

**FDA Webinar: Marketing Clearance of Diagnostic Ultrasound
Systems and Transducers: Final Guidance**

**Moderator: Irene Aihie
August 22, 2019
1:00 pm ET**

Coordinator: Welcome and thank you for standing by. At this time all participants are in a listen-only mode until the question-and-answer session. Today's conference is being recorded. If you have any objections, you may disconnect at this time. I would now introduce your conference host, Ms. Irene Aihie. Ma'am, you may begin.

Irene Aihie: Hello and welcome to today's FDA Webinar. I am Irene Aihie of CDRH's Office of Communications and Education. On June 27, 2019, the FDA issued the final guidance document Marketing Clearance of Diagnostic Ultrasound Systems and Transducers.

The guidance provides detailed recommendations for manufacturers seeking marketing clearance of diagnostic ultrasound systems and transducers. In addition to outlining regulatory approaches for certain diagnostic ultrasound devices, this guidance document describes the types of modifications to a diagnostic ultrasound device for which FDA does not intend to enforce the requirements for a new pre-market notification 510(k).

Today (Shahram Vaezy), Biomedical Engineer in the Office of (unintelligible) Diagnostics and Radiological Health here in CDRH will present an overview of this guidance document. Following the presentation, we will open the lines for your questions related to information provided through the presentation.

Additionally, there are other interests such as minor experts here with us to assist with the Q&A portion of our Webinar. Now I give you Shahram .

Shahram Vaezy: Hello. My name is Shahram Vaezy. I'm a Biomedical Engineer in the Division of Radiologic Health, also health and technology 7 (OHT 7) in the Office of Product Evaluation and Quality (OPEQ) in the Center for Division of Radiologic Health (CDRH). Our division is responsible for the regulatory review of diagnostic ultrasound devices that are primarily used in the radiology departments.

This Webinar is intended to provide an introduction to the recently-issued FDA guidance document: Marketing Clearance of Diagnostic Ultrasound Systems and Transducers. This guidance document was issued in the draft form on October 2, 2017, and in the final form, after addressing public comments on the draft, on June 27, 2019.

The agenda for today's Webinar is to provide a background on ultrasound regulation in the United States. It is important to understand the overall context of ultrasound regulation in such a fast-growing industry. I will provide the highlights and scope of the final guidance document to draw your attention to the significant changes as compared to the previous guidance document.

The significant changes are:

- A compliance, or enforcement, policy under which the FDA does not intend to enforce compliance with the pre-market notification (510(k)) requirements. In other words, certain devices would not need 510(k) clearance prior to marketing.
- A transducer element check feature to be implemented in diagnostic ultrasound systems to ensure proper probe performance for acquiring images or signals with sufficient accurate visualization of the anatomy and/or physiology of the tissues under interrogation.

A routine update of the current consensus standard and the guidance standards referenced in the ultrasound guidance document.

We will wrap-up with key takeaways of the final guidance document for preparing pre-market notifications.

Some examples of the compliance policy applications will be discussed. After the completion of the presentation, there will be some time for Q&A.

The objectives of this presentation are as follows:

First, I will provide an overview of the regulatory history of diagnostic ultrasound devices in the United States, a synopsis of the various FDA guidance documents for diagnostic ultrasound devices.

Next, I will briefly present on the significant growth of the ultrasound industry and the associated regulatory considerations. It is important to understand how the FDA could adjust to the technological advancements of the industry.

I will present on the major differences between the previous guidance document issued in 2008 and the recent final guidance document issued on

June 27, 2019. Hopefully, this information will help us become familiar with the new regulatory evaluation.

Okay, let's get started with a brief background on the regulation of diagnostic ultrasound devices.

First and foremost, it is important to understand that diagnostic ultrasound devices are considered pre-amendment medical devices. In other words, there were diagnostic ultrasound devices marketed prior to the 1976 medical device amendments to the federal Food, Drug and Cosmetic Act which is known as the Act. Therefore, device manufacturers may seek regulatory clearance of their devices based on demonstrating substantial equivalence of their device to those marketed legally prior to 1976. Such a device would be considered a Class 2 medical device.

Importantly, most diagnostic ultrasound devices are considered belonging to Class 2 and receive marketing clearance from the FDA to the through the premarket notification also known as the 510(k) process, 510(k) being the section of the Food, Drug and Cosmetic Act where this requirement is defined.

