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Non-Invasive Ventilation in a Regular Hospital Ward

Ventilación no invasiva en sala de hospitalización general

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ABSTRACT

Introduction: Clinical experience has allowed the use of non-invasive ventilation outside the acute-care setting. We describe the clinical profile and evolution of patients who received non-invasive ventilation in a regular ward.
Materials and methods: Retrospective study in patients with ventilatory support for one year in a general hospital.
Results: Non-invasive ventilation was delivered to 43 patients, 67.4% of which had hypercapnia. The male/female ratio was 1:1. Age and BMI (Body Mass Index) were 68.3 ± 12.4 years and 30.1 ± 12.3 kg/m^2, and the main diagnoses were chronic obstructive pulmonary disease, neuromuscular disease and obesity-hypoventilation. One third of patients began non-invasive ventilation in the Intensive Care Unit, and two thirds had been using non-invasive ventilation at their homes before being admitted with exacerbation of chronic obstructive pulmonary disease (39.5%) or disease progression (14%). Hospital length of stay was 12.1 ± 7 d (14 ± 9 in survivors and 5.7 ± 3 in deceased patients). Arterial blood gas analysis on admission showed: $PaCO_2$ (partial pressure of arterial carbon dioxide), 52.7 ± 13.7 mmHg; PaO_2 (partial pressure of arterial oxygen), 72.2 ± 16.2 mmHg, and pH, 7.36 ± 0.08. A pH level < 7.35 was found in 18.6%, and $PaCO_2$ > 45 in 57.4%. $PaCO_2$ values upon discharge were lower (46.1 ± 4.6; p > 0.05). The ST (spontaneous-timed) mode was used in 34 patients (79%). The ventilation period was 12.7 ± 10.2 days, using 6.9 ± 3.1 h/d. One third of patients received palliative care (13.9% of mortality). Three patients (7%) were transferred to the Intensive Care Unit due to clinical decline, and thirty-five were discharged with chronic ventilation (94.6%).
Conclusions: there were few referrals to the Intensive Care Unit. Hospital mortality was low, and patients who died had advance directives.

Key words: Non-invasive ventilation; Respiratory failure; Mortality.

RESUMEN

Introducción: La experiencia clínica ha permitido la ventilación no invasiva fuera de unidades críticas. Describimos el perfil clínico y evolución de pacientes que recibieron ventilación no invasiva en sala general.
Material y métodos: Estudio retrospectivo en pacientes con soporte ventilatorio durante un año en un hospital general.

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Resultados: Se utilizó ventilación no invasiva en 43 pacientes, 67,4% con hipercapnia. La relación hombre/mujer fue 1:1. La edad y el IMC fueron 68,3 ± 12,4 años y 30,1 ± 12,3 kg/m^2 y los diagnósticos principales, enfermedad pulmonar obstructiva crónica, enfermedad neuromuscular y obesidad-hipoventilación. Un tercio inició la ventilación no invasiva en la unidad de cuidados intensivos, y dos tercios usaban ventilación no invasiva en domicilio antes del ingreso por exacerbación de la enfermedad pulmonar obstructiva crónica (39,5%) o progresión de la enfermedad (14%). La estancia hospitalaria fue 12,1 ± 7 d (14 ± 9 en supervivientes y 5,7 ± 3 en pacientes fallecidos). La gasometría arterial al ingreso reveló $PaCO_2$: 52,7 ± 13,7 mmHg; PaO_2: 72,2 ± 16,2 mmHg y pH de 7,36 ± 0,08. Se halló pH < 7,35 en el 18,6% y $PaCO_2$ > 45 en el 57,4%. La $PaCO_2$ al alta fue menor (46,1 ± 4,6; p > 0,05). El modo ST se utilizó en 34 (79%) pacientes. El período de ventilación fue 12,7 ± 10,2 días con uso de 6,9 ± 3,1 h/d. Un tercio recibió cuidados paliativos (13,9% de mortalidad). Tres pacientes (7%) fueron transferidos a la unidad de cuidados intensivos por deterioro clínico y treinta y cinco egresaron con ventilación crónica (94,6%).
Conclusiones: Hubo escasas transferencias a la unidad de cuidados intensivos. La mortalidad hospitalaria fue baja y los que fallecieron tenían instrucciones anticipadas.

