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DIAGNOSTIC TECHNOLOGIES

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ABSTRACT:

This article discusses the application of information technology in medicine. It highlights how medical information and modern technologies help determine the health status of human organs identify the exact location of diseases and develop preventive and treatment measures.

INTRODUCTION. Nowadays, medicine is closely cunnected with technology. The main goal is to accurately diagnose patients diseases and treat them in a painless way.

Diagnostic technologies include examples such as ECG, MRI and ultrosound.

ECG (Electrocardiogram) is a recorded graph of the electrical impulses generated by the heart muscle during it's activity. In various diseases the size intervals and direction of ECG waves as well as the duration and positioning of intervals change significantly. ECG helps detect different heart rhythm disorders ischemic heart disease and the characteristics and stages of myocardial infarction. ECG is considered one of the most effective methods for diagnosing heart diseases.

Modern medical technology advancements allow ECG recordings to be taken even if the patient is at a considerable distance using telecommunication or radio transmitters. These methods enable the monitoring of heart activity in athletes astronouts and others undergoing intense physical exertion.

MRI (Magnetic Resonance Imaging) is a radiological diagnostic method based on the use of a magnetic field and radio waves to obtain layered and volumetric images of organs and tissues reconstructed using mathematical methods.

Unlike radiowave-based methods MRI uses radio waves with a frequency much lower than that required for ionizing atoms. MRI does not have harmful effects on biological tissues and is considered almost harmless todey.

This is a medical imaging method usez in radiology to visualize the body's anatomy and physological processes for diagnosing diseases.

Ultrasound Diagnostics (UTT) is a widely used examination method that utilizes high-frequency sound waves. The reflection these waves varies depending on the density of different body tissues.

An ultrasound device provides information about the location shape size structure and functional activity of internal organs . This method os safe painless does not have harmful effects on the body and does not expose a person to X-ray radiation.

Ultrasound examination may be prscribed in the following cases:

1. Presence of complaints and pain;
2. Inflammatory diseases;
3. Organ injuries;
4. Tumor processes;
5. Developmental anomalies.

In addition ultrasound is the primary method for studying the anatomy and functional condition of the fetus during pregnancy.

Ultrasound (UTT) is a harmless method that poses no risk to health. Therefore there are no absolute contraindications to it's use.

In addition to ECG, MRI, and ultrasound, modern medicine employs various other diagnostic technologies to improve accuracy and patient care. Computed Tomography (CT) scans use X-rays and computer processing to generate cross-sectional images of the body, helping detect tumors, fractures, and internal bleeding. Positron Emission Tomography (PET) scans are used primarily in oncology, cardiology, and neurology, providing detailed images of metabolic activity within tissues and helping diagnose conditions such as cancer, Alzheimer's disease, and heart disease.

Another significant advancement is AI-powered diagnostics, which assist in interpreting medical images, predicting disease progression, and identifying abnormalities that may not

be visible to the human eye. AI is particularly useful in radiology, pathology, and dermatology, improving early disease detection and reducing diagnostic errors.

Wearable health devices such as smartwatches and portable ECG monitors have become essential for monitoring heart health, blood oxygen levels, and even detecting irregular heart rhythms like atrial fibrillation. These devices enable continuous health tracking and allow for early medical intervention.

Endoscopy and minimally invasive imaging techniques, such as capsule endoscopy, provide detailed visuals of the gastrointestinal tract, helping diagnose conditions like ulcers, polyps, and gastrointestinal bleeding without the need for traditional surgical procedures. Similarly, optical coherence tomography (OCT) is used in ophthalmology to provide high-resolution imaging of the retina, aiding in the early detection of glaucoma and macular degeneration.

Another groundbreaking diagnostic method is genetic testing and molecular diagnostics, which allow for the identification of hereditary diseases, predispositions to certain conditions, and even personalized treatment plans. Precision medicine, driven by genetic analysis, enables targeted therapies for diseases such as cancer and rare genetic disorders.

Robotic and automated diagnostic systems are also transforming laboratories, improving efficiency in blood analysis, biopsy examinations, and microbiological testing. Lab-on-a-chip technology, which miniaturizes lab testing onto a small device, allows rapid and portable analysis of blood, saliva, or urine samples, making diagnostics more accessible, especially in remote or underserved areas.

These advancements in medical diagnostics not only improve the accuracy of disease detection but also enhance treatment outcomes by enabling early intervention and personalized healthcare strategies.

Relative contraindications are mainly associated with situations where the procedure is not advisable such as:

1. Life-threatening conditions requiring immediete medical intervention;
2. Skin damage or dermatogical diseases in the examined area that may interfere with the contact of the ultrasound probe.

Conclusion

In conclusion the demand for diagnostic technologies is increasing significantly nowadeys. In particular ultrasound (UTT), electrocardiogram (ECG), Magnetic Resonance Inaging (MRI) and others help diagnose many patients accurately and correctly. This in turn makes doctors work easier.

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