The FDA issued the first diagnostic ultrasound guidance in mid-1980. Several other guidance documents were issued following the 1980 guidance. The last guidance document before the current one was issued on September 9, 2008.

Finally on June 27, 2019, the FDA issued a revised guidance document entitled "Marketing Clearance of Diagnostic Ultrasound Systems and Transducers, Guidance for Industry and Food and Drug Administration Staff."

And now for the recently-published guidance document.

While the majority of this guidance document is similar to the previous version, there are some noteworthy differences that need to be highlighted. These are as follows:

Perhaps the most significant highlight of the recent guidance is a compliance policy, otherwise referred to as enforcement policy. Based on this policy, the FDA does not intend to enforce compliance with the 510(k) requirements for certain modified ultrasound and transducer devices that have already obtained an initial 510(k) clearance when certain conditions apply. Let me provide a bit of background for this policy and elaborate on its implications.

The medical ultrasound industry has experienced a tremendous growth and technological advancements. The advancements have been in multiple fronts.

There are significant advances in the engineering aspects, both hardware and software of diagnostic ultrasound devices.

We have seen advances in transducer technology, signal processing, visualization and overall extraction of information from basic echo information gathered from tissues. 2D arrays, elastography and 3D visualization are examples of these advancements.

There are significant advances in the clinical applications of ultrasound as well. Examples are in musculoskeletal, neural and contrast imaging. Also there are significant advances in the development of application-specific systems primarily in the form of point-of-care, portable devices. These systems are primarily based on technologies and devices that have been applied in the clinical conditions for a number of years.

So we have a technology at a certain point in its maturity that we have a number of well-established modes of operation, in well-defined parameter

ranges, that have been evaluated by the FDA for many years. Furthermore, there's a rich track record for these technologies, making them very known from both engineering and clinical perspectives.

A reasonable regulatory adjustment to these changes would be to update our approach through regulation of ultrasound devices. The recent guidance is in the spirit of a least burdensome approach to allow manufacturers with an established track record of ultrasound device development to make certain modifications to their devices more quickly without the need to submit another 510(k). This enforcement policy is intended to further promote and protect the public health by allowing the availability of a wide range of versatile ultrasound devices for clinical care.

Another significant highlight of the recent guidance document is the recommendation for manufacturers to incorporate a transducer element check in the probes. This feature was introduced a result of our continued surveillance of the industry. We have seen numerous examples of probe performance issues due to transducer aging, damage or other problems. The transducer element check was introduced to ensure continued safety and effectiveness of the probe. We will get into the details of this feature in just a few slides. Clearly the recent guidance document includes updated consensus standards, and updated FDA guidance documents.

So as a summary, the recently-issued guidance document:

- supersedes the previous guidance document issued in 2008. The title of that document was very similar to the recent one, as noted here.

As described on the previous slide, there are a number of specific types of modifications for diagnostic ultrasound device for which FDA does not intend to enforce the requirements for a new pre-market notification 510(k). The 2008 guidance had specified a new 510(k) for these types of modifications. We will get into these types of modifications in just a few slides.

And the new guidance document includes a new transducer element check that applies to all ultrasound devices covered in this guidance. Therefore, whether a 510(k) would be required or

not, manufacturers should start implementing this new feature in their diagnostic ultrasound systems.

Okay, let's go over the compliance policy. The compliance or enforcement policy is that FDA does not intend to enforce compliance with the 510(k) requirements for certain modified ultrasound devices.

Clearly the manufacturer has a 510(k) clearance for the new device that has now been modified and is the subject device in question. In order to qualify for this compliance policy, a number of conditions should apply to the modified ultrasound device.

I will list these conditions in this and the following slide, the full descriptions of these conditions are provided in Section 5.1.2 of the guidance document.

The conditions are as follows:

Intended use of the modified device is not changed. The intended use remains to be diagnostic use via obtaining echo signals, new clinical applications are not introduced unless the manufacturer has clearance for such use or another device, no disease- or treatment-specific indications, no use of contract agents. and the device remains to be for prescription use. Reusable ultrasound bronchoscopes are excluded and no intracardiac or intravascular indications should be introduced.

The device is not a reusable device subject to requirements for the submission of reprocessing labeling and validation data. As a specific example, sterile use should not be introduced if not previously cleared.