Palabras clave: Ventilación no invasiva; Insuficiencia respiratoria; Mortalidad.

INTRODUCTION

The efficacy of non-invasive ventilation (NIV) in respiratory failure was described in the '90s. From that moment forward, it has been used to treat diseases that have traditionally been managed at the Intensive Care Unit (ICU), such as chronic obstructive pulmonary disease (COPD) and cardiogenic pulmonary edema.[1]

The use of NIV can reduce the need for intubation, shorten the hospital length of stay, and reduce mortality, resulting in a rational use of the resources.[2, 3] The acquired experience has allowed its use outside the ICU.[4] The failure or success can depend on the type of patient, the staff's skill, and follow-up tools. Each institution has to design its own response protocol according to its resources.[4-6]

Frequently, patients with chronic respiratory failure show exacerbations that require hospitalization.[2-9] To decide where to deliver NIV inside the hospital can be a complex decision involving several factors such as the kind of underlying disease, associated comorbidities, the severity of the physiological damage, and the patient's preferences.[5-9]

On the other hand, NIV is used in environments without continuous monitoring, such as the patient's home (HNIV), where the ventilatory treatment is guided by the health care team and the family, for the purpose of improving the patient's quality of life.[5-10]

Finally, a group of patients with progressive diseases or advance disease stage develop respiratory failure. In these cases, NIV can be used in combination with other treatments to mitigate dyspnea.[10, 11]

In 2017 we organized a multidisciplinary team to deliver NIV at the regular hospital ward in patients without immediate indication for ICU admission in the absence of clinical severity signs (according to the Plant[12]criterion) or advance directives for therapeutic limitation.

OBJECTIVES

To describe the clinical profile of patients who received NIV in a regular hospital ward and their clinical outcome.

MATERIALS AND METHODS

Retrospective study in patients treated with NIV in a regular hospital ward.

The protocol was approved by the Ethics and Institutional Review Committee of the Hospital Británico de Buenos Aires, in accordance with the Declaration of Helsinki (protocol: CRI# 1052, March 2020).

Population

The study included consecutive adult patients who had been admitted to the regular ward of the Hospital Británico de

Buenos Aires between January and December 2019 (12 months), and received NIV. They were included when they were receiving HNIV and were admitted due to an acute event, or if they were transferred from the ICU to the regular ward. Patients with tracheostomy younger than 18 years were excluded.

Clinical data

The following information was obtained from the unique electronic medical record (EMR), SAP™: medical history, reeason for hospitalization, and previous use of NIV. Spirometries performed in our institution (MedGraphics Paul. Saint Paul, USA, Nhanes III reference equation) up to 3 months before were taken into account.

Our center is a clinico-surgical general hospital with 350 beds and 40 beds for adult intensive care. The Respiratory Kinesiology, Pulmonology, Internal Medicine and Intensive Care Departments have residents and personnel on duty 24 hours a day.

The indication and use of NIV was decided by a multidisciplinary team. Patients were examined when they began the NIV and two hours later, with daily periodic visits in the morning and at night.

The ventilation parameters were selected after the process of adaptation, gradually, taking into account the clinical status until the patient achieved a balance between efficacy (objective) and tolerance (comfort and compliance).

Ventilators were classified in the following way:

- Basic, level I devices: continuous flow generators for barometric ventilation with basic compliance monitoring, without battery or alarms.
- Intermediate, level II devices: continuous flow generators for barometric ventilation with battery and high priority alarms, with ventilatory efficiency and compliance monitoring.
- Advanced devices with life support (level III): volume-controlled or pressure-controlled ventilation, alarms of different priority levels, availability of internal and external battery and full monitoring.

The ventilator choice was based on clinical complexity (acute, chronic, palliative care), hours of use and vital support requirement. The interface was selected for each patient. The monitoring was obtained through a ventilator-integrated software; Encore Pro II ™ and Direct View ™ (Philips-Respironics™. Murrysville USA) and ResScan 10.1™ (ResMed™. San Diego, USA).

