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**Ocena wiedzy, postaw i umiejętności personelu medycznego
wobec stosowania ultrasonografii w stanach zagrożenia życia**

Assessment of knowledge, attitudes, and skills of medical personnel
towards the use of ultrasound in life-threatening conditions

STRESZCZENIE W JĘZYKU ANGIELSKIM

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Introduction

Since the invention of ultrasound, medics have tried to integrate the use of ultrasound with physical examination. As a result, the use of ultrasound has gained diagnostic value and attempts to implement it are now carried out at the stage of diploma education as well as postgraduate training in many specialties, with particular emphasis on such specialties as emergency medicine, anesthesiology, cardiology or obstetrics and gynecology. In addition, the technological development of various probes and transducers as well as the mobility of new ultrasound devices paved the way for a more accurate and specific diagnostic examination not only in hospital conditions - but also, importantly, in the conditions of emergency medical emergency teams. Currently, many ultrasound protocols are used for emergency medicine, with the F.A.S.T protocol and its extended version eF.A.S.T. those applicable in trauma care are the most recognizable. The scope of using ultrasound in emergency medicine, apart from its application to detect intraperitoneal bleeding in trauma patients, includes, among others, diagnosis of pericardial effusion and tamponade, hydronephrosis in patients with abdominal pain, assessment of pregnant patients with vaginal bleeding or abdominal pain, or in the pandemic era, lung assessment in patients with COVID-19.

Aim of the study

The common goal of the series of articles included in the monothematic publication cycle is to assess the knowledge, attitudes and skills of medical personnel regarding the use of ultrasound as a diagnostic method in patients in a state of health and / or life threatening.

Material and methods

The series of publications making up the doctoral dissertation comprises five publications. The aim of the first study was to familiarize the reader with the possibility of using ultrasound in emergency medicine conditions, with particular emphasis on the most commonly used ultrasound protocols. The aim of the second study was to present the F.A.S.T. (Focussed Assessment with Sonography for Trauma). The aim of the third study was to familiarize the reader with the use of ultrasonography to measure the thickness of the sheath of the optic nerve as a diagnostic element of indirect assessment of the increase in intracranial pressure. The fourth paper was aimed at determining the sensitivity and

specificity of the ultrasound examination during cardiopulmonary resuscitation. The study was designed and conducted as a systematic review and meta-analysis. The study was performed in accordance with the PRISMA standard and the Cochrane Library methodology. In order to search for publications that met the inclusion criteria of the study, electronic databases (PubMed, Scopus, EMBASE, Web of Science, CENTRAL) were searched. Finally, the database search was dated March 2, 2021. Out of 6217 records potentially meeting the search criteria, finally 20 studies including 3265 patients and published at the turn of 2001-2019 were included in the study. The fifth paper was an experimental study in which 23 paramedics were trained for the first time in the eF.A.S.T. During the training, participants learned how to properly perform the eF.A.S.T. and interpret ultrasound images obtained on the basis of projections obtained under the eF.A.S.T. In the evaluation, the following were assessed, inter alia, time and correctness of the eF.A.S.T. The study participants were also asked to interpret both normal and pathological ultrasound images. The aim of this part of the study was to determine the ability of the participants to recognize internal bleeding or tension pneumothorax. The evaluation was performed twice: the first evaluation immediately after the training and the second two months after the training.

Results

The first three papers are review papers describing ultrasound protocols used in emergency medicine. In a study (meta-analysis) assessing the usefulness of an ultrasound examination during cardiopulmonary resuscitation based on a database review, 6,217 scientific publications were initially identified, 20 of which finally met the inclusion criteria for the study. These studies were published between 2001 and 2019 and included 3,265 patients in cardiac arrest. The sensitivity and specificity of ultrasound in terms of patient survival until hospital discharge was 6.2% (95% CI: 4.7% to 8.0%) and 2.1% (95% CI: 0.8% to 4.2%). For the endpoint of return to spontaneous circulation, the sensitivity of PoCUS was 23.8% (95% CI: 21.4% to 26.4%) with a specificity of 50.7% (95% CI: 45.8% to 55, 7%). In turn, the survival rate at admission to the hospital, the sensitivity and specificity of PoCUS were 13.8% (95% CI: 12.2% to 15.5%) and 20.1% (95% CI: 16.2% to 24.3%). 23 paramedics took part in the study to assess the ability to perform and interpret ultrasound examinations in injuries (eF.A.S.T.). Median time to complete the eF.A.S.T. was 3 minutes. On the other

hand, the effectiveness of detecting tetanic pneumothorax was 91.3% and 86.9% (immediately after training and two months after training, respectively ($p = 0.723$)). The correctness of diagnosis of pericardial bleeding in the ultrasound was 82.6% and 73%, respectively. 9% ($p = 0.056$) The experiment also allowed for the assessment of the correctness of blood identification in the pelvic area (95.6% and 78.2%).

Conclusions

The conducted research allows for the following conclusions: there are several ultrasound protocols applicable in emergency medicine, both in the conditions of emergency medical teams, and at the diagnostic stage in the Hospital Emergency Department; Ultrasound protocols in cardiopulmonary resuscitation should be further developed to promptly diagnose potentially reversible causes of cardiac arrest; After a short training, paramedics are able to correctly interpret ultrasound recordings during the eF.A.S.T. and the interpretative skills gained during the short training did not deteriorate significantly during the 2-month evaluation period.