



# The Physicians' Guide to Upgrading an Ultrasound Machine

# Preface

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Ultrasound imaging has become an indispensable medical diagnostic tool in today's modern age of healthcare delivery. It has gained widespread acceptance of medical practitioners as it's quick, reliable, painless, safe, and extremely easy to use.

Ultrasound technology is great to help examine a pregnant woman and her unborn baby. But that doesn't even skim the surface of the extensive uses of the valuable technology today. By using sound waves to produce images of vital organs, ultrasound technology helps medical practitioners visualize the anatomy to detect causes of pain, swelling, infections and even serious abnormalities.

What's more, its use is not only restricted to evaluate and identify illnesses anymore but to also treat severe heart conditions like pulmonary embolism and other life-threatening disorders. Regarded as the new stethoscope, ultrasound is now an integral part of modern medicine.

## INCREASING SIGNIFICANCE OF ULTRASOUND

Portability and compactness are two factors that have helped increase the dominance of ultrasound machines today by making them more accessible.

Ultrasound goes where your practice is, on the field or in the clinic. It helps drive treatment decisions universally, whether it is at the patient's bedside, emergency departments, Intensive Care Units (ICUs), healthcare camps, and even remote villages and towns.

There's no doubt that ultrasound has and will continue to gain increasing significance in medicine. It's now a necessity in every practice for providing quality and prompt healthcare. Equipping your clinic with the latest ultrasound machine will no doubt go a long way in ensuring greater clinical efficiency, patient outcomes, and satisfaction.

# Introduction

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## WHO

National Ultrasound is the number one ultrasound supplier in the United States providing state-of-the-art equipment and excellent service to health care practitioners around the world. Focusing solely on the ultrasound machine category, we've been a trusted and dedicated supplier of new and used ultrasound systems, parts, and probes in the United States since 2003.

We're one of the best and most knowledgeable suppliers, with highly skilled and experienced technicians who have more than 250 years of collective experience working with equipment from the six largest ultrasound manufacturers. Our mission – providing quality ultrasound equipment and services at the lowest possible prices – has earned us a place in the Inc. 5000 list of fastest-growing companies for the seventh consecutive year!



# Introduction (cont.)

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## WHAT

National Ultrasound provides a full range of revolutionary ultrasound equipment to meet your needs, no matter how critical, specific, or urgent they are. Our machines come with advanced imaging capabilities, Doppler, real-time feedback, high-grade lithium batteries, portability, and a streamlined workflow. These can significantly help improve the quality of patient care, outcomes, and satisfaction.

## WHY

As a distributor and supplier of ultrasound machines, National Ultrasound helps ensure that medical practitioners are equipped with the right equipment that can help them provide quality care, no matter what specialty they cater to. By providing the best diagnostic equipment available in the market, National Ultrasound helps doctors focus on enhancing the healthcare delivery offered at their clinic. We believe in doing our bit to ensure uniform access to quality health care.

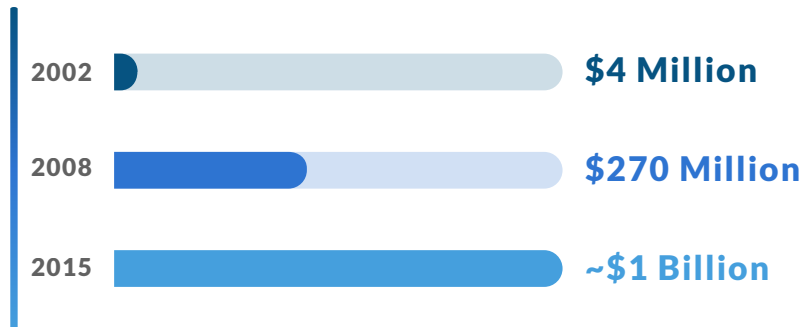
## HOW

Our range of console and portable ultrasound machines features reputable brands like GE, Mindray, Philips, Sonosite, Siemens, Samsung, Chison, Sonoscape and many more! Our wide variety of ultrasonography and diagnostic imaging equipment includes basic models with black-and-white imaging to high-end systems with innovative technology that transforms the way you perform ultrasound scans.

We also stock ultrasound and diagnostic imaging accessories like printers and recorders, printer paper, probe covers, disinfectant solutions, and many more. To keep your machines fully-functioning at all times, we offer maintenance and support services and stock transducers, ultrasound replacement parts, and ultrasound replacement probes.

# What is the State of Ultrasounds in 2020?

## Portable Ultrasound Device Revenue by Year



## WIDESPREAD USE

The widespread use of ultrasound technology has launched from just \$4 million in 2002 to over \$270 million in 2008. By 2015, the market for portable machines had further increased to almost \$1 billion, which by the way was only one-seventh of the revenue for all ultrasound machines!<sup>1</sup> The overall ultrasound device revenue more than doubled from 2000 to 2015, reaching over \$7 billion.

## EVER-INCREASING DEMAND

With advances in technology, ultrasound machines will continue to experience an ever-increasing demand. From the period of 2018 to 2023, the market for ultrasound machines is expected to increase at a compounded annual growth rate of 3.7%. This means that ultrasound revenue is expected to cross \$8,229m by 2023<sup>2</sup>.