Follow-up included clinical examination and physiological parameters (vital signs, ventilatory mechanics, state of consciousness, and pulse oximetry: $SatO_2$). The basal arterial blood gas (ABG) was obtained in the morning. Hypercapnia was defined as $PaCO_2 > 45$ mmHg. The current protocol proposes that gasometry should be performed daily in unstable patients during the first hospitalization stage, and every 48 h or whenever there is clinical change during the patient's stay in the regular ward. We suggested daily data download from the internal memory of the ventilators in accordance with our institutional protocol, with review of efficiency and compliance and possible parameter adjustment. The respiratory polygraphy was made whenever there was inconsistent monitoring information, or in cases of lack of clinical improvement after multiple parameter adjustments.

We reviewed the clinical outcome (death, hospital discharge, inclusion in a palliative care program, limitation of therapeutic effort), hospitalization place, use of ventilatory support, and referral to and from the ICU.

The decision to discharge patients from the hospital was made jointly between participant services, once the patient showed clinical stability, family and social support, organized home care (in case this modality was applicable) and gasometric improvement. Upon discharge, the patient coordinated daytime visits to hospital and outpatient offices of the corresponding specialist physician. Figure 1 shows the current follow-up protocol.

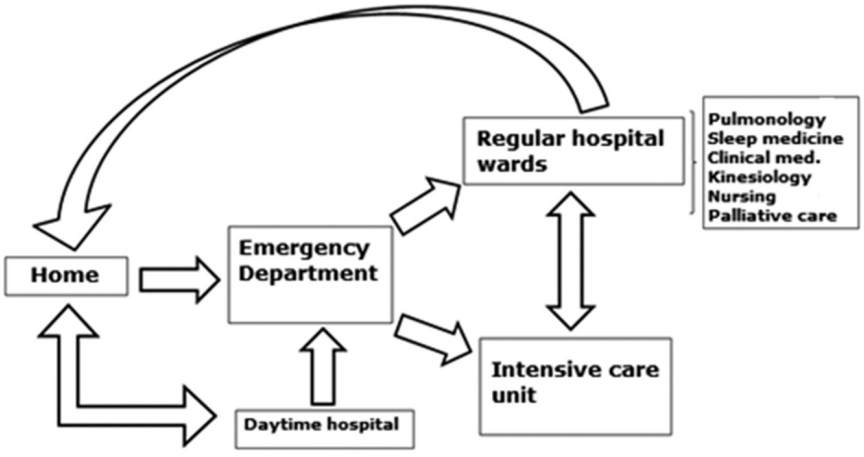

Figure 1. Response protocol for integrated management and monitoring of ventilatory support.

Statistical analysis

Categorical variables are expressed in percentages.

In the case of continuous variables with normal distribution, results are expressed as mean and standard deviation. Numerical variables without normal distribution are expressed as median and percentile (25%-75%).

Differences between groups were compared through the Mann-Whitney Test or the χ^2 Test for quantitative and qualitative variables, respectively. Comparisons including three or more groups were made through the Kruskal-Wallis Test and the non-parametric Cochran's Q Test.

A p value > 0.05 was considered statistically significant.

The analysis was conducted with the Prism 8.02 software (Graph Pad, La Jolla, CA).

RESULTS

NIV was delivered to 43 patients of 68.3 ± 12.4 years with a body mass index (BMI) of 30.1 ± 12.3 kg/m^2 for one year. 44.2% were obese and 67.4% showed hypercapnia. The male/female ratio was 1: 1.

The diagnoses were (n = %); COPD (17; 39.5%), neuromuscular diseases (16; 37.2%), obesity and hypoventilation (5; 11.6%), heart failure (3; 7.0%) and thoracic cavity restriction (2; 4.7%). Table 1 shows the characteristics of the population.

