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Research article

A study to assess the practice of incentive spirometer among post-operative patients at a tertiary level care hospital

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Background: Incidence shows that 17% to 88% of people will have decreased lung volumes after surgery. This can be made less sever and less likely by use incentive spirometer. An incentive spirometer is routinely considered a part of the perioperative respiratory therapy strategies to prevent or treat complications and helps improve the functioning of lungs. **Aims:** The role of incentive spirometry is well established for preventing post-operative pulmonary complications but there is lack of evidence regarding its use and compliance in patients. The main aim of this study is to assess the practice of incentive spirometry amongst the post-operative patients. **Methods and materials:** It is a Case series type of descriptive observational study carried out on post-operative patients in a tertiary care hospital using a checklist for three consecutive post-operative days. **Results:** On day 1, only 8% of the patients performed adequately while 52% were moderately adequate and 40% were inadequate in performance. On day 2, 30% were adequate, 58% were moderately adequate while 12% had inadequate performance. On day 3, 64% of the patients performed adequately 32% were moderately adequate while 4% still had inadequate performance. **Conclusion:** It is concluded that practice and use of incentive spirometry improved in the period of three days. Patients were able to perform better and were more competent in the practice. The compliance improved on day third as compared to day one and patients were able to perform the steps adequately.

Key words: Practice, asses, incentive spirometry, post-operative patients.

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1. Introduction

Post-operative care is the management of patients after surgery. The goal of post-operative care is to prevent complications such as atelectasis, infection, to promote healing of the surgical incision, and to return the patient to a state of health. [1]

According to definition, postoperative recovery is the process of being in a state of complete well-being, which requires a lot of energy. This can be achieved by returning to preoperative level of independence/dependency in activities of daily living and optimum level of psychological well-being by regaining control over physical, psychological, social and habitual functions. [2]

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The process of postoperative care of patients includes but is not limited to encouragement of early mobilization in which deep breathing and coughing exercises should be included to prevent any pulmonary complications. Ensuring adequate nutrition, preventing skin breakdown and pressure sores, turning the patient frequently and providing adequate pain control are some other points to be included in post-operative care. [3]

Upper-abdominal surgical procedures are associated with a higher risk of complications, followed by lower-abdominal surgery and thoracic surgery. Abdominal surgeries causes rapid shallow pattern of breathing which results in uneven ventilation of lungs leading to development of micro atelectasis and pulmonary insufficiency. The most frequently reported cause of morbidity, mortality in the postoperative period is pulmonary complication, and therefore it is particularly important to identify patients at risk [4].

For prevention of post-operative complications deep breathing exercises and restoration of respiratory function

are of utmost importance as discussed earlier. Incidence shows that 17% to 88% of people will have decreased lung volumes after surgery and other complications include atelectasis, pneumonia, and respiratory failure. This is made less sever and less likely, by use incentive spirometeris a medical device used to help patients improve the functioning of their lungs. [5].
Incentive spirometer provides visual reinforcement for deep breathing by the patient. An incentive spirometer assists the patient to breathe slowly and deeply and to sustain maximal inspiration. The gauze on the spirometer allows the patients to measure their own progress, providing immediate positive reinforcement. Optimal gas exchange is supported and secretions can be cleared and expectorated. It restores normal breathing and circulation and thus helps in early recovery. [6]

The patients first takes a few normal breaths and inhales deeply for few seconds, which pops, open the alveoli. The balls provide a visual feedback for performance of the patient. The patients are then asked to repeat the same maneuver many times a day. Incentive spirometry routinely considered to prevent or treat complications as a part of the perioperative respiratory therapy strategies. Incentive spirometry encourages the patient to take long, slow, deep breaths, which mimic natural sighing, or yawning this decreases pleural pressure, promoting increased lung expansion and better gas exchange [7].

