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## **THE POTENTIAL TASKS TO SOLVE CONCERNING HANDHELD ULTRASONOGRAPHY APPLICATION: A REVIEW**

### **Introduction and background.**

The hand-held ultrasonography devices are applied for diagnosis and guidance nowadays [1]. These are used in practice and in various scientific researches currently [2], [3], [4], including ones on AI sonography interpretation [5].

However, despite of its proven extreme usefulness [6], [3], some disadvantages of different importance degree might also be present.

**Purpose.** The aim of this review is to look through the current researches on hand-held ultrasonography devices application and to outline present or potential issues.

**Materials and methods.** The search strategy included requests “sonography hand-held devices”, sorting “by relevance” was applied, articles dated the year 2019 and later were included. Additional search entries were found by manual search through the reference lists from the original researches and books. As a free search engine Google Scholar was used initially.

**Results.** The main of potential pitfalls of hand-held ultrasonography devices application may depend either on the device, or on the sonographer [7]. Although hand-held echocardiography was reported to be dependable in obtaining the left ventricle measurements and functional indices [3], portable devices may predictably lack modes and some hardware and software sets the ultrasonography workstations may have and the image quality might depend on [7].

However, there are researches, validating the scanograms properties of hand-held devices and comparing the properties to the ones of cart ultrasonography appliances scanograms [8].

Despite of being reliable in time-limited diagnostic tasks and treatment guidance, the hand-held ultrasound devices application might also pose several questions, and on the opinion of Hsieh et al. [9], those questions might be concerning patients’ electric, electromagnetic, radiofrequency (wireless technologies) safety, technical issues, such as device requirements (software and hardware up-to-date condition criteria), patients’ data confidentiality and safety, depending on the technology applied. However, manufacturers of medical devices should control these ones and guarantee the sonographers’ and patients’ safety, except the disinfection, that should be controlled by the sonographer, and the device maintenance.

Interestingly, the interpretation of right upper quadrant images, obtained by hand-held devices, was not admitted to be less reliable than in ultrasonography workstations usage [10], and, reportedly, it did not take significantly more time [10], [8] to interpret the hand-held devices ultrasonograms than the ones, obtained by the stationary devices [10]. And sonography personnel of different knowledge and practice level predictably might have different results in interpretation of scanograms [11]. In addition, the training programs for personnel to make them able to perform certain sonography protocols vary among countries. Thus, it might take from 10 to a hundred echocardiograms to complete training in different programs, those are also being revised. Medical education systems of many countries, while having a great part of similar features, were not shown to have standardised sonography teaching programs [6].

**Discussion.** The hand-held ultrasound devices application is of interest, and the its presence in the researches proves that. Although, it is not recommended to use the hand-held sonography

instead of routine physical examination or advanced traditional echocardiography, it may be of great use [12], especially in the ICU setting [6].

### Conclusion

The hand-held ultrasonography was reported to be extremely useful and reliable in many fields of medicine, however, attention should be paid to the factors, those slightly differ from the ultrasonography workstations usage. These factors might be the patient data confidentiality (accounting networking technologies, especially the wireless ones), device access regulation and sonography training programs standardisation, in addition to the factors, those already are controlled in traditional ultrasonography workstations application, including the patients' and sonographer's safety.

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