Reasons for admission were COPD exacerbation (39.5%), heart failure (21%), progression of muscle weakness (14%), pneumonia (11.6%), percutaneous gastrostomy (4.7%) and emergency surgery (4.7%), among other things (4.7%). Hospital length of stay was 12.1 ± 7 d for all the population; 14 ± 9 d for survivors; and 5.7 ± 3 d for deceased patients.

Twenty-eight patients (65.1%) were using HNIVat the time of admission. The remaining 15 patients (34.9%) began NIV at the ICU and were transferred to a regular ward after they were stabilized.

The barometric mode with backup frequency (S/T) was the most widely used (79%) (Table 2). Most patients (90%) used oronasal masks, and 21 (48.8%) needed supplemental O_2, especially COPD patients (Table 2). The time NIV was use was 12.7 ± 10.2 d, with a compliance of 6.9 ± 3.1 h/d, and we could observe more extensive use in COPD (p < 0.01) (Table 2).

Twenty-nine patients had $PaCO_2$ > 45 mmHg upon admission (67.4%); and 8 had pH < 7.35 (18.6%).

Three patients (7%) were admitted to the ICU due to clinical worsening (2 for impaired consciousness and one due to progressive hypercapnia), though none of them died.

Thirty-five patients were discharged with HNIV (94.6% of dicharged subjects). There were 7 (20%) new indications of home ventilation (Table 4). The $PaCO_2$ upon discharge was lower (46.1 ± 4.6; p 0.05), even though 10 patients (27% of survivors) were discharged with $PaCO_2$ > 45 mmHg (Table 3).

Finally, 16 patients (37.2%) were included in palliative care programs (mortality of 37.5%: 6 patients); there were 5 COPD patients and 5 cases of metastasised prostate cancer. The deaths were COPD-related and had some aspects in common: patients were older and had advance directives for therapeutic limitation, high $PaCO_2$ levels and took opioids to alleviate dyspnea or refractory symptoms (Table 5).

TABLE 1. Characteristics of the study population

Variables	All the patient n = 43	COPD n = 17	NMD n = 16	Other n = 10	p
Males#	22 (51.2)	22 (51.2)	14 (87.5)	4 (40)	0.005&
Age (years)	68.3 ± 12.4	68.3 ± 12.4	62.7 ± 10.4	69.8 ± 9.3	0.0006*
BMI (kg/m^2)	30.1 ± 12.3	30.1 ± 12.3	24.9 ± 4.8	39.6 ± 3.7	0.01*
Basal pH	7.36 ± 0.08	7.36 ± 0.08	7.38 ± 0.05	7.33 ± 0.06	0.07*
PaO_2 (mmHg)	72.2 ± 16.2	72.2 ± 16.2	80.1 ± 12.5	71.1 ± 19.0	0.03*
Arterial bicarbonate (mEq/L)	29.4 ± 5.1	29.4 ± 5.1	26.1 ± 3.4	34.4 ± 3.8	0.002*
$PaCO_2$ (mmHg)	52.7 ± 13.7	52.7 ± 13.7	45.7 ± 7.4	63.0 ± 9.7	0.0005*
$PaCO_2$ > 45 mmHg#	29 (67.4)	29 (67.4)	10 (62.5)	8 (80)	0.03&
Previous home ventilation#	28 (65.1)	28 (65.1)	15 (93.8)	3 (30)	0.01&

mEq/L: milliequivalents per liter; mmHg: milimeters of mercury; PaO_2: partial pressure of O_2; $PaCO_2$: partial pressure of CO_2;
BMI: body mass index; COPD: chronic obstructive pulmonary disease; NMD: neuromuscular disease.
#Number of cases and percentage (n; %). Values expressed as mean and standard deviation (±).
&Cochran's Q Test. *Kruskal-Wallis Test.

