caregiver answered to a questionnaire about socio-demographic character-istics (age, sex, marital status) and the work conditions (intensive care unit conditions, number of hours of work per day, the number of on-call duty hours at the hospital). The Malasch Burn Inventory score was used to assess the burnout syndrome in our sample.

**Results** One hundred questionnaires were distributed in the departments of EMICU, surgery and pediatrics. Only 79 were collected, registered and then analyzed.

The participation rate was about 79%. We found that 58% of all caregivers working in EMICU had a burnout syndrome and 26% of them were seriously affected. Forty-two percent of the affected caregivers had a high level of emotional distress, 43% had a high level of depersonalization, and 39% had a low level of professional fulfillment.

The mean average age of our sample was 33 years with a standard deviation of 9. We have a female predominance with a sex ratio of 0.46. Fifty-six percent of the caregivers enrolled in the study were married.

From all the persons who answered to the questionnaire, 47% chose their department of work. More than half of our population (72%) works in the hospital from < 10 years. The average number of hours of work per week was 41 h. Twenty-seven percent of all caregivers had to work at least two on-call duties per week.

Analytical study showed that among the socio-demographic characteristics, the female sex was significantly associated with the lowest score of professional fulfillment (p = 0.03). Seventy-two percent of caregivers affected by burnout were male with 40% who were seriously affected. Sixty-one percent of our affected population was married with a severe score in 22.7% of cases.

General surgery department had the highest level of emotional distress and depersonalization (73 and 64%) followed by our EMICU department (56 and 60%), while the level of professional fulfillment was the lowest in pediatric department (14.3%) followed by our EMICU department (23.5%).

**Conclusion** As expected, the prevalence of burnout syndrome is particularly high in our Tunisian emergency and intensive care unit. We found also that it was correlated with socio-demographic characteristics. Our department had one of the highest levels of burnout syndrome in the hospital. We are trying to identify the causes of this high level. Preventive and interventive measures against burnout syndrome should be started. This work is the first step of a multicenter Tunisian study.

**Competing interests** None.

**P27** Length of endotracheal tube, humidification system and airway resistance: an experimental bench study

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**Introduction** After intubation, the resistance of the inspiratory line is usually increased. This rise in airway resistance is associated with the presence of the endotracheal tube, a heat and moisture exchanger (HME) and/or any another tubing in the breathing circuit. During assisted ventilation or in spontaneously breathing patient, these high resistances will increase the work of breathing and negatively impact the chance of weaning. To limit this elevation in resistance, the endotracheal tube is sometime shortened and a heated humidifier used instead of a HME. The aim of this study was to evaluate the actual effect of these strategies on the airway resistance.

**Materials and methods** A two-compartment model of adult lung (DTL: TTL 1600 Dual Test Lung, Michigan Instrument) was connected to a Dräger Evita 4® Ventilator. The ventilator was set in volume-controlled mode (Vc: 0.5 L; respiratory frequency: 20 bpm; inspiratory flow: 70 L/min). To simulate normal and obstructive clinical conditions, two different resistances were placed at the entry of the airline connected to DTL by using Pneuflo® (parabolic resistor, Michigan Instrument; mean ± SD: 2.5 ± 0.06 and 17.04 ± 0.03 cmH2O/L s−1). Compliance of the artificial lung was set to 70 ml/cmH2O.

The airline was compounded of an endotracheal tube and a humidification system. Three different inside diameters (ID) (Portex® endotracheal tube of 7, 8 and 9 mm) and two humidification systems (HME (Gibbeck Humid Vent® Adult) or Fisher and Paykel MR850 Heated Humidifier®) were evaluated before and after shortening of the tube at 10 cm length. The change in pressure was measured by an analog
iWorx station/digital IWx/214. Resistance value was calculated from the following equation:

\[ \text{Inspiratory Resistance} = \frac{\text{Peak pressure} - \text{Plateau pressure}}{\text{Inspiratory flow}} \]

Statistical test (Student’s test) was performed. Values are presented as mean ± standard deviation.

**Results**

**Conclusion** The use of heated humidifier instead of HME and shortening of endotracheal tube (10 cm of length) allow significant decrease in airway resistance. Both strategies may be helpful for the weaning of obstructive patients. However, the shortening of the tube (relative impact) has a decreasing impact when the tube diameter is growing and even for smaller tube the impact of humidifier is more important (Table 10).

