When do I need to have a new 510(k)?

My company has a 510(k) cleared software product (e.g. PACS) and we've made changes over the years. We are wondering if we need a new 510(K)?

These are questions that many companies are asking. Software changes are inevitable but how do I know what is the 510(k) or regulatory impact, if any?

Let's start with some FDA background information.

In 2017 FDA released a guidance document (Deciding When to Submit a 510(k) for a Software Change to an Existing Device, issued on October 25, 2017[1]) that has a decision tree to help companies make determine if a change needs a new 510(k) or not.

Before we review the FDA Guidance, let's look at the FDA definition of software;

- A set of electronic instructions used to control the actions or output of a medical device, to provide input to or output from a medical device, or to provide the actions of a medical device. This includes software that is embedded within or a component of a medical device, software that is an accessory to another medical device, or software that is intended to be used for one or more medical purposes that performs these purposes without being part of a hardware medical device.

Note: Software changes/modifications may be identified by many names, including, but not limited to: bug fix, hot fix, patch, software change, code change, or tweak. Regardless of name or form, these are considered design changes by FDA.

Regardless of whether a change requires a new 510(k), the QS regulation[2] requires manufacturers to review and approve changes to device design and production (21 CFR 820.30 and 820.70) and document changes and approvals in the device master record (21 CFR 820.181). Any process whose results cannot be fully verified by subsequent inspection and testing must be validated (21 CFR 820.75), and changes to the process require review, evaluation, and revalidation of the process where appropriate (21 CFR 820.75(c)).

The net effect of these requlations, is to require that there is a process in place to demonstrate that the device meets the change in the design specifications (or the original specifications, if no change was intended). Software companies must keep records, and these records must be made available to an FDA investigator upon request. For many changes to a software device, submission of a new 510(k) may not be required. In these cases, compliance with the QS regulation can reasonably assure the safety and effectiveness of the changed device.

Note: Any modifications that are not directly related to the software, such as labeling changes, should be evaluated using the FDA "Deciding When to Submit a 510(k) for a Change to an Existing Device"[3]. The guidance document explains FDA's current thinking and as such, the threshold for the submission of a new 510(k) in response to a change to an existing device is not different between the two guidance's (hardware & software); however, the terminology used may differ due to the nature of the technology and the assessment of the risks associated with the change. When there are multiple changes that affect labeling or hardware in addition to software, the manufacturer should assess the changes using both the general and software-specific modifications

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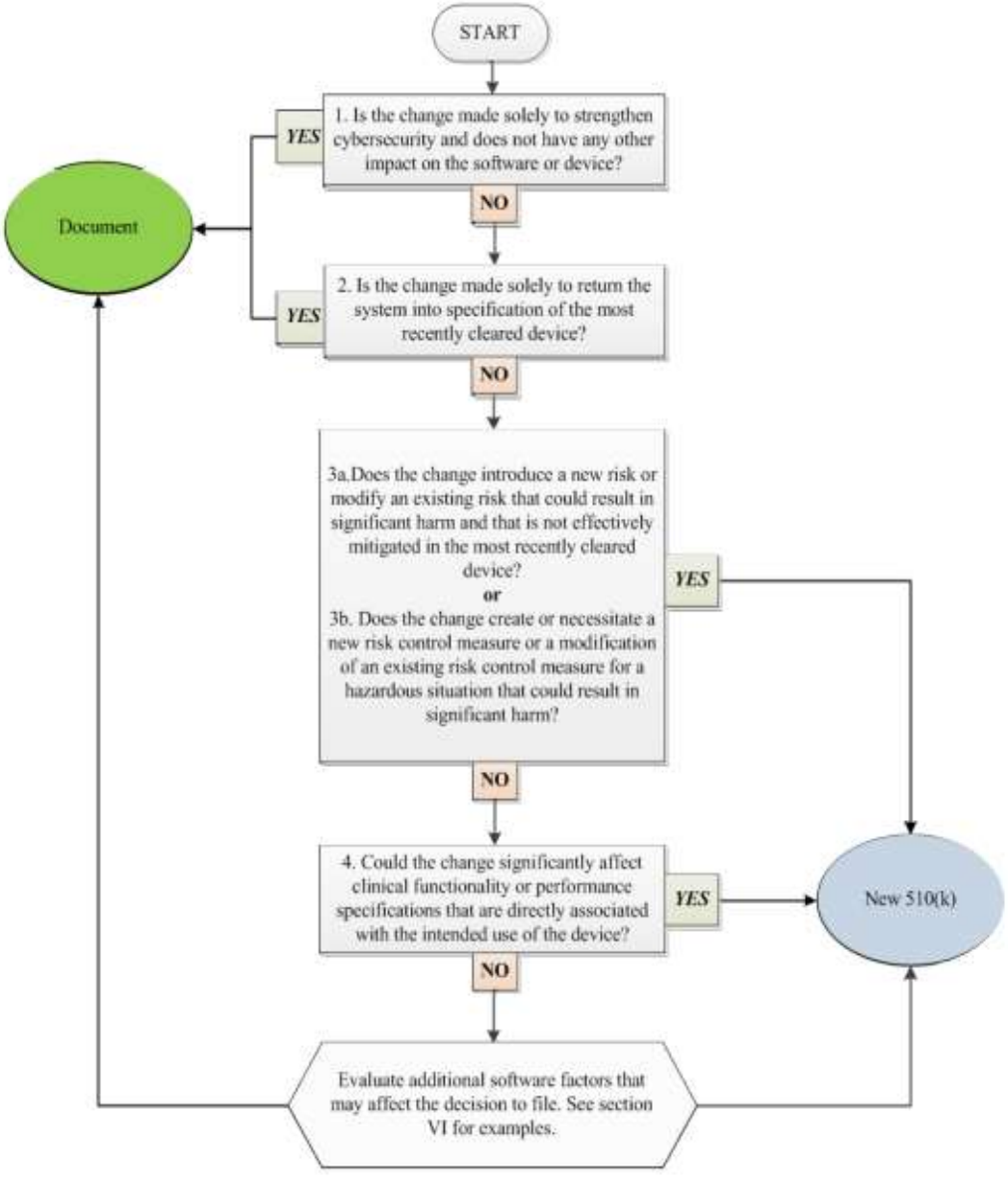
guidances. If either guidance decision trees lead to a “New 510(k)” conclusion, submission of a new 510(k) is required.

