THE USE OF A VIRTUAL CARDIO-RESPIRATORY PATIENT TO ANALYZE PATHOPHYSIOLOGY OF COMORBID OBSTRUCTIVE LUNG DISEASES AND HEART FAILURE

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Aim: To indicate similarities and differences in influence of heart failure (HF) and chronic obstructive lung disease (COPD) on the physiological parameters that can be used in medical diagnosis.

Intended outcome: Methods that enable physicians to differentiate those diseases and to determine the severity of each of them in the case of comorbidity.

HF and COPD are the first and third cases of the death, respectively. Additionally, both HF and COPD are associated with similar reasons, such as ageing or smoking, which relatively frequently leads to comorbidity, particularly in elders; this is a real problem in aging populations. On the other hand, both subjective and objective symptoms of HF and COPD are partly similar [2], which makes differentiation difficult.

The above motivates to perform experiments for better understanding pathophysiology of the comorbidity and finding the parameters that could be used in differential diagnosis. As such experiments are impossible to be carried out on seriously ill patients, the use of virtual or artificial patients seems to be the best solution.

A virtual population, i.e., randomly deviated values of parameters of the standard virtual patient elaborated in the Institute [3], should be examined. A PhD student will simulate various severities of HF and COPD in different combinations; then he/she will observe and analyze similarity and differences in changes of physiological parameters caused by these combinations. If necessary, the student will modify the virtual patient to adapt it to particular current purposes.

Analysis of results should either prove that differential diagnosis of HF and COPD is really difficult or lead to propose new fruitful methods of diagnosis and differentiation.

Bibiography:

[1] https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death

[2] Hawkins NM, Petrie MC,. Jhund PS, et al. Heart failure and chronic obstructive pulmonary disease: diagnostic pitfalls and epidemiology. Eur J Heart Fail. 2009;11(2): 130–139.

[3] Zieliński K, Stecka A, Gólczewski T. VirRespir - An Application for Virtual Pneumonological Experimentation and Clinical Training. In: Lhotska L., Sukupova L., Lacković I., Ibbott G. (eds) World Congress on Medical Physics and Biomedical Engineering 2018. IFMBE Proceedings, vol 68/1. Springer, Singapore