


Oxygen inhalation therapy among elderly patients of a public hospital



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Abstract

Objectives: To describe the characteristics of oxygen inhalation therapy used on elderly patients of the medical clinical department of a Brazilian public hospital, and to evaluate the knowledge of those accompanying them about the therapy. **Method:** An observational, descriptive cross-sectional study was carried out. The sample comprised 52 elderly persons who had been hospitalized in the medical clinical department of a public hospital in Minas Gerais for two months. The characteristics of the application of the oxygen inhalation therapy, the sociodemographic aspects and the general health characteristics of the group were evaluated through the analysis of hospital records, medical prescriptions and in loco observation. The knowledge of the persons accompanying the elderly patients was evaluated through a structured interview. Statistical analysis included exploratory univariate analysis, study of the frequencies of the categorical variables and descriptive statistical analysis of the continuous variables. **Results:** There was a predominance of females (53.8%); a mean age of 75 years; a low educational level (two years) and per capita income (between one and three minimum wages); a marital status of married (42.2%); and nonsmokers (48.1%). A total of 67.3% of the elderly persons had not previously used mechanical ventilation and 61.5% were undergoing physical therapy. The most common outcome was hospital discharge without OIT (53.8%). The nasal cannula was the most commonly used device (51.9%); 42.0% of prescriptions were not documented; monitoring was present in 76.9% of cases; 81.8% of those accompanying the elderly patients did not know what the OIT device was and 27.0% reported having changed the oxygen supply device. **Conclusion:** This study identified the relevant characteristics of the application of oxygen inhalation therapy among elderly patients of a public hospital, demonstrating the need for standardization of information, prescriptions and monitoring of such individuals during oxygen inhalation therapy, with educational measures for the healthcare team and those accompanying the patients.

Key word: Elderly; Oxygen Inhalation Therapy; Hospitalization.

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INTRODUCTION

Among the changes inherent in aging, reducing the elasticity of the intercostal muscles and reduction of vital capacity can favor the development of infections such as pneumonia. The elderly are more susceptible to nosocomial infections, especially respiratory, urinary tract and skin infections, resulting from the reduction of defense mechanisms.¹

The most frequent causes of hospitalization among the elderly in Brazil, among both genders, are heart and coronary disease and lung disease, which alternate as the most and second most common causes.² Hospitalization rates among those aged 80 or above are three times higher than among individuals aged between 55 and 59 years.³

During hospitalization, administration of oxygen is one of the most important treatment methods for patients with hypoxia, which results from several common conditions such as cardiovascular events, chronic respiratory diseases and lower respiratory tract infections.³ Oxygen therapy is the treatment of hypoxia by the inhalation of oxygen at a higher pressure than the ambient air, allowing exchange of gas and reducing the effort of breathing.⁴

The form of administration will depend, primarily, on the efficiency of the system used.⁴ Oxygen, like any drug, if administered improperly, can be toxic and have serious consequences. Toxicity depends on factors such as the absolute pressure of the oxygen supply, the duration of exposure and the sensitivity of the individual.⁵

The harmful effects of the misuse of oxygen include tracheobronchitis, depression of mucociliary activity, nausea, anorexia and headaches, all of which are reversible with the suspension of oxygen therapy. However, other situations can be irreversible, such as atelectasis by resorption, during which alveolar compression and loss of surfactant can occur with deterioration of functioning.⁶

Oxygen inhalation therapy (OIT) is a type of therapy where the handling of both the oxygen delivery devices and the flowmeters that regulate the amount of oxygen being provided are easy to access and use for those accompanying the patient, which is important as such individuals often have to remove the devices or change the flow provided. Such modifications can have negative effects on the treatment of the patient, especially in the case of the elderly.

Therefore, taking into account the natural changes to the respiratory system as a result of aging and the high rates of hospitalization among the elderly, resulting in a need for frequent use of OIT, a greater understanding of how this therapy is being used among the elderly is of great relevance to the area of Geriatrics and Gerontology.

This study aimed to describe the characteristics of oxygen inhalation therapy (OIT) used among elderly patients hospitalized in the internal medicine section of a Brazilian public hospital and to evaluate the knowledge of this therapy among those accompanying the patient.