<sup>1</sup><https://www.hbs.edu/faculty/>

<sup>2</sup><https://www.industryarc.com/Report/1324/>

# Safety & Advanced Technology

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## NON-INVASIVENESS, SAFETY, & PAINLESSNESS

The popularity of ultrasound largely stems from the crucial benefits it offers over other imaging modalities. It's one of the safest diagnostic technologies, thanks to its non-ionizing radiation, non-invasiveness (with few exceptions of invasive ultrasounds), painlessness, and safety aspects.



## INTERNAL STRUCTURE & ORGAN ASSESSMENT

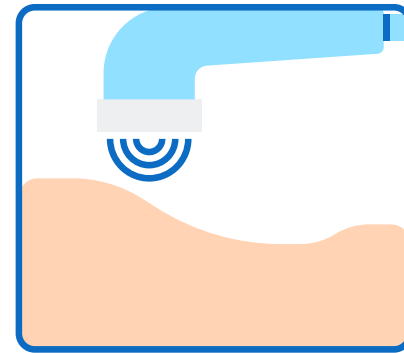
Ultrasound helps doctors evaluate the damage to internal organs after an illness and detect the cause of pain, swellings, and infection. It's used to examine internal body structures like muscles, joints, tendons, blood vessels and internal organs including the heart, pancreas, uterus, kidneys, gall bladder, ovaries, spleen, and liver, to name just a few. It's also the best imaging tool for inspecting pregnant women and their fetuses (unborn babies). It also helps them examine the brain, hips, and spine of infants to check for abnormalities. In addition, it helps doctors detect thyroid, parathyroid, and musculoskeletal conditions, among other things.

# Tumors, Biopsies, & Guided Injections

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Ultrasound has revolutionized healthcare by helping doctors quickly and accurately identify and even treat serious medical conditions. The imaging tool allows doctors to inspect and assess cancerous tumors taking shape inside the body.

In addition, by using ultrasound technology, doctors can now conduct biopsies in a minimally invasive manner saving patients unnecessary pain, discomfort, and recovery time typically required to heal from a surgical wound. As opposed to a surgical biopsy, an ultrasound-guided biopsy takes relatively lesser time to heal and prevents the complications typically caused by surgeries.



Regardless of the specialty, ultrasound technology helps health professionals make accurate and quick diagnoses, enabling faster treatment decisions that eliminate the risk and complications of late diagnoses and save lives. Ultrasound machines are also widely used to guide intravenous injections as they help doctors more quickly and easily visualize the intravenous vein.

# The Investment is Worth It



The Lifecycle of  
Ultrasound Machines  
is Approximately  
**5-7 Years**

## LIFECYCLE OF ULTRASOUND MACHINES

Upgrading your practice's ultrasound machine is a necessary investment that pays for itself. The lifecycle of ultrasound machines is approximately 5 to 7 years, after which it requires frequent upkeep. The exact lifespan of imaging equipment depends on its utilization. For instance, equipment that has been used for more than 4000 exams every year has a life expectancy of 5 years, while machines that have been utilized for 2000-4000 scans have an expectancy of 7 years or less.

## TIME & EXPENSE

Using equipment that has surpassed its lifespan proves to be more expensive in the long run, rather than upgrading old equipment for several reasons. The older the equipment, the higher is the probability of risk and failure, causing delays in diagnosing and treating patients.

There's no doubt that the maintenance and repair cost of older equipment is significantly higher due to frequent and unavoidable breakdowns. And to top it all, at times these may be impossible to repair due to the unavailability of spare parts. Even in cases where the old equipment is functioning, its features and functionality may be outdated, rendering it obsolete and causing huge inefficiencies in your practice.



# Repair & Maintenance Costs

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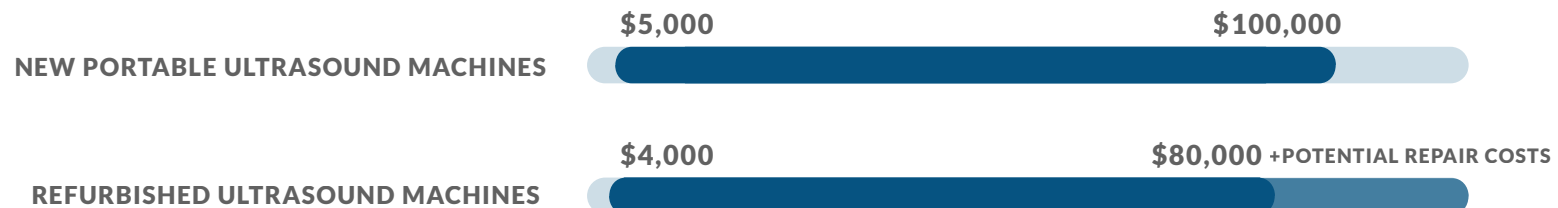
## COSTS OF REPAIRING & MAINTAINING OLD ULTRASOUND EQUIPMENT

Let's examine the maintenance and service costs of older machines. The average onsite service visit for repairing defective equipment is over \$2,000 which can collectively amount to huge repair bills for different machine parts that are liable to break down at frequent intervals. At times, if the broken or defective part is not available as is typically the case for outdated or obsolete machines, it can result in significant monetary losses. The indirect loss of reputation from having to turn away patients cannot be estimated in numbers but can understandably be huge in terms of loss of clientele.

