Abstract: P955

Prediction of heart failure decompensations using artificial intelligence techniques

Authors:
V Escolar Perez1, A Lozano1, N Larburu2, J Kerexeta2, A Artetxe2, G Artola2, R Alvarez2, B Juez3, A Echebarria1, A Azcona1, 1Hospital de Basurto, Cardiology - Bilbao - Spain, 2Vicomtech Research Centre - San Sebastian - Spain, 3Hospital de Basurto - Bilbao - Spain,

Topic(s):
Chronic Heart Failure – Epidemiology, Prognosis, Outcome

Citation:

Introduction
- The creation of large databases and advances in ICT (information and communication technologies) have allowed the development of artificial intelligence or machine learning techniques.
- These methods are capable of creating algorithms based on the data supplied with the aim of helping in the usual clinical practice.

Objectives and methods
- The objective is to determine which parameters measured by telemonitoring (blood pressure, heart rate, O2 saturation, weight and questionnaire) are the best predictors of heart failure (HF) decompensations in our group.
- Data were collected from telemonitored patients in the HF Unit of our hospital from May 2014 to February 2018, with the following variables: baseline characteristics and HF decompensations (decompensations include, in addition to hospitalizations, administration of iv diuretic at home, emergency room or day hospital and adjustment of oral diuretics).

Results
- The study contains 242 patients (138 men and 104 women), with an average age of 78 years (SD 10.9). The most prevalent heart disease is ischemic (33%), followed by idiopathic (18%). The mean LVEF is 42.4 (SD 15.21). 138 patients (57.4%) were in atrial fibrillation. The mean time of evolution of HF is 5.8 (SD 7.08).
- During the 46 months of follow-up, a total of 562 heart failure decompensations were detected. Of these, 379 were managed at home (286 with oral diuretic adjustment, 80 with intravenous treatment and 16 with subcutaneous furosemide pumps). There were 151 hospital admissions and 32 emergency visits that did not require hospital admission (resolution of the decompensation with the intravenous treatment administered in this department).
- Figure 1 specifies monitored parameters, established alerts, sensitivity (Se) and false alert rate per patient and year (FA/pt-y).
- Weight variations (1 kg increase in 3 days or 3 kg in 5 days) and desaturation below 90% in pulse oximetry are good predictors of HF decompensation according to Se and FA/pt-y values. Regarding to the questionnaire, "worse" answers in questions 1 and 2 are very good predictors of decompensation. Questions 3 and 4 also have good predictive values, but less than questions 1 and 2.

Conclusions
- Significant weight increases, desaturation below 90%, perception of clinical worsening, including development of edema, worsening of functional class and orthopnea are good predictors of heart failure decompensation.
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<table>
<thead>
<tr>
<th>Parameter to study</th>
<th>Threshold number</th>
<th>Type of alert</th>
<th>Se</th>
<th>FA/pt-y</th>
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<tr>
<td>SBP</td>
<td>&lt;95 or &lt;150</td>
<td>Yellow</td>
<td>0.28</td>
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<td></td>
<td>&lt;85 or &gt;150</td>
<td>Red</td>
<td>0.08</td>
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<tr>
<td>DBP</td>
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<td></td>
<td>&lt;50 or &gt;100</td>
<td>Red</td>
<td>0.04</td>
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<td>HR</td>
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<td>0.30</td>
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<tr>
<td></td>
<td>&lt;50 or &gt;90</td>
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<tr>
<td>O2Sat</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>&lt;90</td>
<td>Red</td>
<td>0.39</td>
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<td>9.55</td>
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<table>
<thead>
<tr>
<th>n</th>
<th>Questionnaire</th>
<th>Answer</th>
<th>Se</th>
<th>FA/pt-y</th>
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<tbody>
<tr>
<td>1</td>
<td>Well-being</td>
<td>Worse</td>
<td>0.37</td>
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<td>2</td>
<td>Ankle</td>
<td>Worse</td>
<td>0.35</td>
<td>2.9</td>
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<tr>
<td>3</td>
<td>Walks</td>
<td>No</td>
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<td>18</td>
</tr>
<tr>
<td>4</td>
<td>Shortness of breath</td>
<td>Yes</td>
<td>0.41</td>
<td>19.93</td>
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</table>