The main types of changes that must be assed to determine if a new 510(k) is needed.;

1. Does the change strengthen cyber security?
2. Does the change return the software system back into specification?
3. Does the change introduce a new risk or change an existing risk?
4. Could the change significantly affect a clinical functionality or specification associated with the device intended use?



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1. **Is the change made solely to strengthen cybersecurity and does not have any other impact on the software or device?**

   In many cases, a change made solely to strengthen cybersecurity[4] is not likely to require submission of a new 510(k).

   Cybersecurity updates are considered a subset of software changes that are implemented to strengthen the security of a system, protect information, and reduce disruption in service. FDA expects manufacturers to ensure that such changes do not impact the safety or effectiveness of the device by performing necessary analysis, verification, and/or validation. A manufacturer needs to be aware of any incidental or unintended impacts of the change on other aspects of the software or device and take appropriate action. FDA's guidance Content of Premarket Submissions for Management of Cybersecurity in Medical Devices

2. **Is the change made solely to return the system into specification of the most recently cleared device?**

   When a change to the software only restores the device to the specifications of the most recently cleared device, then submission of a new 510(k) is likely not required.

   Generally, it is unlikely that modifications to software (e.g. bug fix) solely to restore the device to the most recently cleared device's specifications could significantly impact safety, effectiveness, or intended use of the device; however, manufacturers should evaluate the impact of the software changes. Manufacturers should conduct an analysis that involves determining the overall impact of the change to the device in terms of risk assessment and performance. In addition, this analysis is important for evaluating any modification that adds new features that appeared in the specification of the most recently cleared device but were not yet implemented. Missing, incomplete, ambiguous, or conflicting software requirements may lead to a software modification that involves updating specifications, resulting in additional software code changes. In these situations, the answer to this question is likely "no". Generally, manufacturers are not required to submit a new 510(k) for changes to a specification document to clarify to an existing software requirement or to capture a missing software requirement, provided that this does not necessitate any changes to software code or product performance specifications. However, manufacturers should still assess the impact of the changes on other software documentation when applying appropriate design controls.

3. **What are the impacts of any changes to risks associated with use of the device and the impacts of any changes to the risk controls for the device?**
   a. **Does the change introduce a new risk or modify an existing risk that could result in significant harm and that is not effectively mitigated in the most recently cleared device?**

      The purpose of this question is to determine whether a new risk is created or has been identified, or if an existing risk is modified, as a result of the software change. The term "risk" is meant to broadly include hazard,

hazardous situation, or cause of an existing hazard or hazardous situation. A "hazardous situation" exists when there is exposure to a hazard (i.e., a potential source of harm) that can lead to physical injury or damage to the health of people. The term "cause" refers to one possible component in the "sequence of events," that can lead to a hazardous situation and possible harm, as described in ISO 14971. Significant harm refers to situations where the risk level is serious or more severe, e.g., the risk could result in injury or impairment requiring professional medical intervention, permanent impairment, or death.

Submission of a new 510(k) is likely required if <u>all</u> of the following criteria are met:

- The change creates a new or modifies a hazard, hazardous situation, or cause in the risk management file.
- The level of harm associated with the new or modified hazard, hazardous situation, or cause is considered serious or more severe, e.g., the hazard, hazardous situation, or cause of the hazardous situation could result in injury or impairment requiring professional medical intervention, permanent impairment, or death. The pre-mitigation risk score should be assessed in order to focus on the effects of the change.
- The hazard, hazardous situation, or cause is not already effectively mitigated in the most recently cleared device

b. Does the change create or necessitate a new risk control measure or a modification of an existing risk control measure for a hazardous situation that could result in significant harm?