METHOD

Type of study and ethical aspects

An observational, cross-sectional and descriptive study was carried out. The study was approved by the Ethics Research Committee of the Universidade Federal do Triângulo Mineiro (protocol nº 2485/2012), following the established ethical conduct for research involving humans. All participants were fully informed about the research and data collection was only performed after a Free and Informed Consent Form was signed.

Sample

The sample consisted of individuals admitted to the internal medicine department of a Brazilian public hospital in the state of Minas Gerais, for

a period of two months between August and September 2012. During the reporting period, 90 elderly persons were admitted to this department. Although the estimate of the outcome of interest was not known, it was taken to be 50.0%, which together with a confidence level of 90.0% and an absolute accuracy of 11.4%, resulted in a final sample size of 52 interviews.⁷

The study included elderly persons aged over 60 years who were receiving OIT (either after mechanical ventilation or as a first choice). Exclusion criteria were currently using invasive and/or non-invasive mechanical ventilation and/or having a history of home oxygen therapy use.

During the two months of data collection 90 elderly persons were hospitalized in the internal medicine sector. A total of 38 (42.2%) elderly persons were excluded. Of these, 34 were not undergoing OIT, three were using invasive mechanical ventilation (IMV) and one was using home OIT. Thus, 52 elderly persons (57.8%) met the criteria for participation in the study.

For the selection of those accompanying the patients, inclusion criteria were established based on individuals who, by their own description, spent long periods with the elderly person and were above the cutoff point of the Mini Mental State Examination (MMSE),⁸ according to educational data.⁹

Variables measured

The sociodemographic and general health characteristics of the elderly persons, the OIT characteristics and the knowledge of the those accompanying the patients about OIT were evaluated.

Sociodemographic characteristics (age, gender, marital status, schooling and *per capita* income) were evaluated using the *Older Americans Resources and Services* (OARS) questionnaire, validated for the Brazilian population.¹⁰

Surveys of the general characteristics of the health of the elderly and the application of the OIT were carried out through on-site observation and analysis of medical records and medical prescriptions. The following general health characteristics were evaluated: smoking history; underlying diseases; history of previous mechanical ventilation (MV) and duration of MV; if patient was undergoing physical therapy; length of hospitalization; duration of OIT and evolution of hospital stay. The following IOT characteristics were evaluated: type of device used, prescription (classified as prescription with a determined dose, prescription with undetermined dose, and without documented prescriptions, or in other words with a medical recommendation which was not entered on medical records or on the prescription sheet) and monitoring.

For the evaluation of knowledge of those accompanying the patients in relation to OIT three structured questions composed of yes or no answers were used. These questions were evaluated during a pilot study. The questions were: "Do you know what this device is?", "Do you know what it is used for?" and "Have you ever altered, removed, or installed the oxygen supply device of the patient you are accompanying?". If the answer to the last question was positive, a fourth question was asked where the companion answered why he or she had altered, removed or installed the device. The resident physiotherapist responsible for data collection conducted the interview individually with each companion, in a room removed from the bed of the elderly patient.

Statistical analysis

The data was saved in an electronic spreadsheet and analyzed with the SPSS™ 19 (Statistical Package for Social Sciences) program. Exploratory univariate analysis, composed of frequencies of the categorical variables and descriptive statistical analysis (mean, standard deviation, median, minimum and maximum) of the continuous variables was performed.

RESULTS

The sociodemographic characteristics of the group were 53.8% female (n=28); 46.2% male (n=24); average age of 75.65 years (\pm 9.6); marital status of single 11.5% (n=6), married/living with partner 44.2% (n=23), widow or widower 32.7% (n=17), other 11.5% (n=6). The average schooling was two years (\pm 2), per capita income was between one and three monthly minimum wages (MW) 65.4% (n=34), from >three to five MW 23.1%

(n=12), >five MW 1.9% (n=1) and no income 9.6% (n=5).

As shown in Table 1, 48.1% of the sample were smokers, 32.7% were admitted to the internal medicine department, 71.1% did not use invasive or non-invasive MV and 61.7% were undergoing physical therapy. The median time of MV, OIT and hospitalization were 12, 10 and 17 days, respectively. Among the most prevalent diseases the most frequent was hypertension, followed by diabetes *mellitus* and pneumonia in third place (table 2).