## IMPORTANCE OF HAVING AN UPGRADE PLAN

Continuing to use old equipment to avoid the expense of purchasing a new ultrasound machine seems to make economic sense but is, in fact, counterintuitive owing to the huge maintenance costs. **Any ultrasound equipment ceases to be an asset after 5 to 7 years and needs to be replaced.** If it's been a while since you updated your ultrasound machine, it is outdated and possibly even obsolete and requires renewal. All clinics should have an upgrade plan to replace outdated ultrasound equipment with state-of-the-art machines to ensure a smooth and efficient practice.

# Price Range of Ultrasound Equipment



## COST OF ULTRASOUND MACHINES

A new ultrasound machine price starts from \$5,000 and depending upon the technology and functionality, it can go as high as \$200,000 or more for premium models. Portable ultrasound machines range from \$5,000 to \$100,000. These price ranges include the customization of probes and extra software options. Image quality and the number of probes/accessories and extras needed will increase the price.

For example, it is possible to purchase a new portable ultrasound for \$5k with 1 probe but that package would only work for certain specialties/applications. A cardiovascular

doctor will need more functionality than a very basic system, but a podiatrist could use that package just fine. The more applications, the more probes are needed.

Used or refurbished machines typically cost between \$4,000 and \$80,000, saving money in the short term. But they can prove to be expensive in the long run with frequent repairs and maintenance, and often don't include a long warranty like new equipment.

# Additional Costs of Ultrasound Machines

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## ADDITIONAL COSTS OF ULTRASOUND MACHINES

To get a better estimate of the cost of an ultrasound machine, it's best to also factor in the hidden costs apart from the upfront purchase price.

While ultrasound accessories like transmission gel and pads are provided in the beginning, these must be replenished on a regular basis. Installation and training are typically included in the purchase price of new equipment but is not included in the purchase of refurbished/used machines. If your staff needs more in-depth training, it can cost up to \$2,500 a day for on-site and \$200 per hour for online training. For delivery consider budgeting around \$300 - \$600 depending upon the location and if you are purchasing a machine that requires freight or white glove shipping.

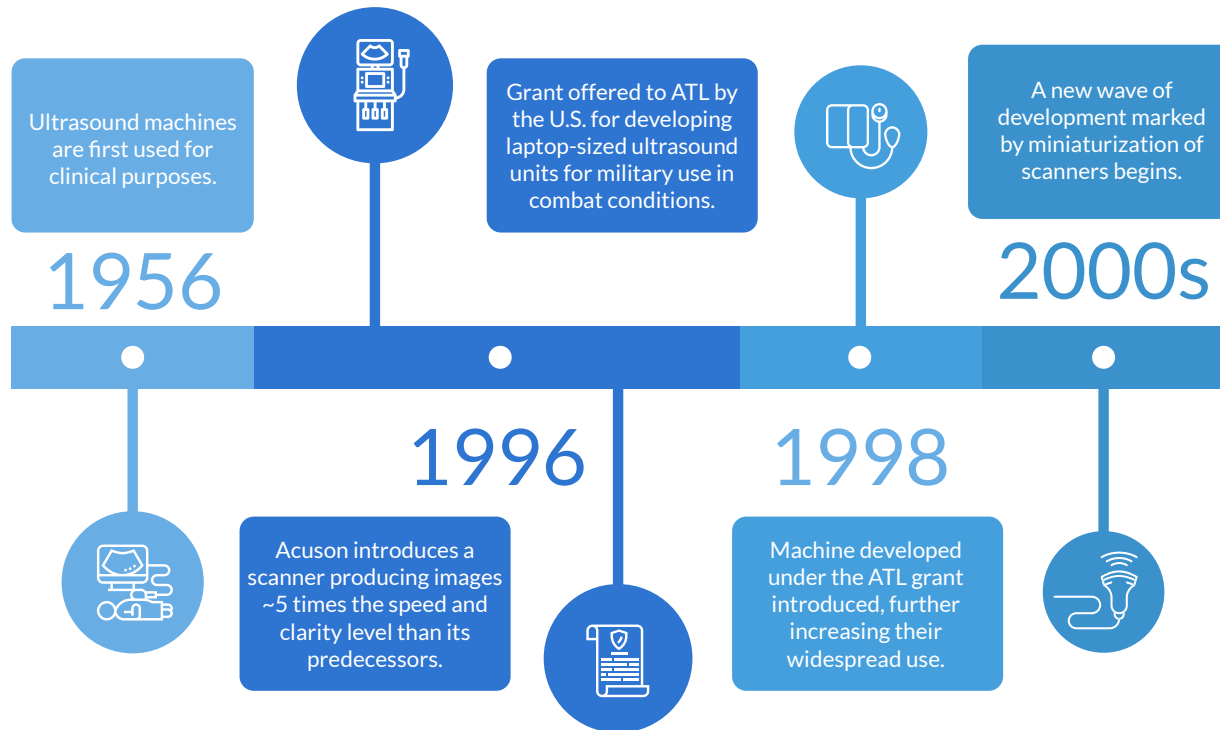
Factor in maintenance and support service at about 15% of the purchase price per year. If you would like additional transducer probes, they can cost between

\$2,000 and \$5,000, depending upon the type of probes. Standard transducers are typically priced between \$2,000 and \$4,000. Advanced ones can cost between \$5,000 and \$20,000. Black and white ultrasound printers cost \$700 or more and high-end thermal or color printers can cost up to \$3,000.

