**Material and Methods (Appendix A)**

Standardized periodic clinical evaluations were performed including: pulmonary function tests, daytime arterial blood gas (ABG) during spontaneous breathing (with or without oxygen therapy, according to medical prescription) and nocturnal pulse oximetry.

Other evaluations routinely performed with the newest generation of home ventilators which include a built-in software that provides potentially valuable data such as leaks estimation, tidal volume, minute ventilation, respiratory rate, percentage of spontaneous inspirations and expirations, and apnea and/or apnea-hypopnea indices (AHI), were not included in the database but they were taken into consideration in the patient monitoring and continuous adaptation, according to the combined approaches suggested by SomnoNIV Group (Janssens et al, 2011) partially validated by some authors (Rabec et al, 2009; Pasquina et al, 2011).

For the diagnosis of obstructive sleep apnea (OSA), patients underwent in-laboratory level 1 or at-home level 3 sleep study (Flemons et al, 1999; Shayeb et al, 2014). Patients with OSA diagnosis previously known to noninvasive ventilation (NIV) institution were referred for sleep testing after a pretest assessment that included sleep questionnaires, medical history and clinical observation. Patients under NIV after an acute episode of respiratory failure predominantly underwent ambulatory level 3 sleep test, after a period of suspension of NIV. An AHI ≥ 5 events/h was used as the cut-off for the diagnosis of OSA.

**NIV Initiation and Follow-up:** Over the study period, analyzed patients were treated with bilevel pressure-cycled ventilators: VPAP ST S9 VPAP S9 STA (Resmed) and BIPAP PR1; A30; A40; Trilogy 100 (Philips Respironics), which were chosen according to patient´s needs. The choice of the interface took into account the patient's face characteristics, preference, and the performance during the training period (with evaluation of non-intentional leaks).

Ventilators were set in pressure support ventilation with an initial pressure support level of 10 cmH2O and an expiratory positive airway pressure (EPAP) of 4 cmH2O. The backup respiratory rate was set to the minimum setting of 10 breaths per minute. Patient breathing, peripheral oxygen saturation and data provided by the ventilator in real time were taken into consideration to increase EPAP and/or IPAP; after 1-2 hours of daytime NIV acclimatization.

Pressure support ventilation mode was changed to pressure-controlled ventilation mode, with a backup respiratory rate set at 2 cycles below the resting respiratory rate (measured before NIV institution with the patient breathing quietly at rest). The inspiratory and expiratory triggers were set at the standard factory settings and adjusted to patient comfort. The inspiratory time was set at 25-33% of the duty cycle. ABG under NIV was performed to verify at least partial correction of hypercapnia (with improvement or maintenance of patient comfort assessed by the Borg scale). This NIV acclimatization was followed by nocturnal titration with oxygen therapy entrained at the daytime prescription rate.

The main goal in the initial evaluation was to reduce hypercapnia while maintaining patient comfort (evaluation and resolution of problems, data analysis by the ventilator and integrated oximetry and ABG without NIV the day after). Ventilator settings were changed when ABG still revealed hypercapnia or there was reference to discomfort. Oxygen therapy was adjusted in order to maintain oxygen saturations ≥ 90%.

Although the backup respiratory rate was programmed 2 cycles below that monitored at rest during wakefulness for the majority of patients, in those with no significant hypercapnia reduction, despite the maximum tolerated pressure support, the strategy of increasing the respiratory rate above the patient's basal respiratory rate was used (high-intensity ventilation).

In a small subgroup of patients, another modality was used (volume-assured pressure assisted/controlled ventilation), especially in those with prolonged ventilation (> 12 hours/day), intolerant to higher IPAP (> 25 cmH2O). IPAP were initially programmed with a differential of 5 cmH2O between maximum and minimum IPAP and with an inspiratory programmed tidal volume at 8 mL/kg of estimated ideal body weight. Parameterization was made according to the above-mentioned monitoring data, as well as maximum delivered IPAP, exhaled tidal volume and leaks (monitored by the ventilator software).

Parameter changes were performed until hypercapnia improvement was achieved with patient comfort (maintenance or increase of adherence to NIV and evaluation of dyspnea assessed by the Borg scale).

If the patient was already performing NIV (after admission for acute exacerbation), the first outpatient evaluation was performed with the ventilator, interface and oxygen charge initially prescribed, and necessary changes were subsequently made.

Patient follow-up consisted of outpatient medical consultations, of variable frequency according to clinical evolution, and of home visits by respiratory nurses to a selected subgroup of patients of the hospital's catchment area. Complementary titration was performed using polygraphy under ventilation, whenever necessary (Janssens et al, 2011).

During follow-up, complications and ventilation effectiveness were reviewed. It included nocturnal oximetry and ABG during spontaneous breathing at rest and during NIV (whenever there was the need to change the ventilator parameterization).

**Home NIV Interruption:** In patients who had started NIV after an acute episode of respiratory failure, the NIV weaning was supported by one of the following data: 1) noncompliance (less than 4 h/day) and no significant hypercapnia on ABG; 2) patient refusal despite attempts to improve patient comfort such as ventilator parameterization and interface changes; 3) absence of home NIV criteria after progressive reduction of pressure support performed in patients without home NIV criteria before hospitalization. Weaning was considered successful when neither clinical deterioration, nor respiratory acidosis (pH < 7.35) or significant hypercapnia were observed one month after completely discontinuing home NIV. If OSA was clinically suspected from history, physical examination or baseline oximetry, it was then investigated with attended limited respiratory polygraphy (ambulatory level 3 sleep test).

**Definition of variables**

1. **Hospitalization Rates Before and After NIV Initiation as Cost-effectiveness Indicators**

Analysis of the number of hospitalizations and days spent in hospital for respiratory illnesses was performed regularly at follow-up evaluations and confirmed at centralized computer records. Patients were instructed to make available the clinical information after hospital discharge (particularly relevant for hospitalizations in other hospitals). Number of hospital admissions and days spent at hospital per year, before and after home NIV institution, could therefore be compared.

1. **Other Technical Aspects**

**Compliance** to NIV was regularly assessed according to the ventilator time register. Noncompliance was defined as an annual average usage of < 4 hours per day. The first compliance assessment was obtained one month after home NIV institution.

**NIV parameters** established at the first evaluation (IPAP; EPAP; pressure support; respiratory rate) were considered: parameters in progress in patients with NIV instituted after exacerbation or parameters in course after acclimatization of patients with elective NIV institution.

**First ABG** was performed in the first visit at the noninvasive respiratory care unit (ambulatory) during the morning (while spontaneously breathing at rest with or without oxygen therapy according to clinical indication) in all patients, and after a night of NIV support treatment in those evaluated for the first time after NIV institution in the acute phase. **Final ABG** was performed in the last recorded visit at the noninvasive respiratory care unit during the period under analysis (between August 2011 and July 2014), under the same conditions: during the morning (while spontaneously breathing at rest, with or without oxygen therapy according to clinical indication).

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