Table 1. Distribution of elderly persons (N=52) according to general characteristics. Uberaba-MG, 2012.

| Characteristics | n | % | Mean | Sd | Median | Min/Max |
|------------------------------|----|------|------|------|--------|---------|
| Smoking | | | | | | |
| Non-smoker | 25 | 48,1 | - | - | - | - |
| Smoker | 17 | 32,7 | - | - | - | - |
| Ex-smoker | 10 | 19,2 | - | - | - | - |
| Ventilação mecânica anterior | | | | | | |
| Yes | 17 | 32,7 | - | - | - | - |
| No | 35 | 67,3 | - | - | - | - |
| Duration of IMV (days) | - | - | 20,0 | 28,9 | 12 | 1/92 |
| Physiotherapy | | | | | | |
| Yes | 32 | 61,5 | - | - | - | - |
| No | 20 | 38,5 | - | - | - | - |
| Specialty | | | | | | |
| Internal medicine | 17 | 32,7 | - | - | - | - |
| Pulmonology | 12 | 23,1 | - | - | - | - |
| Cardiology | 11 | 21,2 | - | - | - | - |
| Surgery | 3 | 5,8 | - | - | - | - |
| Others | 12 | 23,1 | - | - | - | - |
| Evolution | | | | | | |
| Discharge without OIT | 28 | 53,8 | - | - | - | - |
| Discharge with OIT | 8 | 15,4 | - | - | - | - |
| Transferal | 6 | 11,5 | - | - | - | - |
| Death | 10 | 19,2 | - | - | - | - |
| Duration of OIT | - | - | 14,8 | 15,8 | 10 | 2/91 |
| Duration of hospitalization | - | - | 22,7 | 19,2 | 17 | 2/120 |

OIT= oxygen inhalation therapy; IMV= invasive mechanical ventilation; sd= standard-deviation; Min/Max= minimum/maximum.

Table 2. Prevalent diagnoses. Uberaba-MG, 2012.

| Diagnoses | n | % |
|-----------------------|----|------|
| Arterial hypertension | 32 | 61,5 |
| Diabetes mellitus | 21 | 40,4 |
| Pneumonia | 18 | 34,6 |
| Cardiac insufficiency | 17 | 32,7 |
| COPD/asthma | 8 | 15,4 |
| Stroke | 7 | 13,5 |
| Various fractures | 6 | 11,5 |

COPD= Chronic Obstructive Pulmonary Disease.

The nasal cannula was the most commonly used device, appearing in 51.9% of cases, there were no limitations on oxygen intake in daily records

in 42.3% of situations, monitoring was present in 76.9% of patients and evolution was predominantly positive where OIT was not used (53.8%) (table 3).

Table 3. Distribution of elderly persons (N=52) according to oxygen inhalation therapy characteristics. Uberaba-MG, 2012.

| Characteristics | n | % |
|----------------------------|----|------|
| Devices | | |
| Nasal cannula | 27 | 51,9 |
| Tracheostomy mask | 11 | 21,2 |
| Face mask | 10 | 19,2 |
| Venturi mask | 1 | 1,9 |
| Non-rebreathing mask | 3 | 5,8 |
| Prescription | | |
| Determined dose | 16 | 30,8 |
| Indeterminate dose | 14 | 26,9 |
| No documented prescription | 22 | 42,3 |
| Monitoring | | |
| With monitoring | 40 | 76,9 |
| Without monitoring | 12 | 23,1 |

Eight elderly persons were unaccompanied. Of the 44 persons accompanying the patients evaluated, 81.8% did not know what the device was, 31.8% did not know what the device was used for and 72.7% reported having never removed or installed the supply of the OIT equipment and/or changed the oxygen flow used (table 4). Question

No 4 was related to the reasons for removing or inserting the device. The most cited responses from those who answered yes to the previous question (Question 3 n=12) were: discomfort with device in 58.4% (n=7) of responses, followed by breathlessness, 25.0% (n=3), and during eating in 16.6% (n=2) of situations.

