



Ultrasound Trainings

Introduction to Medical Ultrasound Implementation

I. Course Objectives

- At the conclusion of this session, participants will be able to verbalize what is medical ultrasound
- Participants will be able to verbalize the historical development of medical ultrasound
- Participants will be able to verbalize the role of ultrasound in Obstetrics and Gynecology
- Participants will be able to verbalize the different types of ultrasound used in Obstetrics and Gynecology

II. Why is This Topic Important?

- Medical ultrasound is a crucial topic for several reasons in the field of healthcare
- It is important for its non-invasive nature, diagnostic capabilities across various medical fields, role in prenatal care, cardiovascular imaging, procedural guidance, monitoring, portability, and cost-effectiveness. The continuous advancements in ultrasound technology further enhance its significance in modern healthcare

III. What is Medical Ultrasound Services?

- Medical ultrasound is an imaging technology that uses high-frequency sound waves to visualize internal body structures.
- It is a non-invasive and flexible modality widely used in various medical fields. Ultrasound works by emitting sound waves from a transducer, which then records the echoing waves to create real-time two-dimensional grayscale images.
- This technology is valuable for evaluating physiology, and fetal health, and detecting abnormalities in organs and tissues.
- Ultrasound is used for a wide range of medical purposes, including imaging the heart, blood vessels, liver, gallbladder, kidneys, and unborn child during pregnancy. It is also used to guide minimally invasive procedures such as biopsies and fluid aspiration.
- Medical ultrasound is generally considered safe, as it does not use ionizing radiation. The speed of sound varies in different body tissues, and through electronic processing of the returning sound waves, a two-dimensional image can be created to provide information about the tissues and objects.
- Ultrasound continues to evolve with additional functions, including 3D imaging, elastography, and contrast-enhanced ultrasound using microbubbles

IV. Historical Development of Medical Ultrasound

- The use of ultrasound in medicine began during and shortly after the 2nd World War in various centers around the world. The work of Dr. Karl Theodore Dussik in Austria in 1942 on transmission ultrasound investigation of the brain provides the first published work on medical ultrasonics.
- The use of ultrasound in medicine has a rich historical development. The first paper about ultrasound was published in 1794 by Lazzaro Spallanzani, an Italian physicist, who studied the use of sound waves to determine the position of objects, laying the foundation for the use of ultrasound in medical imaging.
- The work of Dr. Karl Theodore Dussik in Austria in 1942 on transmission ultrasound investigation of abdominal masses is considered a significant early milestone in the use of ultrasound for medical purposes.
- Subsequently, the use of ultrasound in medicine accelerated, with George Döring Ludwig using ultrasound to detect gallstones in 1949, and Ian Donald introducing ultrasound in diagnostic medicine in 1956.
- Ian Donald's work was particularly influential, as he used ultrasound to detect abdominal tumors and cysts, and later to visualize the fetus, earning him the title "the father of OB-GYN ultrasound".
- The development of commercially available systems from the mid-1960s onwards further facilitated the wider dissemination of medical ultrasound.
- The historical development of ultrasound has been marked by various key figures and milestones, ultimately leading to its widespread use as a common medical imaging modality

V. Role of Ultrasound in Obstetrics and Gynecology

- Ultrasound plays a crucial role in obstetrics and gynecology, providing valuable information for monitoring the health and development of the fetus during pregnancy, as well as diagnosing and managing various gynecological conditions. Here are some key aspects of the role of ultrasound in these medical fields:

1. Obstetrics

○ Pregnancy Confirmation

- Ultrasound is often used to confirm the presence of a viable pregnancy and estimate the gestational age.

○ Fetal Development Monitoring

- It allows healthcare providers to monitor the growth and development of the fetus.
- Measurements such as crown-rump length (CRL), biparietal diameter (BPD), and femur length help assess fetal age and detect potential abnormalities.

- **Assessment of Fetal Anatomy**
 - Detailed anatomical surveys, often performed during the second trimester, help identify any structural abnormalities in the fetus.
- **Fetal Well-being and Monitoring**
 - Doppler ultrasound assesses blood flow in the umbilical cord and other vessels, helping to evaluate fetal well-being.
- **Multiple Gestations**
 - Ultrasound is crucial in managing multiple pregnancies, monitoring the growth of each fetus, and assessing potential complications.
- **Amniotic Fluid Assessment**
 - It helps in evaluating the volume and characteristics of amniotic fluid, which is essential for fetal development.
- **Guidance for Invasive Procedures**
 - Ultrasound guidance is often used during procedures such as amniocentesis or chorionic villus sampling to ensure accuracy and minimize risks.

2. Gynecology

- **Pelvic Imaging**
 - Ultrasound is employed to visualize and assess the uterus, ovaries, and surrounding pelvic structures for abnormalities such as fibroids, cysts, or tumors.
 - **Evaluation of Reproductive Organs**
 - It helps in diagnosing conditions like endometriosis, polycystic ovary syndrome (PCOS), and uterine abnormalities.
 - **Infertility Investigations**
 - Ultrasound aids in assessing the reproductive organs and identifying factors contributing to infertility.
 - **Guidance for Procedures**
 - It is used to guide procedures such as hysterosonography, saline infusion sonography, and ovarian cyst aspiration.
 - **Monitoring Ovarian Follicles**
 - In assisted reproductive technologies (ART), ultrasound is used to monitor the development of ovarian follicles during fertility treatments.
 - **Uterine Abnormalities**
 - Ultrasound helps in identifying uterine anomalies, such as septate or bicornuate uterus, which may impact fertility or cause complications during pregnancy.
- In both obstetrics and gynecology, advancements in ultrasound technology have improved imaging quality and diagnostic capabilities, contributing to better patient care

and outcomes. Regular ultrasound examinations are a standard part of prenatal care and gynecological assessments, providing valuable information for healthcare professionals to make informed decisions regarding patient management.

VI. Different Types of Ultrasound Used in Obstetrics and Gynecology

- 1. Obstetric Ultrasound:** Used for confirming pregnancy, estimating gestational age, and monitoring fetal well-being
- 2. Gynecological Ultrasound:** Pelvic Ultrasound
 - These types of ultrasound play a vital role in the diagnosis and management of conditions in obstetrics and gynecology, contributing to improved maternal and fetal care.

VII. Conclusion

- Medical ultrasound is an imaging technology that uses high-frequency sound waves to visualize internal body structures.
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- It is important for its non-invasive nature, diagnostic capabilities across various medical fields, role in prenatal care, cardiovascular imaging, procedural guidance, monitoring, and its portability and cost-effectiveness. The continuous advancements in ultrasound technology further enhance its significance in modern healthcare
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VIII. References

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