The modes of operation for the modified device are well-established. Our current thinking on the modes of operations that are well-established are provided in Table 2 of the guidance

document. Pretty much no surprises here. For example, adding any or a combination of the basic modes such as A-mode, B-mode, and Doppler will qualify for the compliance policy. Example of the modes not included are shear wave elastography, acoustic attenuation mapping, transmission-based imaging and sound speed measurement.

The modifications should not lead to acoustic outputs that exceed the recommended maximum output levels. This is simply a safety consideration. I would like to take this opportunity to point-out that, as always, acoustic output levels beyond those specified in the guidance document and what have historically been used by manufacturers may be utilized in an ultrasound system. However, those devices would not be qualified for the compliance policy and the manufacturers should submit a Q-submission to discuss their plans for such a development. This is described in Section 5.2.4 of the guidance document, where the 510(k) submissions are described.

The modifications do not result in ultrasound parameters outside well-known ranges specified in the guidance document. These parameters are a center frequency of 1 to 20 MHz, peak rarefactional pressure of up to 7 MPa, number of cycles in pulse up to 100, excluding the CW Doppler and coded excitation modes of operation and pulse repetition frequency of 100 Hz to 20 kHz.

Continuing with the conditions for a device that would qualify for the compliance policy, the modifications of the device do not utilize novel mechanical or thermal effect for imaging or measurements. This is to ensure that the safety and effectiveness of the device are reviewed appropriately.

There is currently a fairly good understanding of the mechanical and thermal effects induced using acoustic output level specified in the guidance document with reasonable levels of acoustic dose. However, at higher levels, such as those that could be used for Acoustic Radiation Force Impulse (ARFI) imaging, there might be biological effects that should be analyzed. Similar to what I mentioned on the acoustic output levels, the cases where the level of

thermal or mechanical effects could be increased as a result of certain modifications, manufacturers are encouraged to discuss their plans with the FDA via a Q-submission.

As for measurements and analyses that may be introduced as a result of a certain device modification, they should be clearly described for the users and the users should be able to adjust the associated control parameters with such measurements and analysis.

This is considered an important component of these measurements. It should be possible to reverse the newly-introduced image processing method. Also, it should be possible to change or adjust assumptions used in a measurements, and very importantly the device operator should be informed fully on the algorithms used for these measurements and analyses.

Clearly if a manufacturer does not plan to provide controls for these measurements, then the device would not qualify for the compliance policy and a 510(k) should be submitted to the FDA to allow the FDA to review the safety and effectiveness of the measurements and analyses.

As I have stated in the highlights of the new guidance document, manufacturers should include a transducer element check for all probes with the device. This is an important feature that I will discuss in detail in the next couple of slides.

Similar to the recommendations in the previous guidance document, the transducer surface temperature should fall within a well-defined range, and appropriate transducer covers should be recommended to users.

And now to the transducer element check that I alluded to earlier.

First and foremost let me say, this feature is introduced as a result of our post-market analysis. There have been reports of transducer malfunctions that have gone unnoticed by the operators, not due to the operator error, but primarily due to the complexity of the image formation processes that may not conducive to revealing transducer malfunction.

Therefore, it's our thinking that a transducer element check would provide a method to ensure the safety and effectiveness of the probe to provide the image quality originally intended.

Importantly the transducer element check applies to all diagnostic ultrasound devices regardless of whether they would qualify for the compliance policy or not.

The characteristics of the transducer element check are as follows:

First, the transducer element check should be integrated an integrated test. Basically, the manufacturers should implement this feature as part of each probe.

The integrated tests of transducer performance should be performed each time a transducer is connected to the main system or activated. Please note that this feature is not meant to slow-down the busy workflow of scanning for the operators. Manufacturers are encourage to design innovative methods of performing this test while maintaining, or improving, the existing workflow structure and timeframes.

The transducer performance test should be accessible by competent technical personnel such as operators or service personnel. This recommendation is

based on the necessity to keep the operators informed about the transducer performance and image quality.

We certainly appreciate that the different performance specifications may be necessary for transducers based on the application and system configuration. However, each device should include some level of testing. For example, an impedance check of each transducer element may provide a preliminary evaluation of the element integrity and function.

Next, of great importance, in the spirit of keeping the operators informed on the transducer function, and maintaining image quality, device manufacturers should implement methods to communicate their results of the transducer performance test to the operators.

This information should clearly identify regions of the image that could be potentially compromised by transducer malfunction. This integrated test of transducer element check should also generate a report on the performance of the probe under test for documentation.