TABLE 2. Characteristics of ventilatory treatment

	All the patients n = 43	COPD n = 17	NMD n = 16	Other n = 10
Devices and modes#				
Level 1	20 (46.5)	11 (64.7)	3 (18.7)	6 (60)
Level II	16 (37.2)	6 (35.3)	7 (43.7)	3 (30)
Level III with vital support	7 (16.3)	–	6 (37.5)	1 (10)
S/T mode	34 (79.0)	15 (88.2)	13 (81.3)	6 (60)
Spontaneous barometric mode	6 (13.9)	2 (11.8)	–	4 (40)
Volume-controlled barometric mode	2 (4.7)	–	2 (12.5)	–
Control pressure	1 (2.3)	–	1 (6.3)	–
More than one ventilatory mode	2 (4.7)	–	2 (12.5)	–
SupplementalO_2	21 (48.8)	16 (94.1)	1 (6.3)	2 (20)
Basic parameters@				
IPAP (cm of H_2O)	17 (12-22)	18.3 (14-24)	15.2 (13-18)	17 (15-18)
EPAP (cm of H_2O)	7 (6-9)	7.8 (7-10)	6.8 (6-8)	8 (6-9)
Respiratory rate (BPM)	14 (10-19)	13 (12-16)	18 (15-21)	14 (12-15)
*Monitoring data**				
Total number of days with NIV	12.7 ± 10.2	12.2 ± 8.9	9.2 ± 7.3	13.3 ± 5.3
Mean use of NIV (adherence in h/d)	6.9 ± 3.1	8.6 ± 0.8	6.7 ± 2.9	5.7 ± 0.9
Tidal volume (mL)	475.9 ± 119	453.6 ± 82.1	369.4 ± 126	524.5 ± 169
Unintentional leak (L/min)	29.2 ± 15.5	29.4 ± 12.7	25.4 ± 12.4	44.3 ± 18.9
Monitoring with ventilatory polygraphy#	9 (20.9)	2 (11.8)	4 (25)	3 (30)

S/T (*spontaneous-timed Mode*):barometric ventilatory mode with backup frequency; Cm of H2O: water centimeters;
IPAP: inspiratory pressure; EPAP: expiratory pressure: BPM: breaths per minute; L/M: liter per minute.
#Number of cases and percentage (n; %). @Mean and percentile 25%-75%. *Values expressed in mean and standard deviation (±).

TABLE 3. Arterial gasometry on admission and discharge

Variables	Admission	Discharge	p^
pH	7.36 ± 0.08	7.39 ± 0.06	0.16
PaO_2 mmHg	72.2 ± 16.2	75.9 ± 18.7	0.46
$PaCO_2$ mmHg	54.7 ± 10.7	46.1 ± 4.6	0.05
HCO_3 mEq/L	29.4 ± 5.1	29.0 ± 3.3	0.91
EB +	3.5 ± 3.8	4.0 ± 2.9	0.55
$SatO_2$ (%)	91.8 ± 7.2	91.4 ± 7.5	0.84
$PaCO_2$ > 45 mmHg#	29 (67.4)	10 (27)	0.01

mmHg: milimeters of mercury; PaO_2: partial pressure of O_2; $PaCO_2$: partial pressure of arterial CO2 ;
$SatO_2$: saturation of O_2; EB+: excess-bases; HCO_3: serum bicarbonate.
Values expressed as mean and standard deviation (±). #Number of cases and percentage (n; %). ^T Test.

TABLE 4. Context of NIV start and outcome

First NIV use (n = 43)#	
ICU	15 (34.9)
Hospital regular ward	26 (60.5)
Emergency Department	2 (4.7)
Hospital discharge (n = 37)#	
Chronic use of NIV	35 (94.6)
Discharge and referral to home hospital program	6 (16.2)
Inclusion to palliative care program	16 (37.2)
Advance directives and limitation of therapeutic effort	12 (27.9)
Mortality#	
Deaths with NIV in regular ward	6 (13.9)
Deaths with HNIV after 28 days	2 (5.4)

#Number of cases and percentage (n; %)