## TAX ADVANTAGES OF PURCHASING ULTRASOUND MACHINES

Buying a new ultrasound machine can help you save money in the form of tax benefits. With section 179 of the IRS tax code, businesses can write off the entire purchase price of new and used equipment and/or software up to \$1,000,000. Get the equipment of your choice and take advantage of tax savings with section 179!

# Your Current Ultrasound Machine Has Obsolete Technology



## THE EVOLUTION OF ULTRASOUND

Ultrasound machines have undergone tremendous advancements overall in the last two decades. They have developed extensively in all aspects including their imaging capabilities, ergonomics, workflow, ease-of-use, functionality, and features. Quite naturally the scope of their applications has increased too with each new development since they were first used for clinical purposes in Glasgow in 1956.

# Innovations in the 1990s and 2000s

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The major technological improvements began from the 1990s when some companies further developed scanner technology by using faster computers and more sensitive probes. In 1996, a scanner introduced by Acuson produced images at almost five times the speed and clarity level than its predecessors.

What further propelled innovation was the grant offered to ATL by the U.S. Defense Advanced Research Projects Agency (DARPA) for developing laptop-sized ultrasound units in 1996 for military use in combat conditions. These machines were introduced in 1999 which further increased their widespread use. While it had become a norm to use ultrasound towards the end of the last century for examining unborn babies, it was now being used for assessing other internal organs and evaluating several medical conditions, resulting in its extensive use in almost every specialty of healthcare.

## RAPID TECHNOLOGICAL ADVANCEMENTS OF THE 2000s

In the 2000s a new wave of development marked by miniaturization of scanners swept the ultrasound imaging industry. Advanced signal processing and

high-speed architectures further led to the technological progress of scanners and imaging capabilities. These machines were markedly smaller than the cart-based systems typically used in the 1990s.

The introduction of compact machines expanded the applications of ultrasound machines than ever before. The ability to carry imaging technology in different settings made it more accessible than ever, resulting in widespread adoption to improve the quality of healthcare delivery. The trend of innovation has continued further with the introduction of cutting-edge technologies like 3D/4D and Artificial Intelligence (AI) to enhance the capabilities and functionality of ultrasound machines. 3D ultrasound offers a faster acquisition rate of datasets which in turn leads to enhanced visualization.

AI leads to enhanced speed and optimized diagnostic views, which is particularly valuable in producing a cardiac echo. Ultrasound equipment with these advanced technologies can help detect and even treat life-threatening medical conditions like cancer and cardiovascular diseases.

# Technical Innovations

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For your reference, we've picked the 10 top most ultrasound machines in each category of application:



## PORTABLE - MINDRAY M6

The Mindray M6 ultrasound machine is a portable, color, compact, and lightweight ultrasound machine that provides just the right balance between size and performance. It offers state-of-the-art diagnostic capabilities and intelligent workflow features. Thanks to its compactness and lightweight, it can fit into any small space, making it one of the most portable ultrasound systems for the bedside and other intensive care settings.

## HANDHELD - GE VSCAN EXTEND DUAL PROBE

The GE Vscan Extend Dual Probe is an innovative, pocket-sized, general-purpose diagnostic imaging system. It's lightweight and can be integrated into training sessions and exams with its simplified user interface. It helps visualize and measure fluid and anatomical structures and can be used in clinical diagnostic procedures, routine monitoring, and assessments for adult and pediatric patients, and for procedural guidance.



## Technical Innovations (cont.)

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### VETERINARY - MINDRAY DP-30 VET

The Mindray DP-30 Vet is a powerful black-and-white ultrasound system that is light in weight and has a great ergonomic and portable design, allowing veterinarians to carry it wherever they go. It offers advanced imaging technologies and a convenient workflow.

### 3D/4D - GE VOLUSON E8

The GE Voluson E8 is an ultrasound system with exceptional imaging capabilities and can be used in a range of routine to complex women's health exams. It's perfect for busy practices with a high volume, with its ease-of-use and precision in imaging. It provides 2D/3D images and includes color Doppler sensitivity and sophisticated 3D/4D technologies.



## Technical Innovations (cont.)

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### GENERAL IMAGING - GE LOGIQ E9 WITH XDclear ULTRASOUND MACHINE

The LOGIQ E9 with XDclear is a powerful and versatile ultrasound machine especially suited for a wide variety of general imaging needs. It's designed to offer advanced and intuitive imaging and extensive functionality that goes beyond conventional ultrasound. It helps visualize blood flow without the limitations of Doppler and delivers superior image quality on a broad spectrum of patient body types.

