

Effectiveness of Incentive Spirometry on Respiratory Parameters among Patients with Chest Tube Drainage in Icus of a Tertiary Care Hospital, Ludhiana, Punjab

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Abstract

The respiratory system plays a crucial role in delivering oxygen to the cells of our body. The cells of our body require a continuous supply of oxygen, without this oxygen we would die within minutes. All of this breathing couldn't happen without help from the respiratory system. The aim of the study was to assess the effectiveness of Incentive Spirometry on respiratory parameters among patients with Chest Tube drainage. A pre-experimental one group pre-test and post-test design was carried out by using purposive sampling technique and it was conducted on 30 patients with chest tube drainage in ICUs of a tertiary care hospital, Ludhiana, Punjab. Data was collected by self-report for demographic variables, clinical profile sheet and assessed the respiratory parameters by using Respiratory Distress Observation Scale (DOS). The Mean±SD of heart rate in pre-test (O_1) was 1.43 ± 0.50 which got decreased to 0.36 ± 0.49 in post- test (O_4) with statistically significant at $p = 0.000$. In pre-test Mean±SD of respiratory rate was 1.30 ± 0.46 and got decreased to 0.30 ± 0.46 during post- test. The Mean±SD of restlessness was 1.23 ± 0.81 in pre-test whereas in post-test it was decreased to 0.23 ± 0.43 . The study conclude that Almost all subjects were having respiratory distress during pre-test but after using incentive spirometry in chest tube drainage patients, the parameters were improved daily gradually and during post-test only 26.6% patients were having respiratory distress. The results were highly significant at $p<0.05$. The incentive spirometry is effective for improving respiratory parameters among chest tube drainage patients.

Keywords: *Incentive spirometry, respiratory parameters, effectiveness, chest tube drainage.*

Introduction or Background

The respiratory system plays an important role in delivering oxygen to the cells of our body. The cells of our body require a continuous supply of oxygen, without this oxygen we would die within minutes. All of this breathing couldn't happen without help from the respiratory system. The conditions affecting the thoracic cavity range from acute problems to long term chronic disorders.¹After any surgery, there are certain changes in the abdominal area, which induce modifications

in pulmonary mechanics and respiratory function, resulting in post-operative pulmonary complications.² This lead to higher hospital costs, increased morbidity, mortality and extended hospital stay. The changes which lead to these complications include decreased mobility of diaphragm, depressed activity of central nervous system, changes in the ventilation-perfusion ratio, inefficient cough, increased respiratory rate and increased and reduced pulmonary volumes and capacities³. Patients who have undergone abdominal surgery, have shown a decline in inspiratory capacity, total inspiratory time, and ventilation at the lung bases, leading to a higher risk of developing PPCs.^{4,5} Forces acting on the respiratory system help produce the thoracic and abdominal movements, especially the respiratory muscle strength that is compromised abdominal surgery.⁶⁻⁸Chest physiotherapy is commonly requested with the aim to avoid the development of

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pulmonary complications by reversing the pulmonary dysfunction after surgery.⁹ Incentive spirometry (IS) is a form of respiratory training that underlines sustained maximum inspiration.^{10,11} Incentive spirometry is used primarily to prevent alveolar collapse and atelectasis in post-operative patients. Despite the widespread use of IS for patients after surgery, the effectiveness of this technique alone or in addition to general deep breathing and coughing for the prevention of post-operative pulmonary complications is not clear.¹² Due to its low cost, incentive spirometers are widely used in hospitals. They are used for treating and preventive purposes regarding pulmonary complications. This device works with visual stimulation to deep inspiration and is largely used by patients in post-operative periods of abdominal and thoracic surgery. Despite its low cost, the routine use of IS in CABG will add to the cost of care. Studies evaluating the effectiveness of IS in patients who have had cardiac surgery, however, have been unable to demonstrate the superiority of IS over other techniques.¹³ Promotion of exercises is found to be good conservative management for patients with surgery, because breathing exercises can improve lung function as well as can strengthen the respiratory muscles, even when the lungs are diseased. The proposed rationale using incentive spirometry is to prolong exhalation and thereby improve pulmonary functions.¹⁴ Trauma is the leading cause of death for individuals up to the age of 45 years. Chest trauma constitutes the major part of traumatic injuries and leads to serious consequences. The majority of chest trauma requires careful surveillance and no surgical intervention.¹⁵ The indications for chest tube includes – pneumothorax, penetrating chest trauma, severe blunt trauma, hemothorax, pleural effusion, bronco-pleural fistula, post-operative use in thoracic / cardiac surgeries.¹⁶