The report should generally include a list of elements, or smallest available patches of elements that have been compromised. Finally, the transducer element check should be available to the operators to initiate any time a particular probe is suspected of failure.

As I mentioned earlier, these characteristics have been included to ensure continued safe and effective operation of the probes monitored by the folks who are working with these systems on a daily basis.

And now on the update of consensus standards that are recognized by the FDA and have been referenced in the new guidance document.

These standards are:

Referred to as of the Output Display Standard in the previous guidance document. It's IEC 60601-2-37 on the basic safety and essential performance of ultrasonic medical diagnostic and monitoring equipment, the 2015 update,

IEC 62359 ultrasonic field characterizations for the determination of thermal and mechanical indices related to medical diagnostic ultrasonic fields, the 2017 update.

IEC 62127-1 ultrasonic hydrophones, Part 1 for measurement and characterization of medical ultrasonic fields up to 40 MHz, 2013 issue date and a Part 2 of the same standard IEC 62127-1 ultrasonic hydrophones Part 2 for calibration for ultrasonic fields up to 40 MHz, annex 1, issued in 2013.

IEC 60601-1 for basic safety and essential performance of medical electrical equipment, electrical safety, the 2012 update and finally IEC 60601-1-2 for basic safety and essential performance of medical electrical equipment for electromagnetic disturbances, the 2014 update.

An important note is that there is an FDA guidance document on the appropriate use of the voluntary consensus standards in pre-market submissions. I will provide a link in the next slide.

As for the update of the FDA guidance documents they are, as I just mentioned, there's an update on the appropriate use of voluntary consensus standards in pre-market submissions for medical devices, issues dated September 14, 2018.

An important guidance document is deciding when to submit a 510(k) for a software change to an existing device, dated October 25, 2017. The new ultrasound document is consistent with the policies outlined in this guidance document.

A very important guidance document is: Request for feedback and meeting for medical device submissions, the Q-submission program that I alluded to earlier. This is dated May 7, 2019. This guidance document provides information on the mechanisms to seek FDA feedback on various topics related to the regulatory pathway of a medical device. This is a free program. Early interaction with the FDA is highly encouraged to allow the FDA to provide regulatory feedback on device development.

The FDA guidance document Reprocessing medical devices in healthcare settings, validation methods and labeling, dated March 17, 2015, provides information on cleaning and disinfection of medical devices.

Also, the FDA guidance document Submission and review of sterility information in pre-market notifications, the 510(k) submissions for devices labeled as sterile, dated January 21, 2016. The reference to the FDA guidance document on electromagnetic compatibility, has also been updated. The latest guidance document was issued on July 11, 2016.

Last but not least, the FDA guidance document content of pre-market submissions for management of cybersecurity in medical devices, dated October 2014, is a new guidance document referenced in the ultrasound guidance document.

So, for key takeaways, the recent guidance document enables manufacturers with an established track record of ultrasound device development to make certain modifications

without the need to submit another 510(k). In addition to providing a less-burdensome approach for manufacturers, this policy will help reduce burden of review of modifications with established history of safety and effectiveness.

A new transducer element check is included in the guidance document as a mechanism for users to test possible degradations due to aging, and ensure continued safety and effectiveness.

Now as for the transition period, the guidance document is effective immediately but please note that the guidance document represents FDA recommendations, manufacturers should address these recommendations.

As for other forms to discuss the guidance document, there will be presentations at professional societies.

We can go over some examples of the compliance policy applications. We'll provide a brief list of these examples.

First example, adding continuous wave (CW) and pulsed wave (PW) Doppler interrogation methods to the mode of operation of a device. Suppose the device had only B mode previously and the manufacturer has added CW and PW. These are the modes of operation that are listed in Table 2 of the guidance document as I mentioned earlier.

A second example, adding an algorithm that measures the volume of an organ on its scientifically well-established image segmentation and volume calculation methods. The scientific basis of the algorithm should be disclosed to the users for optimal usage of the measurement. This is an example of adding a measurement or analysis. Remember that this addition would require that the algorithm of volume measurement be provided to the users. Also the controls for the algorithm should be provided.

