Content of Premarket Submissions for Device Software Functions, Draft Guidance
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Moderator: Elias Mallis

Elias Mallis: Hey, everyone, and welcome to today's CDRH webinar. This is Elias Mallis, Director of the Division of Industry and Consumer Education in CDRH's Office of Communication and Education, and I'll be your moderator for today's program.

Today's topic will cover the draft guidance on the content of premarket submissions for device software functions. Now, this is a substantial cross-cutting effort that impacts a wide range of medical devices, and this draft guidance is currently open for public comment. We're holding this webinar to provide you with an opportunity to learn more about the efforts and to answer your questions as you consider providing us with your feedback.

It's now my pleasure to introduce you to our presenters for today's program. Aneesh Deoras, Assistant Director of the Cardiac Ablation, Mapping, and Imaging Devices Team, Office of Cardiovascular Devices, Office of Product Evaluation and Quality, and Ian Marcus, Team Lead of the Digital Health Policy Leadership and Development Team in the Division of Digital Health, Office of Strategic Partnerships and Technology Innovation.

We'll kick off today's program with a presentation from our panelists and then come back around for discussion and field your questions about this topic. Ian will get us started today. Thank you, Ian.

Ian Marcus: Thank you for the introduction. Happy holidays, everyone, and thank you for joining us today for the Draft Guidance, Content of Premarket Submissions for Device Software Functions webinar. My name is Ian Marcus, and I am the Team Lead for the Digital Health Policy Team in the Division of Digital Health, and I will begin today's presentation.

Today's webinar will include three sections. First, we will share background information on the history of the guidance, its purpose, as well as our motivation and objectives for updating the guidance. Next, we will present a summary of the draft guidance and highlight notable proposed content with a focus on the differences between this draft guidance and the current version, which we will refer to as the 2005 guidance. After our presentation, we will open up the webinar for the question and answer session.

The objective of today's webinar is to provide an overview of the draft guidance to help inform your review and comments to the public docket. More specifically, we have structured today's program to provide information that will describe the purpose of the guidance, the scope of the proposed recommendations, and the intent of the requested software documentation.

Through the presentation, we highlight for your awareness how the proposed updates complement other existing guidance documents, align with current software practices and FDA-recognized voluntary consensus standards, and reflect changes to medical software policies resulting from the 21st Century Cures Act. Lastly, we will provide you with the information you need to submit comments to the public docket.

Let's start off with a brief background on the guidance. Consistent with the 2005 guidance, the draft guidance aims to address two important questions when software is submitted in a premarket

submission. One, what software documentation is recommended for a marketing submission, and two, what should the documentation demonstrate? To address these questions, the guidance provides recommendations that leverage a risk-based approach to identify the software information generally necessary for evaluating the safety and effectiveness of a device in a premarket submission.

The guidance's recommended documentation provides the review team with a complete narrative, providing a story that describes how traceability and good software engineering practices were employed to appropriately design, verify, and validate device software functions. We will discuss these recommendations in greater detail during my colleague Aneesh's portion of the presentation. Please note, the draft guidance published in November this year is not in effect at this time. The draft guidance is available for public comment and is intended to supersede the current 2005 guidance when it is finalized.

There have been a number of developments since the issuance of the 2005 guidance including Congress promulgating new laws related to software. The updates proposed in the draft guidance are intended to reflect the most up-to-date premarket software documentation expectations. Specifically, the updates proposed are intended to foster timely access to safe and effective software devices, promote least burdensome principles, provide clarity and simplicity, align with changes resulting from the 21st Century Cures Act, harmonize with FDA recognized voluntary consensus standards, and address FDA's MDUFA IV digital health commitments.

The purpose of the draft guidance is consistent with the 2005 guidance such that it identifies the software information generally necessary to evaluate the safety and effectiveness of a device in a premarket submission. This software information would be typically generated and documented during software development, verification, and design validation.

Please note the guidance is intended to complement other existing guidance documents that provide recommendations related to software, such as premarket submission recommendations for interoperable medical devices and the management of cybersecurity in medical devices. In developing the draft guidance, the least burdensome approach was applied to identify the minimum amount of information generally needed to support a premarket submission for a device that uses software.

When describing devices that use software, recent guidance documents, such as the Policy for Device Software Function and Mobile Medical Applications and the Policy for Multiple Function Device Products, have used the term device software function to describe software functions that meet the definition of a device as defined in Section 201(h) of the FD&C Act. These guidance documents use the term function to describe a distinct purpose of the product, which could be the intended use or a subset of the intended use of a product.