TABLE 5. Inpatient mortality and patient characteristics

Variables	Deceased *n* = 6	Survivors *n* = 37	p
Age*	75 ± 11.1	67.3 ± 10.6	0.04
Inclusion to the palliative care program#	4 (66.7)	12 (32.4)	0.001
Total NIV days at the regular ward	4.6 ± 4.1	13.8 ± 10.3	0.05
pH	7.30 ± 0.10	7.36 ± 0.07	0.11
$PaCO_2$	67.8 ± 18.1	50.6 ± 11.8	0.007
PaO_2	63.5 ± 10.6	75.6 ± 16.5	0.16
COPD diagnosis#	5 (83.3)	12 (32.4)	0.001
Advance directives in EMR#	6 (100)	11 (29.7)	0.01
Use of parenteral opioids#	5 (83.3)	4 (10.8)	-
Use of benzodiazepines#	4 (66.7)	2 (5.4)	-

mmHg: milimeters of mercury; PaO_2: partial pressure of O_2; $PaCO_2$: partial pressure of CO_2; EMR: electronic medical record.
Values expressed as mean and standard deviation (±). #Number of cases and percentage (n; %).
Chi-square for categorical variables and T-Test for numerical variables

DISCUSSION

This analysis describes the use of NIV in the regular ward of a general hospital in Argentina, and shows that NIV was delivered to patients with COPD, neuromuscular disease, hypoventilation due to obesity and respiratory failure (especially hypercapnic). A significant proportion of patients was using HNIV or needed ventilatory support upon discharge.

Some hospitals have developed specialized respiratory care units.[13, 14] Our hospital doesn't have that type of unit, but we do treat a considerable amount of NIV candidates outside de ICU. Even though general ward rooms don't have centralized monitoring, we established the following nurse/patient ratio: 1:5, residents and kinesiologists with active care shifts, 24 h a day.

The number of ICU beds limits the number of patients who are admitted for respiratory failure. In their study, Lapichino et al showed that there is a tendency among intensive care physicians to give priority to surgical patients, mostly those with clinical diseases,[15] particulary when unfavorable results are expected. On the other hand, ICU admission of less severe cases or patients with chronic diseases implies risks (for example, infection, isolation, delirium, etc.) and increases healthcare costs.

NIV has been delivered at the regular hospital ward for more than one decade. In an Italian study, 56% of 756 patients were successfully treated with

NIV (60% due to COPD exacerbation). Also, 47% of the subjects were directly referred from the emergency unit.[16] In out center, patients who had already adapted to NIV had priority for admission to a regular ward. A small percentage of patients (7%) were transferred to the ICU.

In many parts of the world,[14] the regular ward environment is considered inadequate for delivering NIV.[4] However, a multicenter, randomized, controlled trial,[18] directed by Plant et al showed the efficacy and safety of NIV in a regular ward in patients with COPD exacerbation and mild respiratory acidosis (pH 7.30-7.35). When NIV is delivered by qualified personnel, it reduces the number of occupied beds at the ICU, the intubation rate and mortality.[18] In our series, due to preestablished safety criteria, the admission pH (7.36) was higher than the value reported in similar studies.[14-18]

COPD exacerbation has been the most analyzed disease for the use of NIV outside the ICU. It has been suggested that a diagnosis other than COPD would be predictive of failure. More experience is necessary so as to recommend NIV in a regular ward in other situations.

COPD patients showed high values of $PaCO_2$ and hypoxemia and needed supplemental oxygen and higher-pressure support, though they didn't reach the values suggested by some authors.[9] On the other hand, patients with NMD were younger and had a much lower BMI. The fact that many of these patients had already received HNIV can explain why this group showed closer to normal $PaCO_2$ values.

Also, it was possible to identify a heterogeneous group mainly composed of obese subjects with alveolar hypoventilation, most of which hadn't been diagnosed before admission and were characterized by high BMI, chronic respiratory acidosis (high level of blood bicarbonate) and acidemia (exacerbation).

The 37 survivors with NIV showed minimum pH deviation on admission (7.36 vs. 7.30) and a $PaCO_2$ that was lower than that of patients who died (51 mmHg vs. 68 mmHg), thus indicating that the latter had severe respiratory failure. Besides, most patients in this sample were using home NIV; this means they continued using a ventilatory support that was familiar to them. More than 80% of patients in this group showed severe acidemia ($pH < 7.35$), so it would have been questionable to use limited resources from the ICU environment. On this regard, it is interesting to see that the existence of a non-invasive ventilation program avoided the use of valuable, scarce, and expensive resources (intensive care bed) for patients with HNIV, many of which were hospitalized for intercurrent conditions and required control and supplementary monitoring exams for the purpose of optimizing the ventilatory support.