**Competing interests** None.

**Reference**


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**Table 10** See text for description

<table>
<thead>
<tr>
<th></th>
<th>Normal initial Resistance</th>
<th>High initial Resistance</th>
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<tr>
<td></td>
<td>HME</td>
<td>Heated humidifier</td>
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<tr>
<td>4.88 (+/- 0.04)</td>
<td>2.5 (+/- 0.06)</td>
<td>19.73 (+/- 0.03)</td>
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<tr>
<td><strong>(</strong>) -95%</td>
<td><strong>(</strong>) - 15.8%</td>
<td></td>
</tr>
<tr>
<td>Tube 7</td>
<td>Tube 7 cut down</td>
<td>Tube 7</td>
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<tr>
<td>13.36 (+/-0.06)</td>
<td>11.74 (+/-0.03)</td>
<td>26.19 (+/-0.04)</td>
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<tr>
<td><strong>(</strong>) -13.0%</td>
<td><strong>(</strong>) -4.2%</td>
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</tr>
<tr>
<td>Tube 8</td>
<td>Tube 8 cut down</td>
<td>Tube 8</td>
</tr>
<tr>
<td>8.36(+/-0.05)</td>
<td>7.27(+/-0.01)</td>
<td>22.99(+/-0.02)</td>
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<tr>
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<td><strong>(</strong>) -3.6%</td>
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</tr>
<tr>
<td>Tube 9</td>
<td>Tube 9 cut down</td>
<td>Tube 9</td>
</tr>
<tr>
<td>4.39(+/-0.05)</td>
<td>3.90(+/-0.10)</td>
<td>10.79(+/-0.04)</td>
</tr>
<tr>
<td><strong>(*) -10.3%</strong></td>
<td><strong>(*) -2%</strong></td>
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</table>

**P28**

**Diagnosis contribution and safety of bronchoalveolar lavage in intensive care unit**

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**Introduction** Bronchoalveolar lavage (BAL) is a diagnostic tool that explores the deep lung; it can provide useful histological and microbiological information. However, endobronchial injection of important volumes of saline serum may cause hypoxemia. This risk is particularly important to consider in ICU patients. The aim of this study was to determine the diagnostic value and to identify incidents attributable to BAL in intensive care unit.

**Patients and methods** This was a retrospective study conducted from January 2011 to December 2014 at the respiratory ICU of the Abderrahmen Mami Hospital in Ariana (Tunisia). Were included all patients who underwent BAL in intensive care unit. We recorded demographic, clinical and paraclinical characteristics of patients, results and incidents of BAL.

**Results** During the 4 years of the study, 100 BALs were performed in 100 patients (55 men and 45 women) with a mean of age of 44 years (15 years – 87 ans). Respiratory history was present in 22 patients and systemic disease in 31 patients, and 42 patients were smokers. The main cause of admission was acute respiratory failure (97 patients). On chest X ray, alveolar and/or interstitial damage was found in 93 patients; 78 were bilateral. BAL was contributory to diagnosis in 77 patients: 28 cases of intra-alveolar hemorrhage, 26 cases of bacterial pneumonia (ten community-acquired pneumonia and 16 nosocomial), eight cases of pulmonary pneumocystosis, six cases of active pulmonary tuberculosis, six cases of malignant pulmonary infiltrate, two cases of eosinophilic pneumonemia and one case of histiocytosis X.

The major occurring incident was severe hypoxemia in four patients among which three had required endotracheal intubation. In the 96 remaining patients, BAL was safe and harmless.

**Conclusion** In ICU, BAL is a good and safe tool; it contributes to diagnosis in 77 % of cases. However, the risk of worsening breathing after BAL should be evaluated, especially in critically ill patients.

**Competing interests** None.

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**P29**

**Impact of fiberoptic bronchoscopy performed under noninvasive ventilation on the outcome of critically ill patients: a cohort study over 11 years**

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**Introduction** Fiberoptic bronchoscopy (FOB) is frequently performed in intensive care unit (ICU) for diagnostic and/or therapeutic procedures. The main complication of FOB is hypoxemia, which can lead...