To reflect the most up-to-date digital health terminology, the draft guidance uses the term device software functions to account for all instances in which software performs the device function, including Software as a Medical Device, referred to as SaMD, and Software in a Medical Device, referred to as SiMD. The definition section of the guidance introduces these terms and provides additional clarity on their definition, including citation to relevant regulatory references.

The draft guidance is consistent with the 2005 guidance in that it applies to all types of premarket submissions that include one or more device software functions. These premarket submissions include 510(k) premarket notifications, De Novo classification requests, Premarket Approval applications, or

PMAs, investigational device exemptions, humanitarian device exemptions, and biologics license applications.

The draft guidance also clarifies how the device constituent part of a combination product is generally within the scope of the draft guidance when the device constituent part includes a device software function or functions. As I previously mentioned, consistent with the 2005 guidance, the draft guidance recommendations are intended to complement other existing guidance documents that provide recommendations related to software.

While the recommendations in the draft guidance describe what software information should be included in a premarket submission, the draft guidance is not intended to provide recommendations regarding how device software should be developed, verified, and validated. This information can be found in other sources, such as the General Principles of Software Validation guidance document. Lastly, it is important to note that the draft guidance does not apply to automated manufacturing and quality system software, software that is not a device, nor does it apply to software-related documentation that may be needed to evaluate post-market software device issues.

The least burdensome approaches used by the 2005 guidance and draft guidance rely on risk-based factors to identify the minimum amount of software information to support a premarket submission. The 2005 guidance uses 12 questions to help distinguish between three levels of concern: minor, moderate, and major.

The draft guidance proposes to improve the risk-based approach by using four simplified factors to help identify two documentation levels: basic and enhanced. In the next few slides, I'll discuss in more detail the purpose of the documentation levels, the four factors used to identify the most appropriate documentation level, and I will walk through two examples of how the documentation levels may be used using the four simplified factors.

The purpose of the documentation level is to help identify the minimum amount of software information that would support a premarket submission. The draft guidance documentation levels are based on a device's intended use, including the design and risk to a patient, a user of a device, or others in the environment of use. This is consistent with the 2005 guidance.

However, as you'll see on the next slide, the draft guidance uses four simplified factors instead of 12 questions and three definitions to guide readers to identify the appropriate documentation level. Please note, the documentation level is determined by the intended use of the device as a whole, not individual device functions, such that a premarket submission for device software functions will have only one documentation level.

Now let's talk about the basis for determining the documentation level. On this slide, we see two boxes. On the left is basic documentation, and on the right is enhanced documentation. On the right, we see enhanced documentation should be provided for any premarket submission that includes device software functions where any of the four factors listed in the box apply. If none of the four factors apply, then basic documentation should be provided instead.

The specifics of the documentation will be covered in later slides by my colleague Aneesh. As a reminder, the four factors represent risk-based considerations simplified from the use of 12 questions in the 2005 guidance to promote greater consistency in their application. The first enhanced

documentation factor is the device is a constituent part of the combination product. This factor is consistent with a question from the 2005 guidance used to identify a major level of concern, but uses updated combination product terminology to improve readability.

The second enhanced documentation factor states the device is a, intended to test blood donations for transfusion-transmitted infections or b, is used to determine donor and recipient compatibility or c, is a blood establishment computer software. Like the first enhanced factor, the second factor is also consistent with a question from the 2005 guidance used to identify a major level of concern.

The third enhanced documentation factor states the device is classified as Class III. This factor is new when compared to the 12 questions in the 2005 guidance. Class III devices are commonly associated with the highest level of concern in the 2005 guidance. The intent of this factor is to utilize a well-understood regulatory consideration to provide for a simpler approach to identifying the appropriate documentation level.

Lastly, the fourth factor states a failure or latent flaw of the device software function could present a probable risk of death or serious injury, either to a patient, user of the device, or others in the environment of use. These risks should be assessed prior to the implementation of risk control measures. You should consider the risk in the context of the device's intended use, the direct or indirect impacts to safety, treatment, and/or diagnosis, and other relevant considerations.

This fourth factor is consistent with several questions used to identify a major level of concern in the 2005 guidance. The fourth factor is intended to concisely summarize any additional risk considerations that could present a probable risk of death or serious injury. The factor uses the term probable to help capture reasonably foreseeable software and hardware risks associated with the device, including those risks resulting from intentional or reasonably foreseeable misuse of the device prior to the implementation of risk control measures.

Probable risks also include the likelihood that device functionality is intentionally or unintentionally compromised by inadequate device cybersecurity. The term probable is intended to exclude the consideration of purely hypothetical risks, consistent with the use of the term probable and other FDA guidances. Now let's walk through two examples from the draft guidance to demonstrate how these factors can be used to determine the documentation level for a device.