Table 4. Knowledge of those accompanying the patients about oxygen inhalation therapy. Uberaba-MG, 2012.

| Question | Yes n (%) | No n (%) |
|---|--------------|-------------|
| 1- Device “Do you know what this device is?” | 8 (18,2) | 36 (81,8) |
| 2- Use “Do you know what it is used for?” | 30 (68,2) | 14 (31,8) |
| 3- Modification “Have you ever altered, removed, or installed the oxygen supply device of the patient you are accompanying?” | 12 (27,3) | 32 (72,7) |

DISCUSSION

The results showed that more than half of the elderly persons admitted to the internal medicine department during the two months studied were undergoing OIT, highlighting the importance of careful study of this type of therapy. In addition, the present study found that the group of hospitalized elderly persons using OIT was mostly female, with an average age of 75, a married marital status, an average schooling of two years, and a per capita income between one and three minimum wages. Other studies involving the hospitalization of elderly persons in public hospitals have identified a similar profile.^{11,12} These results can be explained by the higher number of older women in Brazil,¹ in addition to the relationship between low education and income and the increased use of public health services in the country.¹³

Smoking was present in 32.7% of the sample, and 48.1% of the elderly persons were non-smokers. In a review proposed by Lima & Faustino,¹⁴ the prevalence of smoking in the elderly varied greatly according to the sample, ranging from 0 to 59.4%. In the hospital environment, where the present study was developed, it is believed that smoking,

which is present in a considerable part of the sample, adds to the health complications that lead to hospitalization. Smoking among elderly persons receives little attention, even though stopping this habit in old age can bring great benefits, such as reducing the risk of becoming ill, better control of the evolution of pre-existing diseases, better quality of life and increased life expectation.¹⁵

Previous use of IMV was found in 28.9% of the group, with a mean treatment duration of 12 days. A prolonged duration exposes the individual to risks such as pneumonia, changes in the respiratory muscles, as well as systemic effects on kidney, heart and gastrointestinal functioning.¹⁶ This condition can lead to dependence on external oxygen support, since the individual exposed to the MV and high concentrations of oxygen may experience conditions such as surfactant depletion and suffer cytotoxic effects and changes in respiratory physiology, with breathing depression, pulmonary vasodilation and systemic vasoconstriction.¹⁷

Among the population studied, physiotherapy was a widely used form of treatment, and therefore the physiotherapist was essential for the monitoring and evolution of the elderly through this type of

therapy.^{18,19} Physiotherapy treatment, in addition to its motor and respiratory evaluation and intervention functions also involves the continuous monitoring of vital signs and parameters of oxygen therapy, as well as bronchial hygiene and pulmonary re-expansion techniques, contributing to more comprehensive and effective care for the patient undergoing oxygen therapy.¹⁸

The specialties of the most frequent hospitalizations of the elderly were internal medicine, pulmonology, cardiology, and surgical clinical. These specialties manage various common diseases of aging such as pneumonia, chronic obstructive pulmonary disease (COPD), cardiovascular diseases such as heart failure (HF) and cerebrovascular accidents or strokes (CVA), in addition to fractures.^{2,12,13} These situations often feature OIT as a therapeutic resource, used as needed by the patient.^{4,18,20}

In terms of evolution, approximately 15% of the elderly persons hospitalized and treated with OIT were discharged for treatment at home, which indicates the need for monitoring and long-term care, not only of the patient but also the environment in which he or she lives, the household conditions and the care to which the patient has access.^{21,22}

The median duration of hospitalization was 17 days. Rufino et al.²³ found a hospitalization in the internal medicine section of 20.9 days, which was higher for the elderly, with prolonged hospitalization being associated with lower income, education and greater age. The length of hospitalization variable in the present study may be related to the diversity of diseases, specialties and physical and functional profiles of the elderly patients. The duration of OIT was 10 days, although other studies that examined the duration of oxygen therapy among hospitalized elderly persons were not found in literature.

It is evident that due to the inherent characteristics of pulmonary aging associated with cardiovascular and respiratory diseases, such as in this sample, extended periods of OIT may be required. However, no studies containing such information were found, making comparison of OIT duration impossible.^{1,3} A study performed with children found a median of six days of oxygen therapy,²⁴ although the sample differed from the present study. The need for further research into this subject should therefore be stressed.