Indications of use for this method includes Presence of pulmonary atelectasis or conditions predisposing to the development of pulmonary atelectasis Prolonged bed rest, Surgery in patients with COPD, Restrictive lung defect associated with a dysfunctional diaphragm or involving the respiratory musculature, Patients with inspiratory capacity less than 2.5/kg/ml. Patients with neuromuscular disease. Contradictions of Incentive spirometry includes patients who cannot be instructed or supervised to assure appropriate use of the device, in whom cooperation is absent or patients unable to understand or demonstrate proper use of the device diaphragmatic dysfunction, or undergoing opiate analgesia. Patients unable to generate adequate inspiration with a vital capacity less than 10 mL/kg or an inspiratory capacity less than 33% of predicted normal. Hazards and complication of incentive spirometry are less unless not performed as instructed, Hyperventilation/respiratory alkalosis, Hypoxemia secondary to interruption of prescribed oxygen therapy, Fatigue and pain. [8]

In 95% of hospitals in America, incentive spirometer is used prophylactically as well as for treatment of atelectasis. The incentive spirometer assures reproducible sustained maximal inspiration records the frequency and well acceptable by the patient. While incentive spirometry is widely used clinically as a part of routine prophylactic and therapeutic regimen in perioperative respiratory therapy, its clinical efficacy remains controversial.[9]

The role of incentive spirometry established for preventing post-operative pulmonary complications but there is lack of evidence regarding its use and compliance in patients. The main aim of this study is to assess the practice of incentive spirometry amongst the post-operative patients

Objectives:

1. To asses the practice of flow oriented incentive spirometer among the post-operative patients of surgery in patient department
2. To asses their ability to perform incentive within a period of three consecutive days following a surgery.
3. To assess the compliance of post-operative patients in performing incentive spirometry effectively.

2. Materials and methods

The methodology adopted for the research including research design, target population, sampling technique, sampling size, criteria for selection of samples (inclusion &exclusion criteria), research setting, development and description of tool, data collection procedure, procedure and time frame, feasibility of study, ethical consideration, data analysis is as given below.

Research approach: Quantitative approach

Research design: It is a Case series type of descriptive observational study to assess the practice of incentive spirometer among post-operative patients to be done on post-operative patients in the IPD of the Department of Surgery at AIIMS Rishikesh.

Research Setting: The present study was carried out on post-operative patients in general surgery IPD of AIIMS, Rishikesh that is tertiary care hospital in Rishikesh, Uttarakhand.

Target population: The post-operative patients of general surgery IPD who are advised for incentive spirometry.

Sample size: 50 undergoing abdominal surgery.

Sampling technique: Non-probability Purposive sampling.

Criteria for selection of samples:

Inclusion:
- Age: 18 years to 70 years.
- Patients prescribed for incentive spirometry.
- Patients willing to participate.
- Patients of post-operative day 1 to post-operative 3.
- Patients who are admitted in surgery for three consecutive after surgery.

Exclusion:
- Patients not willing to participate.
- Patients who have undergone tracheostomy.
- Patients in which incentive spirometer is contraindicated.

- Patients who have oral injury.

Data collection tools and techniques

The most important aspect of research was the collection of appropriate information, which provides necessary data to answer the questions that were raised in the study. Hence, the tool was developed to assess competency based on

- Extensive review of literature related to practice of incentive spirometry
- Consultation with experts from nursing and research field.

The data collection tool consisted of two parts:

Part A- Socio demographic profile

The researchers developed this. In this questions regarding socio demographic profile, baseline information including name, age, gender, diagnosis, bed no., date of starting incentive spirometer.

Part B- Review checklist

The tool consists of practice checklist to assess the performance of patients.

The outcome was based on scoring of the patients based on adequacy of each step in the checklist:

1. All steps performed satisfactorily: >91% (adequate performance)
2. One step missed: 75-80% (moderately adequate)
3. Two steps missed: 50-75% (inadequate)
4. Not able to perform

Procedure of data collection:

Type of incentive spirometer used will be flow oriented incentive spirometer. Duration of intervention will be three consecutive post-operative days i.e. postoperative day 1, 2, 3 during the day time. Frequency, length and number taken as prescribed by the surgeon.