Appendix A of the draft guidance includes six examples to demonstrate the implementation of the documentation level factors. These generalized examples do not necessarily account for every possible detail, risk, or consideration a sponsor should evaluate and should not be taken to mean that the devices described definitely do or do not require a certain documentation level. When addressing the factors, we encourage sponsors to leverage their device's risk assessment when providing a rationale for choosing a documentation level.

The draft guidance example on this slide is a non-contact infrared thermometer intended for intermittent measurement of body temperature from the forehead. The device is Class II and is not a constituent part of a combination product. The device is not a blood establishment computer software and is not intended for use in testing blood donations for transfusion-transmitted infections or determining donor and recipient compatibility.

A failure or latent flaw of the device software function would not present a probable risk of death or serious injury to either a patient, user of the device, or others in the environment of use prior to the implementation of risk control measures. Therefore, this device would likely fall under basic documentation level.

This next example is for a facility use continuous ventilator. The device is not a constituent part of a combination product, is not a blood establishment computer software, and is not intended for use in testing blood donations for transfusion-transmitted infections or determining donor-recipient compatibility. At this time, the device is Class II. However, a failure or latent flaw of the device software functions, such as an exploited cybersecurity vulnerability that compromises device functionality, would present a probable risk of death or serious injury to a patient prior to the implementation of risk control measures due to the potential loss of a life-supporting function. Therefore, this device would fall under enhanced documentation level.

We encourage you to review the examples in Appendix A to learn more about the implementation of the documentation levels. I will now turn the presentation over to my colleague, Aneesh, who will talk through the software documentation elements for the documentation levels.

Aneesh Deoras: Thank you, Ian. My name is Aneesh Deoras. I'm the Assistant Director for Cardiac Ablation, Mapping, and Imaging Devices in the Office of Cardiovascular Devices, Office of Product Evaluation and Quality. We will now discuss the individual software documentation elements discussed in the draft guidance.

On this slide, you'll find a list of the software documentation elements recommended in the draft guidance. For those of you familiar with the 2005 guidance, you'll find a few of the titles here similar. That includes software description, software requirements specification, and unresolved anomalies.

Some of the items have been modified from the 2005 guidance where there was a software development environment description and now state software development and maintenance practices. One item is missing from the 2005 guidance, and that is the traceability matrix. Traceability has been addressed through the remaining software documentation elements and will be discussed in later slides.

The first software documentation element we will discuss is the documentation level evaluation. For this element, we ask that you provide a statement indicating the documentation level for the device and a description of the rationale for that documentation level. The guidance encourages you to leverage your device's risk assessment when providing a rationale for choosing a documentation level. Appendix A includes examples to help demonstrate the implementation of the documentation level factors that Ian explained before. We do make a note in this section that during premarket review, FDA may request additional information if it is needed to evaluate the submission.

Our next software documentation element is the software description. For this element, we asked that you provide a comprehensive software description, including an overview of operationally significant software features, analyses, inputs, and outputs. For this section, we have provided a curated set of questions to help readers consider and share focused device description information. The section encourages the inclusion of additional information if needed to help streamline or further FDA's understanding of the device's functionality. The section includes recommendations for premarket submissions for modified devices, and it provides references to relevant guidance documents.

The next software documentation element we will discuss is the system and software architecture diagram. For this element, we ask that you provide detailed diagrams of the modules, layers, and interfaces that comprise the device, their relationships, the data inputs, outputs, and flow, and how users or external products, including IT infrastructure and peripherals, interact with the system and software. The draft guidance recommends that sponsors provide an appropriate level of detail to convey this information in a manner that facilitates an efficient premarket review. The section includes visual language and reference considerations that can be leveraged when developing diagrams for a premarket submission.

Appendix B includes example system and software architecture diagrams. The examples in Appendix B are for illustration purposes only. However, the approach illustrated we believe can be applied to any system and software architecture diagram, including those for standalone SaMD. The examples help demonstrate how the considerations in the text section can be implemented into a system in architecture diagram. The examples, though, are not intended to represent a complete system and architecture diagram.

The next software documentation element we will discuss is the risk management file. This element consists of three separate components. The first is the risk management plan, second is the risk assessment, and the third is the risk management report. This section replaces the device hazard analysis in the 2005 guidance. The recommendations of the section have been updated to better align with ISO 14971, which is an FDA-recognized voluntary consensus standard for risk management.

The next software documentation element we will discuss is the software requirement specification. For this element, we ask that you provide complete documentation describing their needs or expectations for a system or software, present that information in an organized format, and provide enough information to demonstrate traceability of the software requirements with other software documentation elements.