It is important to note the harmful effects of prolonged therapy and treatment using high concentrations. In the cardiovascular system, high oxygen concentrations can raise blood pressure and reduce cardiac output and cardiac oxygen consumption. Furthermore, coronary flow drops in response to hyperoxia-induced vasoconstriction, which may lead to a reduction of cerebral and renal blood flow.⁵ Atelectasis by resorption may occur in the pulmonary system where the mechanisms involve alveolar compression, resulting in loss of surfactant due to the deterioration of their functioning. High oxygen concentrations can weaken immune function, leading to an increase in the inflammation of the airways, alterations in the tracheal aspirates and secondary infections, mainly by species of pseudomonas and proteus bacteria.²⁵

For this type of treatment, various devices can be used, with their selection based on the flow required. The most commonly used devices are nasal cannulas, followed by tracheostomy masks and facial masks. These results are partly similar to other studies,^{18,26} in which a prevalence of the use of nasal cannulas predominated, followed by Venturi and facial masks. Venturi masks were only used in 1.9% of the sample, a result that differs from the studies cited.^{18,26} This result can be attributed to the different contexts in which research into this subject has been carried out. These results can be

attributed to the flows required for each type of device, as in an internal medicine environment the elderly are already clinically stable, so the supply they require is, in the vast majority of cases, the type of low oxygen flows offered by nasal cannulas. For this study, we evaluated the types of devices and flows provided, however, these indicators were not evaluated due to the heterogeneity of diagnoses and profiles of the elderly persons.

When the prescription documentation was analyzed, it was found that 42.3% of cases had not been documented in medical records and/or prescription sheets, while 26.9% of prescriptions did not determine the dosage and 30.8% did. Monitoring was present in 76.9% of cases. Such findings should be carefully studied given the relevance and potential damage of using such treatment without prescribed parameters, so that all staff are aware of the risks. A multicenter study in Portugal found that 6.6% of patients had no documented OIT prescription and 17.6% of prescriptions had no fixed dose, while monitoring was absent in 70.9% of the case of prescriptions with fixed doses.²⁶ The monitoring of the parameters for the modification and suspension of OIT is of great importance, as this therapy has benefits and drawbacks when applied without monitoring.¹⁹

Other international studies that include audits for the evaluation of oxygen therapy also found that a minority of patients underwent documented treatment, and when there was a prescription, it was not suitable or did not establish parameters.^{25,26}

Moreover, deficiencies were observed in the monitoring and control of this therapy, suggesting a need for educational activities in the area, which would result in an improved quality of regulations and monitoring.^{25,26}

As important as the training of the health team is the education of the individuals accompanying the patients. It was observed that most did not know what the device was, but knew what it was used for. Some persons accompanying the patients

(27.3%) said they had changed, removed or installed the oxygen supply devices for various reasons, including patient discomfort and to eat meals. This finding suggests a need for health education strategies directed at this group, regarding the importance of the proper administration of oxygen to the elderly. The presence of a companion during hospitalization is a right of elderly persons, with such an individual assuming a co-caregiver role in this environment, in partnership with the health team.^{27,28} It is therefore extremely important to identify the knowledge and practices of such persons, as they are partners in caring for the elderly, even in hospitals.^{28,29}

Despite the small sample size and the limitation of being performed in a single department of a public hospital, the results of this study identify relevant characteristics of the application of OIT among the elderly, as well as the knowledge of their companions, enabling the formulation of strategies related to OIT when used with this population group.

CONCLUSIONS

The present study evaluated the characteristics of treatment with oxygen inhalation therapy among a group of hospitalized elderly persons, an expressive number of whom used nasal cannulas without documented prescriptions. It was found that those accompanying the patients did not know what the oxygen supply device was and said they had changed, removed or installed the oxygen supply device used by the elderly persons.

From the perspective of care of hospitalized elderly persons, the study identified relevant characteristics of the application of oxygen inhalation therapy among elderly patients admitted to a public hospital and identified the need for standardization of information, prescriptions and monitoring of such treatment in elderly patients, and the provision of educational strategies for health staff and those accompanying the patients.

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