Data was collected in following stages:

- The patients were assessed based on standard assessments and selected based on the inclusion and exclusion criteria as stated.
- A detailed description was given to the patients on use of incentive spirometer.
- The criteria used to assess the practice and efficiency of performance was through the performance review checklist (annexure attached) and the visual feedback of comparison of elevation of ball on day 1 versus day 3.

Plan for data analysis

Descriptive and inferential statistics were used to analyze the data. In descriptive statistics- Mean, Standard Deviation, etc. were used to analyze the socio-demographic and selected clinical competency data. Calculations were done manually using calculator, Microsoft excel.

Ethical considerations: Institutional Ethical Committee approved this study protocol

3. Result: A case series type of descriptive observation study was conducted on post-operative patients in a tertiary care hospital of Uttarakhand to assess the use, practice and compliance of incentive spirometry in post-operative patients in general surgery ward.

Organization and presentation of data: The Analyzed data was organized according to the objectives under following headings:

1. Findings related to socio-demographic profile
2. Finding related to adequacy in practice of incentive spirometry

1. Findings related to socio-demographic profile:

A total of 50 patients were taken who met the criteria for research. Figure 1 demonstrates the gender and figure 2 demonstrates age group .Predominant age group was 41-50 years and male gender (56%) was predominant. Most of the patients underwent upper abdominal surgeries while twelve patients underwent resection surgeries for cancer.

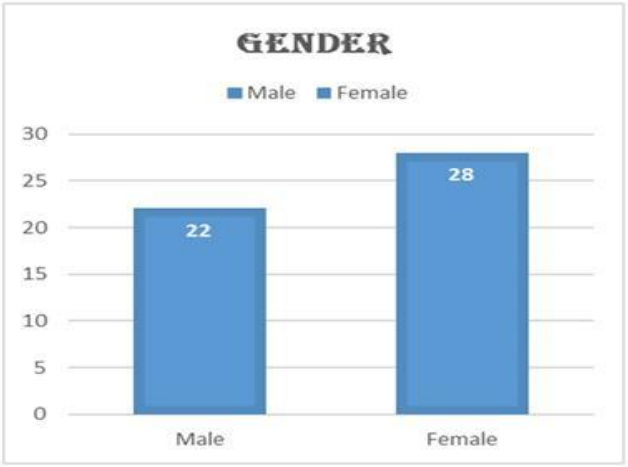

Figure 1: Gender of sample

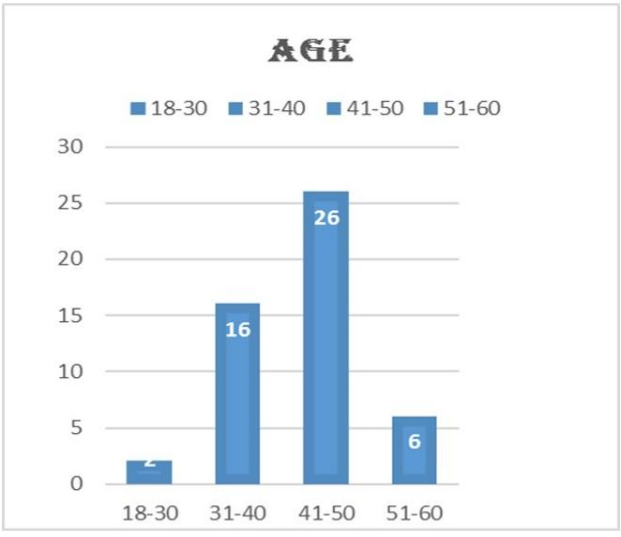

Figure 2: Age of sample

2. Finding related to adequacy in practice of incentive spirometry:

Figures 3, 4 and 5 demonstrates the result of practice of incentive spirometry on postoperative day 1, 2 and 3 respectively. On day 1, only 8% of the patients performed adequately while 52% were moderately adequate and 40% were inadequate in performance. On day 2, 30% were adequate, 58% were moderately adequate while 12% had inadequate performance. On day 3, 64% of the patients performed adequately 32% were moderately adequate while 4% still had inadequate performance.