Material and Method

Quantitative approach was used to assess the effectiveness of incentive spirometry on respiratory parameters among patients with chest tube drainage as there was collection and analysis of numeric information related to respiratory parameters. The findings of the study were based on empirical evidence (researcher's observation). Pre-experimental (one group pre-test/post-test design) was used to carry out the study to assess the effectiveness of incentive spirometry on respiratory parameters among patients with chest tube drainage. This study was conducted in ICUs of DMC & Hospital, Ludhiana, Punjab. The target population comprised

of patients with chest tube drainage in ICUs. The size of the sample in this research is 30 patients with chest tube drainage. Purposive sampling technique was used for the present study to draw sample from the target population. An extensive literature review was done to select and develop tool(s) for data collection. It includes socio demographic profile of patient and Clinical profile of patient. It also includes a standardized Respiratory Distress Observation Scale to assess the respiratory parameters among patients with chest tube drainage in ICUs of DMC & Hospital, Ludhiana. Different tools were used to collect the data ie. **Part A:** Socio-Demographic profile: It includes age, gender, marital status, educational status, occupation, working status, habitat & dietary pattern. **Part B:** Clinical Profile Sheet: It includes diagnosis, duration of present illness, duration of treatment & any chronic illness. **Part C:** Respiratory parameters: It includes the heart rate, respiratory rate, restlessness, paradoxical breathing pattern, accessory muscles use, grunting- at end expiration, nasal flaring and look of fear in respiratory distress observation scale (RDOS). The tool to assess socio-demographic profile of patients, clinical profile of patients, Respiratory Distress Observation Scale of respiratory parameters were given to the experts from the Department of Critical care Medicine, Medical Surgical Nursing and Department of Physiotherapy for content validity of tool(s) was determined by expert's opinion. The tools were found to be valid for the study. The reliability of standardized Respiratory Distress Observation Scale is pre-determined by inter-rater method and tool was found to be reliable as $r = 0.64$.⁴⁷ data related to Socio-demographic profile of the patient and clinical profile sheet of patient was collected through subjects and records and reports. Respiratory Distress Observation Scale was used to collect the data regarding respiratory parameters. The observer went to the patients and took pretest on first day and then gave spirometry three times a day for three days and on fourth day posttest was taken.

Major Finding of the Study

Half of the patients i.e. (50%) were in the age group of 46-60 years. Majority i.e (70%) of the patients were male. Maximum subjects i.e. (93.3%) were married. Less than half of the patients i.e. (43.3%) were having educational status up to elementary. More than half of the patients i.e. (63.3%) were working. Majority of the patients i.e. (60%) were non-vegetarian. More than half of the patients i.e. (56.6%) were belongs to urban areas. Less than half of the patients i.e. (46.6%) were

diagnosed with RSA with BTC. Majority of the patients i.e. (80%) were having between 0-5 day duration illness and treatment. More than half of the patients i.e. (60%) were having history of chronic illness. During pre-test 100% subjects were having respiratory distress while during post-test only 26.6% subjects were having respiratory distress and it was found to be statistically highly significant at $p = 0.000^*$. Mean score and standard deviation, in pre-test mean was 11.26, while in post-test it was 4.93 and the standard deviation was 1.48 in pre-test then it was decreased to .944 after providing incentive spirometry, its 't' value was 22.87 which is significant at p value less than 0.05.

Discussion

In the present study, it was found that pre-interventional respiratory parameters were significantly high which specifies that patients with chest tube drainage need pulmonary intervention. Respiratory distress observation scale used in the study included heart rate per min. (Mean \pm SD=1.43 \pm 0.50), respiratory rate per min. (Mean \pm SD=1.30 \pm 0.46), restlessness (Mean \pm SD=1.13 \pm 1.00). Incentive spirometry was implemented to the patients with chest tube drainage for 3 days, 3 times/day and respiratory parameters outcomes were found improved. Post-interventional respiratory parameters among patients with chest tube drainage were improved. Respiratory distress observation scale used in the study included heart rate per min. (Mean \pm SD=0.36 \pm 0.49), respiratory rate per min. (Mean \pm SD=0.30 \pm 0.46), Restlessness (Mean \pm SD=0.23 \pm 0.43). The results showed that there is statistically significant difference between pre- and post-interventional respiratory parameters at $p=0.000$. the comparison of pre- and post-interventional respiratory parameters among patients with chest tube drainage, the results showed that difference between pre-and post-interventional level of respiratory parameters was significant with $t=22.87$ at $p=0.000$.

Conclusion

Almost all subjects were having respiratory distress during pre-test but after using incentive spirometry in chest tube drainage patients the parameters were improved daily gradually and during post-test only 26.6% patients were having respiratory distress. The results were highly significant at $p < 0.05$. The study concluded that the incentive spirometry is effective for improving respiratory parameters among chest tube

drainage patients.

Conflict of Interest- None

Source of Funding- Self

Ethical Clearance: The Pre-experimental study was approved by research and ethical committee of DMC & Hospital, Ludhiana. The subjects were explained about the objectives and activities of research projects. Instructions were given to them and they were assured that their responses would be kept confidential by providing information sheets and informed consent was obtained from the patients.

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