

The history of knowledge translation on an example of ultrasound waves. From military industry to medicine

Summary

Aim: The aim of this dissertation is to present the history of knowledge translation and to show how knowledge of translation of ultrasound waves can be used in various fields of life, especially in medicine.

Material and methods: While writing this paper varied source bases were used, including library resources and web-based materials. The used methods were philological method and comparative with elements of statistical methods (with analysing numeral data from literature).

Sequence and concept of the sections of the research material between chapters is the consequence of chronology of adaptation of ultrasound waves in next fields.

Results: The history of ultrasound translation had began in the military, where the results of research made by physicists were used and ultrasound waves were first used in hydrolocation sonars to detect submarines in the 1917. Then the features of ultrasound waves were applied to studies on human. Military experience were used to build ultrasound equipment for medicine. Starting with the pioneering ultrasound studies of Karl Dussik, who had determined the tissue properties in vivo, through the first contact probe made by Ian Donald and Tom Brown. Ian Donald used it in obstetric diagnostics to assess fetus development. Between 1958 and 1970, ultrasound waves were first used in neurosurgery to examine the human brain. Since 1959 ultrasounds have been used in cardiology and since the 1960s in doppler studies. In 1971 digital technology has been applied to ultrasound diagnostics, and in 1985 years coloured imaging has been introduced.

Today ultrasound are used in almost in all areas of life. In medicine, despite of the diagnosis of diseases, therapeutic features are also used.

In medicine the transfer of ultrasound knowledge from laboratories and basic sciences to clinical practice has made safe diagnostic techniques possible, as well as regarding protection of the most sensitive organs as the developing fetus or eyes and personalized treatment for a range of conditions from surgery (for example kidney stone removal) to targeted oncological therapy (for example prostate cancer).

The translation of knowledge on the practical application of ultrasound waves contributes to the optimalization of treatment and the modernization of therapeutic techniques.

Conclusions: Knowledge translation, understood as the transfer of research results from basic science facilities to the implementation phase, is a relatively new concept, as it was first mentioned in 2000. From Karl Dussik's pioneering ultrasound research, which was the first to determine tissue properties in vivo, to Ian Donald and Tom Brown and the first contact transducer to produce two-dimensional images, ultrasound was dynamically introduced into medical practice. Subsequently, ultrasonic waves have found wide application in various areas of the economy. The analysis of knowledge translation concerning practical applications of ultrasound waves in medicine has shown that they are used in practically all fields of medicine: oncology, gynaecology and obstetrics, interventional radiology, pulmonology, cardiology and cardiac surgery, surgery, orthopaedics, ophthalmology, neurology, dentistry, rheumatology, physiotherapy, dermatology and aesthetic medicine. Ultrasound is used for diagnostic and therapeutic purposes and the translation of knowledge in the application of ultrasound has enabled the personalisation of complex diagnostic and therapeutic procedures, e.g. in surgery or urology. Knowledge translation of practical ultrasound application contributes to treatment optimisation. The translation of ultrasonic wave knowledge into economics has made it possible to introduce modern methods of assessing materials, etc. in industry, electronics, hydroacoustics and space research.