### WOMENS HEALTH - MINDRAY DC-40

The Mindray DC-40 Ultrasound Machine is a new generation of shared service ultrasound that is perfect for OB/GYN, cardiovascular, and general imaging applications. It's a top of the line system offering accessibility and ease-of-use. Don't be fooled by its compact design; it includes a range of advanced technologies and features that increase its scanning accuracy and efficiency.





## Technical Innovations (cont.)

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### UROLOGY - MINDRAY M6

National Ultrasound is the exclusive distributor of the Mindray M6, a state-of-the-art, color, portable ultrasound machine. It's perfect for diagnostic imaging at the patient's bedside and in intensive care and is used in several specialties including women's care, neurology, and cardiology, to name just a few. It's extremely reliable and comes with a 5-year manufacturer's warranty.

### VASCULAR - MINDRAY M8 ELITE

The Mindray M8 Elite is a portable, fully shared service ultrasound system with a full suite of transducers. It can be used in every ultrasound specialty and with its unique software-based approach, it's capable of offering easily upgradeable enhancements, providing practitioners cutting-edge technology throughout its life cycle.



## Technical Innovations (cont.)

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### ANESTHESIA & PAIN - MINDRAY TE5

The Mindray TE5 is a new ultrasound machine with an innovative design, a slim profile, and a small footprint mobile cart, offering easy portability. It offers an extensive list of transducers for both superficial and deep tissue imaging and is designed for streamlined care in surgery, anesthesia, orthopedics and small part imaging applications.

### CARDIOLOGY - GE VIVID E90

The GE Vivid E90 is a console ultrasound machine that is designed for cardiology, emergency medicine, internal medicine, and vascular applications. It offers an ultra-high-resolution multi-touch LCD screen display and a range of functions including vital monitoring and ample storage. It offers a variety of transducers and accessory options like printers, microphones, and recorders, to name just a few.

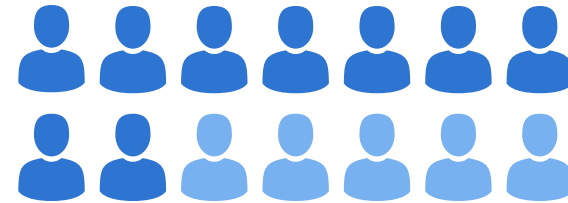


# Other Benefits of Technological Innovations

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Newer ultrasound machines with innovations in underlying technologies help physicians make faster and more accurate diagnoses. Given the fast pace of the modern healthcare system, this is a crucial benefit as it allows doctors to treat a higher number of patients, increasing the efficiency of their practice. This has been made possible by a number of different automation and optimization techniques and standardization of analysis that lead to a more streamlined workflow, resulting in faster patient throughput.

## Allows Doctors to Treat a Higher Number of Patients



## Increases Patient Throughput & Decreases Wait Times



The advent of compact and portable devices with advanced computational power especially allows healthcare professionals to quickly scan internal organs without having to move bulky equipment from room to room. Software presets and optimization further drive time efficiencies by enabling them to quickly switch from one patient to another or one type of exam to another, significantly increasing patient throughput and patient convenience as this will decrease time spent in the waiting room.

# Privacy of Patients

Newer ultrasound machines have features that allow practitioners to store, transmit, and share images in electronic form with other parties including patients, doctors, and hospitals. These devices can be connected to wireless networks for faster data transmission. Most of them allow the sharing of information over various platforms by integrating standard communication protocols like DICOM (Digital Imaging and Communications in Medicine).

These new communication technologies have made it absolutely essential for healthcare organizations to **ensure patient privacy by regulating the flow of confidential and sensitive patient information.**



# What is HIPAA Compliance?

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The Health Insurance Portability and Accountability Act (HIPAA) has established national standards for the protection of sensitive patient data. It includes a series of standards set by the Department of Health and Human Services (HHS) for regulating the use and disclosure of Protected Health Information (PHI).

All companies and entities that provide treatment, payment, and operations in healthcare and/or anyone that has access to patient information are expected to ensure compliance with the HIPAA privacy and security rules. The act also applies to other entities like subcontractors and business associates that support healthcare treatment, payment, or operations.

HIPAA requires all concerned parties to have a physical, network, and process security measures in place to ensure compliance. This is especially relevant to the modern information healthcare systems driven by computerization, which has led to the creation of vast amounts of digitalized patient information or Electronic Health Records (EHR). While computerization has enabled efficiency and ease of use, it has also made patient data vulnerable to risks and security threats.

Hence, HIPAA requires entities to protect ePHI (Electronic Protected Health Information) by controlling access to only authorized personnel. It also requires various physical safeguards like limited and authorized access to the facility, policies for using and accessing workstations and electronic media, and restricted transfer, disposal, and re-use of electronic media and ePHI.

Similarly, it requires technical safeguards for controlling access by setting unique user IDs and automatic log off. For monitoring access, it requires entities to record activity through tracking logs. In addition, it also ensures recovery of patient data through IT disaster recovery and backup and transmission security by ensuring only authorized access to ePHI. It also requires encryption and decryption for the protection of data and emergency access procedures for enhanced access control. The rules apply to all data transmission methods like the internet, email, cloud, etc.