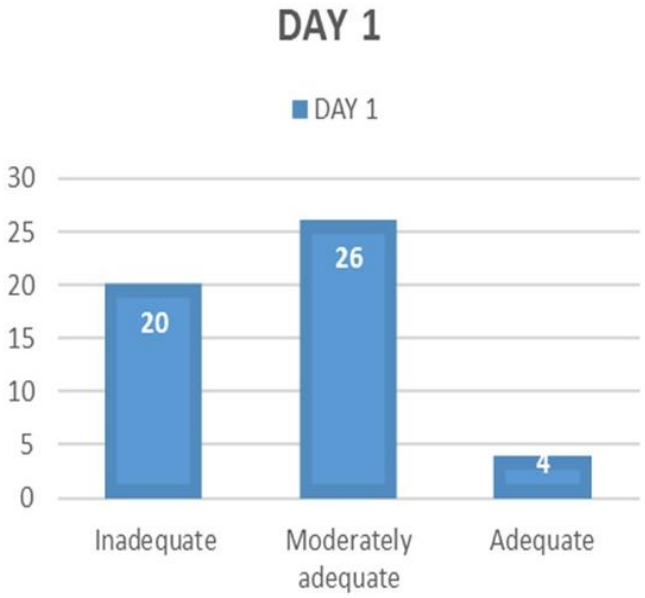

Figure 3: Performance on day 1

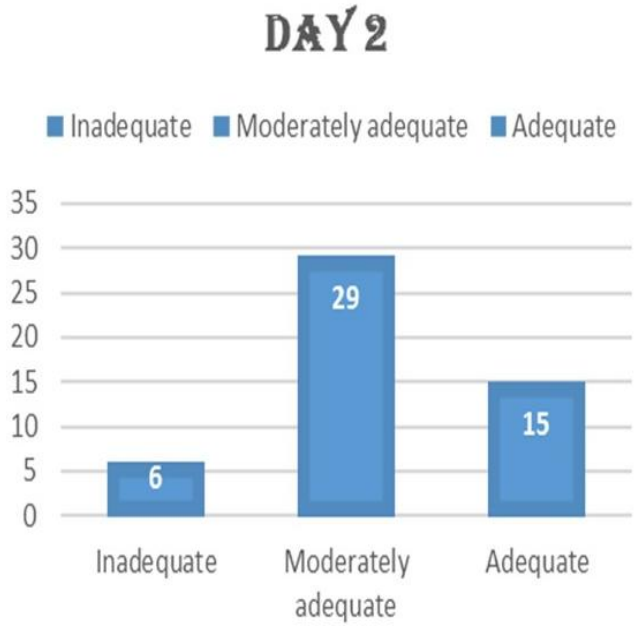

Figure 4: Performance on day 2

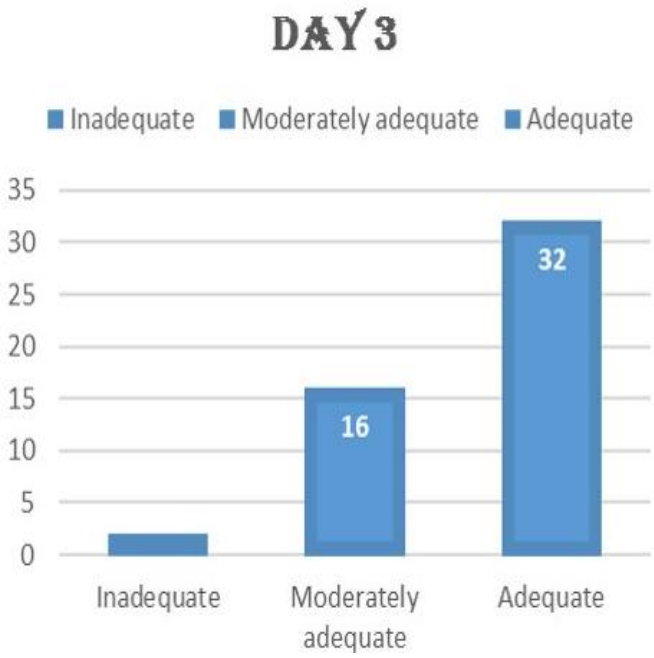

Figure 5: Performance on day 3

It is clear from the above analysis that practice of use of incentive spirometry improved in the period of three days. Patients were able to perform better and were more competent in the practice. It was also seen that compliance improved in day third as compared to day 1 and patients were able to perform the steps adequately. Thus, it is safe to say with positive reinforcement the patients' performance and compliance improved in 3 days' use of incentive spirometry.

4. Discussions

This study provides the data on use and practice of incentive spirometry in post-operative patients in a tertiary care hospital of Uttarakhand. This study do not support the hypothesis that incentive spirometry, which is prescribed intensively among the post-operative patients , has any advantage or disadvantage .This study only objectively measures the compliance and compares the adequacy in performance of patients on three consecutive postoperative days. All the patients who were present in surgical ward on first post-operative and met the inclusion and exclusion criteria were included in the study.

Although there are, many studies related to effectiveness of use incentive spirometry in post-operative patients only a few measures its compliance and adequacy in practice. Maximum benefit could only be achieved if it is practiced correctly and to an extent where it reaps the desired results. Present study deals with issue and gathered data about the practice, use and compliance of incentive spirometry.

(Westwood et al 2007) have reported the postoperative uses of incentive spirometry inpatients have reduced the post-operative pulmonary complication but there is much less evidence regarding the correct performance and compliance of the patient with the use of incentive spirometry [9].

The compliance and performance were reviewed objectively through a checklist and visual feedback through the rising of balls in incentive spirometry. In addition, it was found that majority of patients improved in performance. Their compliance was also increased on third post-operative day.

An intention to treat model was used for this study. The patients were first taught regarding the use and then monitored once in a day to quantify the compliance. Although its use is patient driven intervention, patients required continuous motivation and reinforcement in order to improve its compliance.