Another example would be adding a new transducer with similar indications for use and similar acoustic output as one already cleared in the system. The new transducer may have a new clinical application. This is an important point. If the particular clinical application has been or the indication has been cleared for another transducer manufactured by the same manufacturer. The previous – an interesting point - guidance document allows for the addition of transducers without a 510(k) only if the indications for use of the transducer were a subset of the main system indication. The new guidance allows the addition of a new transducer with a new indication if such an indication had prior clearance on another system of the manufacturer.

Finally adding a B-mode noise reduction filter for general imaging use to a system. Similar to where examples of the volume calculations, the characteristics of the algorithm used for the noise reduction should be provided in the labeling material.

There is a line to the guidance document.

I would like to thank you for your attention and we can now move to the Q&A.

Coordinator: We will now begin our formal question-and-answer session and if you would like to ask your question, please press star 1 on your touch-tone phone. You will be announced prior to asking your question. If you would like to withdraw your question, you may press star 2. One moment for the first question.

Shahram Vaezy: While we are waiting for the questions, I can discuss one of the questions that we have received after the guidance document was issued. The question has been on the transducer element check which is a new component of the guidance document. The question has been on the development of these

features that may take some time by manufacturers and the question is how can this be done for the submissions that are underway if you will?

We have basically, as I mentioned before, what's recommended in the guidance document is really just a recommendation and we hope to see that manufacturers plan to implement these features. We would like to see a plan for transducer element check in future submissions in the future devices, so, as always, we are open to discussions on how to implement such transducer element check in your device.

Irene Aihie: We'll now take our first question.

Coordinator: The first question is coming from (Chris Phillips). Your line is open.

(Chris Phillips): Hi, I have a question related to the guidance. In the previous version of the guidance, there was a suggested template for the 510(k) submissions related to ultrasound devices and that doesn't appear to be the case in this new revision of the guidance. Is it suggested that we go back to using the standard 510(k) order and template or is it hoped that we continue to use the ultrasound guidance from previous as a template for our submissions?

Shahram Vaezy: I'm sorry, if you could elaborate on what you mean by the template for the 510(k).

(Chris Phillips): So there was a recommended order that aligned with the previous guidance that we had been utilizing so that we had the right pieces in place whether we were talking about Class 1 or Class 3 ultrasound systems and the right places to put indications for use. Essentially our 510(k) used to be aligned with the order of the previous guidance. Is it hoped that we default back to the

standard 510(k) template essentially at this point, or is there a specific ultrasound template?

Shahram Vaezy: There is no specific ultrasound template. As you note in the new guidance document, the 510(k) Section has been made pretty similar to what we had in the previous guidance document. The only new element there is the transducer element check and if you want to use your already-setup template for 510(k) submission, that would be fine.

(Chris Phillips): Okay, thank you very much.

Shahram Vaezy: Thank you.

Coordinator: And once again if you do have a question, please press star 1 on your touch-tone phone. The next question is coming from (Gina). Your line is open.

(Gina): Hi. I've got a quick question. I deal with the non-OEM service and repair community and I want to know if they replaced the arrays in an OEM device, does that require the non-OEM supplier to file for a 510(k) for that transducer now?

Shahram Vaezy: That's a very good question and the response hinges on whether the replacement of the transducer would have any bearing on the safety and effectiveness of the probe. So and that has to be definitely tested and documented by the facility that's doing this whether it's a repair or a remanufacturing.

If there is any impact on the safety and effectiveness of the probe, this would be considered a remanufacturing and for remanufacturing the sponsors need to submit a 510(k) if there is no bearing on the safety and effectiveness and

basically the performance of the probe, then it would be considered a repair and a 510(k) is not required.

(Gina): Okay, thank you.

Shahram Vaezy: Thank you.

Coordinator: We have no further questions at this time. I will now turn the call back to Ms. Irene Aihie.

Irene Aihie: Thank you. This is Irene Aihie. We appreciate your participation and thoughtful questions. Today's presentation and transcript will be made available on the CDRH Learn Webpage at www.fda.gov/training/cdrhlearn by Friday, August 30. If you have additional questions about today's presentation, please use the contact information provided at the end of the slide presentation.

As always we appreciate your feedback. Following the conclusion of today's live Webinar, please complete a short 13-question survey about your FDA CDRH Webinar experience. The survey can be found at www.fda.gov/cdrhwebinar immediately following the conclusion of today's live Webinar. Again, thank you for participating and this concludes today's Webinar.

Coordinator: This will conclude today's conference. All parties may disconnect at this time.

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