If your current ultrasound machine does not comply with HIPAA legislation, your practice can face serious legal trouble.

# How HITECH Ensures HIPAA Compliancy

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The Health Information Technology for Economic and Clinical Health (HITECH) Act by the U. S. government ensures HIPAA compliance by levying penalties on health organizations that violate it. The Act was necessitated by the development of health technology, which has driven increasing creation and transmission of electronic health information.

Healthcare organizations can gain the trust of patients and practitioners and avoid penalties by meeting HIPAA and HITECH regulations for integrity and access controls, data storage and transmission, and device security. These controls can be established through a data protection strategy to ensure the security of protected health information.

Owing to the HIPAA and HITECH Acts, it's best for organizations to ensure compliance by taking into account and protecting patient data in all forms like documents, emails, scans, and structured as well as unstructured data. Here's how ultrasound machines can help you ensure compliance.

## WIRELESS AND CLOUD COMPUTING ENABLED ULTRASOUND MACHINES

All new ultrasound machines these days can be connected to a wireless network, which means that they can transmit data over the internet. To ensure HIPAA compliance practices can opt for cloud computing enabled platforms to store, retrieve, and transmit protected health information.

These robust cloud platforms eliminate the need for healthcare organizations and practices to build a secure architecture that is compliant with HIPAA. They have several built-in features that allow businesses to securely handle regulated data and establish access and integrity controls by allowing only authorized access and capturing and storing access logs.

The GE Health Cloud, for instance, delivers security, connectivity, and scalability for healthcare across an interoperable platform. It connects to all GE medical imaging devices and even hundreds of devices and machines from multiple vendors and integrates into their clinical workflows. It manages the volume, velocity, and variety of healthcare data through an integrated analytics & visualization engine.

It provides built-in support for HIPAA compliance including HITECH and HITRUST and for IT healthcare communication standards like FHIR (Fast Healthcare Interoperability Resources) and DICOM.

## SECURITY ENHANCING FEATURES OF NEW ULTRASOUND SYSTEMS

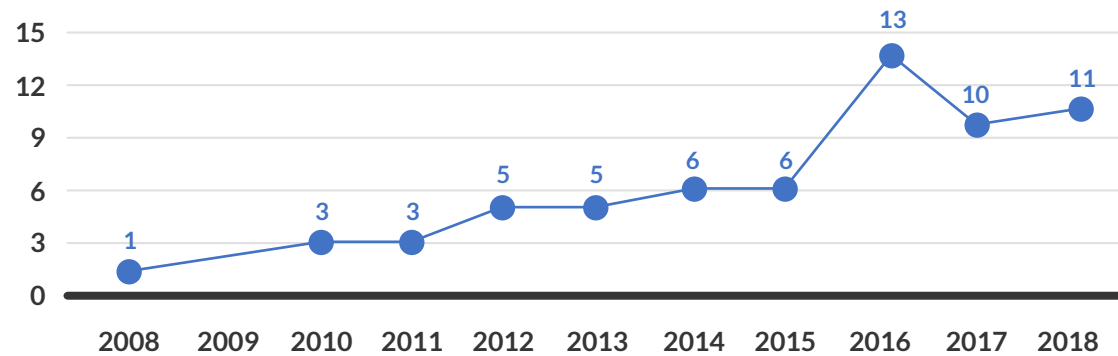
Newer ultrasound machines are typically equipped with a multi-layered defense that secures the system, keeping patient data confidential and secure from all angles. The defense approach includes various features some of which are data encryption, access control, and malware protection.

### ACCESS CONTROL

Some ultrasound systems support LDAP (Lightweight Directory Access Protocol), which is an industry-standard protocol for the management of access and user profiles. This helps them define user account types with the permitted level of access alongside supporting password and lockout procedures. Robust logging features that allow only authorized professionals to use the machine or access sensitive medical data can help secure a system.

# HIPAA Penalty Enforcement

## Total HIPAA Penalties By Year



### PATIENT DATA ENCRYPTION

Data Encryption procedures typically use mathematical functions to encrypt data, preventing unauthorized access to patient data. For protecting sensitive medical when it is being transferred from one device to another over a system's network, many ultrasound systems use DICOM Encryption.

### MALWARE PROTECTION

Data Encryption procedures typically use mathematical functions to encrypt data, preventing unauthorized access to patient data. For protecting sensitive medical when it is being transferred from one device to another over a system's network, many ultrasound systems use DICOM Encryption.