The recommendations in the draft guidance acknowledge modern development practices, and additional forms of software requirements might be included in the submission, such as well-elaborated stories, use cases, textual descriptions, screen mockups, and control flows. The section includes considerations for preparing SRS documentation to help facilitate a timely premarket review, such as tips for formatting, labeling, inclusion of traceability information, and a recommendation that manufacturers may highlight requirements they believe are most critical to the device's safety and effectiveness or those that were modified since a previous device's clearance or approval.

The next software documentation element we will discuss is the software design specification. The recommendations for software design specification are different for basic and enhanced documentation levels. For basic documentation level, we do not recommend that SDS documentation be included. For enhanced documentation level, we do recommend that you include the singular SDS document or set of SDS documents that provide technical design details of how the software functions, how the software design completely and correctly implements the SRS, and how the software design traces to the SRS in terms of intended use, functionality, safety, and effectiveness.

The next software documentation element is software development and maintenance practices. There are multiple ways to address this element. First, you may provide a Declaration of Conformity to the currently FDA recognized version of IEC 62304, Software Life Cycle Processes.

Alternatively, you may provide a summary of the processes and procedures that are in place to manage the software life cycle development, software configuration, change management, and software maintenance activities. For enhanced documentation level devices, we request that you provide the same information but provide the complete configuration, management, and maintenance plan documents in addition to the summary documentation for basic documentation.

The next element we will discuss is software testing as part of verification and validation. The element differs between basic and enhanced documentation levels. For basic documentation, we recommend that you provide a summary description of the testing activities at the unit, integration, and system levels and provide system level test protocols and results. For enhanced documentation, we recommend that you provide the same information, but also include unit and integration test level protocols and results.

The definition section of the draft includes important information pertaining to FDA's thinking on verification and validation as it relates to this specific guidance. Sponsors are encouraged to appropriately reference performance testing material provided elsewhere in the submission to facilitate navigation between submission sections, reduce duplication, and improve readability.

The next element we will discuss is the revision level history. For this section, we recommend that you provide a revision history tabulating the major changes to the software during the development cycle, including the date, version number, a brief description of the changes relative to the previous version, and an indication of the version on which testing was performed. The recommendations include tips on documenting changes that correspond to previously released software versions.

The last software documentation element we will discuss is unresolved anomalies. For this element, we recommend that you provide a list of the remaining software anomalies annotated with an explanation of the impact on safety and effectiveness, including operator usage and human factors, workarounds, and a time frame for correction.

The draft guidance recommends that the following information be provided for each unresolved anomaly; the problem, the impact on device performance, and any plans or time frames for correcting the problem. The draft guidance encourages the communication of unresolved anomalies to the end user to assist in the proper operation of the device. A reference is provided to ANSI/AAMI SW91, Classification of defects in health software, to help with developing this list.

The draft guidance includes additional information sections to help explain the software documentation elements. The first is regulatory considerations for software functions, which includes references to relevant guidance documents and to help readers learn more about FDA's regulatory considerations for device software functions. It also includes a section on off-the-shelf software use in medical devices and a description of how the concepts and the draft guidance could be represented in a future update to the off-the-shelf software guidance.

Finally, it includes a comparison of the draft guidance to IEC 62304 and ANSI/AAMI/IEC 62304. It provides clarification on the similarities and differences between the intents and information discussed in the draft guidance and the recognized consensus standard. Information is also provided to highlight how the draft guidance intends to leverage IEC 62304 where it is appropriate.

The draft guidance includes a definition section, providing definitions for terms like device software function, off-the-shelf software, serious injury, Software as a Medical Device, or SaMD, Software in a Medical Device, or SiMD, and software verification and software validation. You'll notice that SaMD and SiMD are defined for the first time in draft FDA guidance here.

A link to the draft guidance is available on this slide as well as a link to the Federal Register, Notice of Availability.

In summary, the draft guidance simplifies the organization and content of software documentation elements as well as the documentation categorization levels. It proposes clear recommendations to aid in the preparation of software documentation consistent with CDRH's least burdensome principles. It complements existing guidance documents that provide recommendations related to software, including multiple function device products.

It harmonizes with software-related consensus standards. It reflects changes to the Food, Drug, and Cosmetic Act made by the 21st Century Cures Act. And when final, this guidance will supersede the 2005 guidance, titled Content of Premarket Submissions for Software Contained in Medical Devices.

We ask that you please submit your comments on the draft guidance by February 2, 2022, which is within 90 days of its publication. While you may comment on a guidance at any time, in order to make sure that we consider your comments on the draft guidance before it becomes final, please submit your comments before February 2, 2022. A link to the docket is available below.

Thank you. We will now enter the question and answer session.

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