

**TITLE:**

Synchronized registration of instantaneous values of chosen physiological parameters during therapeutic thoracentesis, and their mathematical and physiological analysis.

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<sup>#</sup> - depends on whether the student is the physician or another science representative

**DOCTORAL SCHOOL:**

Doctoral School of Information and Biomedical Technologies Polish Academy of Science (TIB PAN)

**AFFILIATION:** Instytut Biocybernetyki i Inżynierii Biomedycznej im. Macieja Nałęcz Polskiej Akademii Nauk, ul. Ks. Trojdena 4, 02-109 Warszawa (IBIB PAN)

**SCIENTIFIC DISCIPLINE:** biomedical engineering or<sup>#</sup> medicine

**PROJECT DESCRIPTION**

Pleural effusion is relatively frequent affliction, e.g., about 1.5 million patients with pleural effusions are diagnosed each year in US, and the annual number of therapeutic thoracenteses (TT) performed in US was reported between 124,000 and 178,000. Although TT is profitable in the long term (hours, days), it is associated with the risk of various complications, e.g., life threatening re-expansion pulmonary edema. Additionally, some phenomena observed during TT are still not fully understandable. Thus, both for scientific and practical reasons, investigations of organism responses to effusion withdrawal has significant meaning. Our medical-engineering team working as a scientific consortium composed of IBBE PAS and WUM is rather an exceptional team in the world since we can do more than a purely medical or purely engineering team (e.g., [1-5]).

PhD student tasks:

- Technical and/or medical assistance during TT performed in a hospital of WUM.
- Participation in processing of original signals and creation of database.
- Analyses of relationships between changes of particular physiological parameters, also in relation to the patient state, and their biomedical interpretation.

The student will gain a spectrum of experience in biomedical engineering and medicine through work in the medical-engineering team and direct contact with patients, to mathematical and physiological analysis of medical data (including analysis supported by computer simulations (e.g., [1,2])).

1. Gólczewski T, Stecka AM, Michnikowski M, et al. The use of a virtual patient to follow pleural pressure changes associated with therapeutic thoracentesis. *Int J Artif Organs* 2017;40:690-5.
2. Stecka AM, Gólczewski T, Grabczak EM, et al. The use of a virtual patient to follow changes in arterial blood gases associated with therapeutic thoracentesis. *Int J Artif Organs* 2018;41:690-7
3. Zielinska-Krawczyk M, Michnikowski M, Grabczak EM, et al. Cough during therapeutic thoracentesis: Friend or foe? *Respirology*. 2015;20(1):166-8
4. Krenke R, Guć M, Grabczak EM, et al. Development of an electronic manometer for intrapleural pressure monitoring. *Respiration*. 2011;82:377-85
5. Zielinska-Krawczyk M, Grabczak EM, Michnikowski M et al. Patterns of pleural pressure amplitude and respiratory rate changes during therapeutic thoracentesis. *BMC Pulm Med* 2018;18:36

**REQUIRMENTS FOR CANDIDATES**

The candidate has to be either MSc in biomedical engineering, computer sciences, electronics or similar, or he/she has to be MD. He/she has to have physical and mental predispositions to work with patients during invasive medical procedures. At least basic Polish is desirable to protect patients from possible additional stress during TT.