased from 0% at baseline to 87.5% at the seven-day post-test.

The findings support VAT as a potentially useful nursing education strategy to improve short-term disease-related knowledge in hospitalized COPD patients. However, because the study used a single-group, pre-experimental design, the findings should not be interpreted as definitive evidence that VAT alone caused the observed change or that it improves clinical outcomes. Future research should use adequately powered controlled designs, validated scoring systems, longer follow-up, and outcomes that include observed device technique, self-management behavior, quality of life, exacerbations, and hospital utilization.

DECLARATIONS

Ethics approval and consent to participate

The study received institutional and hospital permission, and the dissertation indicates that an ethics committee certificate was obtained. **Insert the full ethics committee name, approval number, approval date, and consent procedure here after verification from Annexure O.** Written informed consent was obtained from participants before data collection. The study should be reported as compliant with applicable institutional ethical standards and the Declaration of Helsinki, if applicable.

Consent for publication

Not applicable; no identifiable participant information is included.

Availability of data and materials

The supporting data are contained in the dissertation's master data sheets. A de-identified participant-level dataset should be deposited in a suitable repository or made available from the corresponding author on reasonable request, subject to ethics approval and institutional policy.

Competing interests

The authors declare that they have no competing interests. **All authors should confirm this statement before submission.**

Funding

No external funding was reported in the dissertation. **Confirm or revise this statement before submission.**

Authors' contributions

Theja B C conceived the study, developed the educational programme and data-collection tool, collected data, conducted the initial analysis, and drafted the manuscript. Shobha K R supervised the study, provided methodological and academic guidance, critically reviewed the manuscript, and approved the final version. **Confirm contributions using the journal's preferred taxonomy before submission.**

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Editorial instruction: The references below are a provisional reconstruction from the dissertation. They must be checked against the original cited papers, corrected, completed, and formatted exactly according to the journal's reference style before submission. Do not submit this reference list without verification.

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