Previous studies shows low compliance (Narayanan A.L.T., Hamid S. R. G. S and Supriyanto E 2016) carried out a research to explore the status of evidence on patient compliance with incentive spirometry interventions in randomized controlled trials (RCTs). A systematic search using MEDLINE, EMBASE and CINAHL databases was conducted to obtain relevant RCTs from 1972 to 2015 using the inclusion criteria. Results showed that only six (16.7%) trials included reports on compliance; however, these were also incomprehensive. Another study was conducted by (Fernandez-Bustamante A, Schoen J, Vidal Milo MF 2017) [11] conducted a randomized controlled trial on incentive spirometry on 112 bariatric surgery patients. Self-reported logs from 12 patients prior to the study showed a mean frequency of IS use of 4.1 times on postoperative day 1 and 10.4 times on day 2. This is an incredibly low compliance compared with the recommended 10 times per hour while awake [10].

Limitations are the focus on Incentive spirometry interventions in the context of abdominal surgeries, because this was our area of interest due to their high susceptibility to PPCs. Secondly, not all patients were prescribed incentive spirometry immediately after the surgery but rather a few days after it. Thirdly, there were only limited no. of patients in which this study is conducted.

Importance of study: In many studies patient's compliance and adequate performance is a confounding factor to help the patient in reducing postoperative complication, which is the mainly examined in this study. The study also provides an insight into the degree of adequacy and compliance among the post-operative patients and also demonstrates and compares the performance among males and females. Through this study, it is clear that compliance and adequacy in performance increased with each post-operative and performance got better on third post-operative. All patients were prescribed incentive spirometry on post-operative days to improve the pulmonary function.

Conclusion

This study is aimed at direct observation of the practice of spirometer and the patient's efficiency to perform the same. By this study it can concluded that compliance in performance increased through regular practice. It was also seen that adequacy of performance was enhanced following the teaching and positive reinforcements.

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