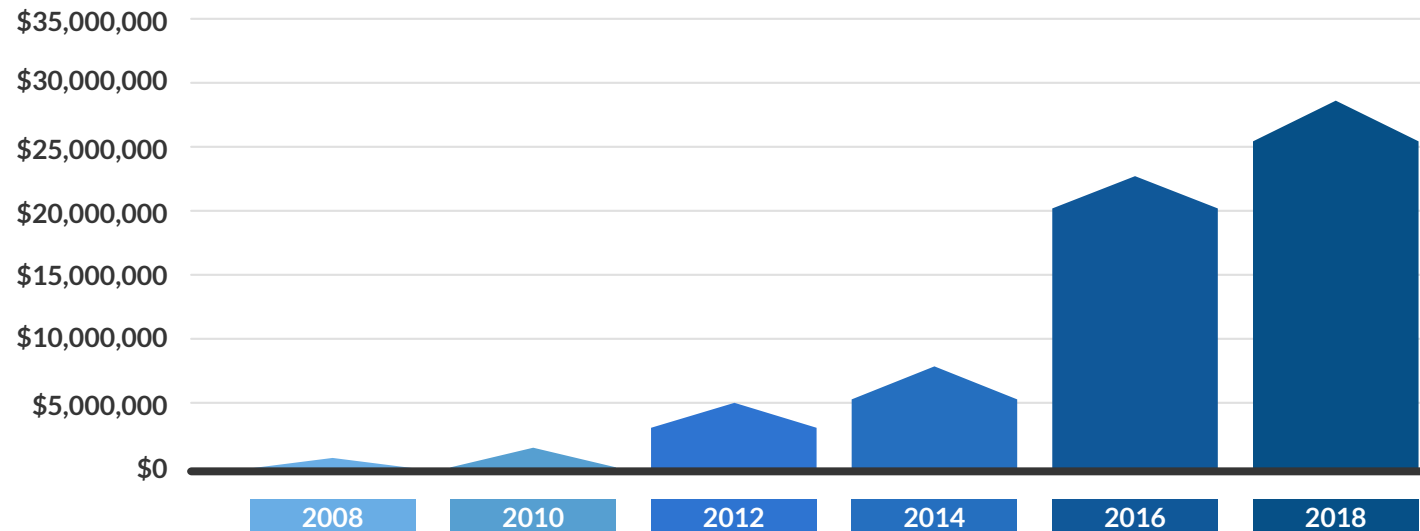
**Ensuring HIPAA compliance is more crucial today as it's now enforced in a more stringent way than ever before.** The graph above shows the sharp increase in the number of HIPAA penalties over the last decade. As can be seen, it grew from merely 1 in 2008 to 11 in 2018<sup>3</sup>.

<sup>3</sup><https://www.hipaajournal.com/healthcare-data-breach-statistics/>



# HIPAA Penalty Amounts

## Total HIPAA Penalty Amounts By Year



Similarly, the penalty amounts imposed by the OCR for HIPAA violations have increased too from 0 in 2008 to close to \$30,000,000 in 2018<sup>4</sup>.

<sup>4</sup><https://www.hipaajournal.com/healthcare-data-breach-statistics/>

# Improves the Diagnostic Decisions of Doctors

These days ultrasounds are an extremely valuable tool for examining internal structures and organs like the kidneys, abdomen, soft tissue, gallbladder, aorta, and thyroid. They can be used in almost all specialties, some of which are listed below:

- **Physicians**
- **Internists**
- **Obstetricians**
- **Gynecologists**
- **Cardiologists**
- **Urologists**
- **Nephrologists**
- **Gastroenterologists**
- **Orthopedists**
- **Podiatrists**
- **Oncologists**
- **Rheumatologists**
- **Surgeons**
- **Anesthesiologists**
- **Endocrinologists**
- **Osteopathologists**
- **Veterinarians**

# Major Uses of Ultrasound

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Here's a quick snapshot of how upgraded ultrasound technology can help your practice provide better patient care. First of all, ultrasound is used to diagnose a variety of health conditions including the following:

## CARDIOLOGY

- Examine the heart to detect defects in the functioning and structure.
- Measure the volume and speed of blood flow through the heart.
- Assess the rate of heartbeat.
- Measure blood flow through the vessels.

## UROLOGY

- Detect and examine kidney stones.
- Measure blood flow through the kidney.
- Early detection of prostate cancer.
- Detect abnormalities in the urinary tract.
- Evaluate problems with voiding.
- Treat urinary tract infections.

## OBSTETRICS AND GYNECOLOGY

- Check the number of fetuses
- Check the sex of the unborn baby and assess its development and its position to check whether it's normal.
- Measure the size of the fetus to determine the due date.
- Assess the growth of the fetus by measuring its size over the course of pregnancy.

**Apart from these uses, ultrasound is also used in emergency settings like emergency rooms, intensive care units (ICUs), and other point of care settings thanks to its prompt diagnoses.**

# Uses of Advanced Ultrasound Technology

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In addition to regular ultrasounds, there are advanced ultrasound technologies that have the following applications:

## USES OF 3D ULTRASOUND IMAGING

3D ultrasounds are formed by combining 2D ultrasound images by specialized computer software. 3D imaging is extremely valuable in detecting early cancers and tumors. It helps doctors examine the following organs for abnormalities:

- Masses in the colon and rectum.
- Prostate gland for early detection of tumors.
- Fetus for abnormal development of face and limbs.
- Blood flow in the fetus for abnormalities.



## USES OF DOPPLER ULTRASOUND

Doppler ultrasound is an advanced ultrasound technique that helps assess the movement of blood flowing through the arteries and veins in the body. It helps visualize and measure the speed and volume of blood flow in the heart and vessels, as a result of which it can detect a variety of conditions that regular ultrasound tests cannot. It's a powerful imaging tool as it can also show the direction of blood flow in different colors. There are three types of Doppler ultrasound technologies:

### COLOR DOPPLER

Color Doppler is a special technique that converts Doppler measurements into an array of colors with the help of a computer. The different colors make it possible to easily visualize the speed and direction of blood flow.