Almost half of the patients used level I devices (basic). Vital support devices were used in NMD patients who had greater dependence or needed to have multiple ventilation modes.[5] Even though the $PaCO_2$ decreased with NIV and was close to normality upon discharge (46 mmHg), not every patient resolved hypercapnia (10 patients were discharged with $PaCO_2 > 45$ mmHg). We must mention that our institutional protocol involves follow-up through a daytime hospital model that prioritizes discharge with ventilatory support once the patient has adapted to ventilation and obtained basic comfortable parameters and improvement in pH and $PaCO_2$.

Our care model is similar to the one used in North America and some European countries; the kinesiologist is included in the team that is responsible for delivering NIV. Furthermore, the nursing staff can detect and resolve problems and intolerance.[19]

According to the data reported by developed countries, one fifth of NIV treatments begin in a regular ward.[20]However, logistic difficulties restrict the use of these treatments. In Europe, Australia and New Zealand, shortage of personnel and infrastructure limit the use of NIV treatments.[21-25] A study of 157 centers in 51 countries of the five continents showed that 66% of them use NIV outside the ICU. Inadequate training and limited human resources are the reasons why NIV outside the ICU wasn't implemented.[26]

In Latin America, data are limited. A survey conducted in fifteen hospitals in San Pablo, Brazil, showed that private hospitals made greater use of NIV, where kinesiologists seemed to be more skilled (100%) than physicians (73%) and nurses (33%).[27]

In Argentina, information is scarce. According to Alonso et al, there are some areas where NIV is not actively used[28]; and this could be considered an indicator of poor sanitary quality. Also, the organizational model of each center determines the use of NIV outside the ICU.[29-31] Our institution has a daytime hospital where we begin HNIV;[29] this can explain the differences with other series.[15, 18-20]

Many patients with advanced cancer or progressive diseases aren't candidates for endotracheal intubation or invasive ventilation. A European study evaluated the acceptability and efficacy of NIV vs. conventional oxygen therapy to reduce dyspnea and the opioid dose. The results suggested that NIV is effective and comfortable for patients with terminal cancer.[10]

In our series, two thirds of patients with NIV and palliative care survived and were discharged. Deaths occurred in patients with advance directives for limitation of therapeutic effort. This finding shows the complexity of decisions at the end of life in cases of respiratory failure, the difficulty to predict the outcome and the role of NIV as "ceiling of treatment" according to Roberts et al, in a multicenter study of real-world.[32]

Azoulay et al conducted a prospective, multicenter study on the use of NIV in terminal patients[11] in 54 centers of France and Belgium. 134 patients with a "do not intubate" order, survivors on day 90, didn't show a reduction in their quality of life. In our series, 43% of patients received NIV concurrently with opioids and anti-axiety drugs. However, this scenario is limited to specialized centers after a case-by-case discussion about the scope of treatment. In any case, NIV shall be continued only if it is well-tolerated by the patient and if a benefit is obtained. On the other hand, other measures must be taken to treat dyspnea (for example, drugs). It is necessary to take into account the fact that in some situations, NIV can unnecessarily prolong the life of the patient.[33]

This study has many limitations, included those inherent to retrospective studies, and since it is a single-center study with a heterogeneous population, comparisons are difficult to make. There isn't any control group, either, and most patients with severe exacerbation criteria had advance directives of limitation of therapeutic effort.

NIV was used in the regular ward environment, especially in patients with COPD, neuromuscular diseases and obesity with hypoventilation, and most of them had used some type of ventilatory support before being admitted and were discharged with indication of home ventilation. However, this perspective enlightens us about the use of resources in this specific population in a real-life scenario.

Both the number of treatment failures requiring ICU admission and the inpatient mortality rate were low. Deaths were recorded in patients with advance directives for limitation of therapeutic effort.

Conflict of interest

Nothing to declare.

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