### POWER DOPPLER

Power Doppler is a recent technique that produces images with a greater level of detail, even in cases when there is minimal blood flow. While it is more advanced than color Doppler, it has a major limitation in that it doesn't show the direction of blood flow.

### SPECTRAL DOPPLER

Spectral Doppler helps practitioners view graphically the measurements of blood flow. For instance, it can show the distance traveled by blood per unit of time. It cannot show a color image but can alternatively present the blood flow information in the form of a distinctive sound instead.

## HOW DOPPLER ULTRASOUNDS HELP

It can help doctors assess a wide range of medical conditions some of which have been listed below:

- Blockages to blood flow
- Congenital vascular malformations
- Vessel narrowing
- Reduced or increased blood flow to the different organs

# Advancements in Ultrasound Technology

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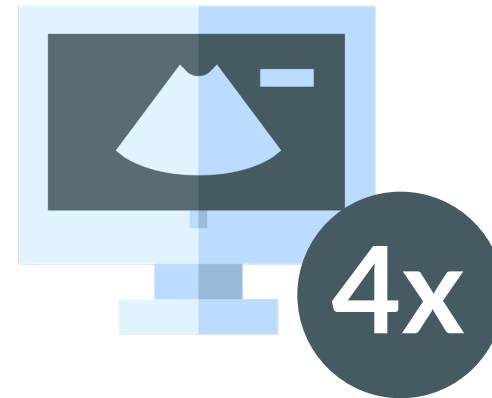
The earlier diagnostic ultrasound machines were large and unwieldy and had fewer features. As technology rapidly evolved, increasingly sophisticated machines with a wide range of diagnostic applications, functionality, features, and tremendous ease of use have now flooded the market.

Real-time 3D and 4D ultrasound machines help medical practitioners view the internal structure and movement of the body's internal organs, providing real-time and dynamic information. For instance, it enables doctors to evaluate and measure the speed of blood flow and heartbeats.

In addition, the interactive feedback and high-quality images increase the diagnostic confidence but also provide timely spatial information, making possible intra-operative ultrasound examinations and guiding surgical procedures. Thus, applications of ultrasound have quadrupled since the 1990s.

In addition, ultrasounds can be as compact as you want them to be as a result of which they're now

accessible in emergency and remote settings. 3D, 4D, Doppler color, portable, small hand-held devices with extraordinary imaging capabilities and streamlined workflow can boost the efficiency of your clinic by providing timely and accurate diagnoses. So, the time to purchase a new ultrasound machine or upgrade your old and outdated equipment is now.



**Applications of Ultrasounds  
Have Quadrupled Since the 1990s**

# Technological Improvements

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Here are some ways in which technological progress has improved the quality of imaging:

## ADVANCED IMAGING CAPABILITIES

Advanced technologies have helped drastically improve the quality of imaging in ultrasound machines, helping doctors make more accurate diagnoses and with increasing confidence.

Contrast resolution, speckle reduction imaging, volumetric imaging, and elastography are just some of the technologies that help reduce artifacts while improving the contrast of an image. A sharp reduction in the noise-to-signal ratios has helped optimize spatial, contrast, and temporal resolution – all leading to superior quality imaging.

All these technologies have also made it possible to better evaluate tissue stiffness and detect hard-to-spot abnormalities. Low-cost ultrasound machines with superior quality imaging have revolutionized healthcare in point-of-care settings by enhancing diagnostic efficacy and efficiency at an affordable price.

## MOBILITY, ERGONOMICS, & COMPATIBILITY

New generation ultrasound devices are distinct from their predecessors not only in terms of their imaging quality and improved workflow but also with respect to their appearance, compactness, and portability. Increasing mobility and compatibility have contributed towards making ultrasound technology readily accessible in point of care settings, increasing its appeal over other imaging tools like CT and MRI.

Smaller ultrasound machines have increased mobility and can be carried to the patient's bedside when there is a risk in moving the patient. Even newer cart-based systems are much easier to wheel and have superior ergonomics that don't cause discomfort to the operator, unlike the previous generation equipment.

Newer ultrasound equipment is also much less noisy than its older counterparts, further increasing its appeal in noise-sensitive settings like ICUs and operation rooms. With regards to smaller clinics, space is just not a limitation anymore and one can equip their practice with a single high-end premium machine with a full range of specialties or two or more mid-range equipment that each focus on a single application.





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# Conclusion



To leverage ultrasound technology in improving the efficiency and quality of healthcare, it's vital to use modern equipment with advanced functionality and features. There is an apparent need for physicians to equip their practices with a modern, state-of-the-art ultrasound machine that helps provide accurate, quick, and reliable diagnoses that translate into faster efficiency and improved patient outcomes and satisfaction.

To purchase a new ultrasound machine or upgrade your existing one, [browse through National Ultrasound's full line of equipment](#) from major reputable brands. Or if you would like professional guidance in choosing the right machine for your practice, [contact National Ultrasound today!](#) Our experts would love to evaluate your requirements and fit you with exactly what you need!