It is possible that introducing new risk control measures or implementing changes to existing risk control measures could significantly affect the safety or effectiveness of the product, and thus such changes should be evaluated. It may be that the change is directly tied to the risk control measures or the software change may necessitate a new or modified risk control measure.

Changes to or additions of risk control measures may be necessary due to new, modified, or previously unknown hazardous situations or causes thereof. **If the changes to risk controls are necessary to prevent significant harm, submission of a new 510(k) is likely required**. **Conversely, submission of a new 510(k) is likely not required when implementing redundant risk control measures** or enhancing existing risk control measures if the risk control measures in the most recently cleared device effectively mitigated the hazardous situation.

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4. **Could the change significantly affect clinical functionality or performance specifications that are directly associated with the intended use of the device?**

   Changes in performance specifications encompass everything from routine specification changes necessary to improve device performance to significant product redesigns. For the purpose of this question, specifications include elements that could influence the device's ability to clinically perform as intended. These specifications may address attributes such as speed, strength, response times, throughput, limits of operation, reliability, delivery rate, or assay performance.

   If the software change could significantly affect clinical functionality or performance specifications that are directly associated with the intended use of the device, then submission of a new 510(k) is likely required. For in vitro diagnostic devices (IVDs), this includes a change that could have clinically significant impact in terms of clinical decision-making.

Common Software Change Types

The following list of common change types are intended to help manufacturers consider additional factors that may affect a decision to submit a new 510(k).

Some of the common software change types include: ·

- **"Infrastructure"** changes are modifications made to the software support system. Examples include but are not limited to: switching compilers, changing programming languages (C to C++, C++ to Java), or changing software drivers or libraries. The complexity of the change should be taken into consideration while determining whether the change requires submission of a new 510(k).
    - For example, when changing programming languages, the similarity of the programming syntax between the two languages, as well as other factors (such as the coding paradigm associated with the old and new code), should be considered. A change from C to C++ may not entail significant code writing if the syntax is similar and would not likely need a new 510(k). On the other hand, moving from a functional or logical coding paradigm to an Object-Oriented Programming paradigm, in conjunction with the change from C to C++, could involve significant software re-write, and submission of a new 510(k) is likely required.
    - Similar analysis generally applies to software driver changes, OS changes, etc. It should be noted that significant changes to verification and validation scripts might be a signal that significant infrastructure changes have taken place and should be examined. Updates to scripts alone do not indicate that submission of a new 510(k) is required; however, it is important to understand why the scripts are being updated. ·
- **"Architecture"** changes are modifications to the overall structure of the software. Examples include but are not limited to: porting to a new OS, software changes to support a new hardware platform, and new middleware. These changes may impact the overall performance of the device or extend the

environment in which the device can operate. The extent of the changes and the impact that they have on the device should be considered in determining whether submission of a new 510(k) is required. · "Core algorithm" changes are modifications made to an algorithm that directly impact or contribute to the device's intended use. Examples include: alarm algorithms on a monitor, a motor control algorithm for an infusion pump, and a detection module and measurement engine algorithm for an IVD.. However, it is important to understand that a complete rewrite of the algorithm, even with the same performance claims and risk profile, may be significant enough to require submission of a new 510(k) because the rewrite may impact performance indirectly.

- **"Clarification of Requirements – No Change to Functionality"** are changes made to clarify software requirements after a product has received premarket clearance. This clarification may be revised phrasing of an existing requirement or creation of a new requirement altogether, without changing or adding functionality. Changes made to clarify the requirements, likely do not require submission of a new 510(k).
- **"Cosmetic Changes – No Change to Functionality" are** changes made to the appearance of the device or User Interface that do not impact the clinical use of the device. For example, changing the company logo that is displayed on the background of every screen could involve modifying multiple software modules; while the number of modules impacted may be large, it is unlikely that the intended change could significantly impact the device's safety and effectiveness or intended use, and submission of a new 510(k) is likely not required.
- **"Reengineering" and "refactoring"** are two common software maintenance techniques. "Reengineering" is defined as the examination and alteration of software to reconstitute it in a new form, and includes the subsequent implementation of the new form. It is often undertaken to replace aging legacy software. "Refactoring" is a disciplined technique for restructuring a software program's internal structure without changing its clinical performance specification. Refactoring seeks to improve a program structure and its maintainability.

  In general, reengineering often results in broader and more complex changes, while refactoring is often narrower in scope and less complex. The complexity of the change and the impact on risk controls or performance should be considered to determine whether the change requires submission of a new 510(k).

  - Changes that are minor modifications to enhance the maintainability of the device within its specification context are unlikely to require submission of a new 510(k).
  - Changes involving significant software re-write likely require submission of a new 510(k) because of the impact on the performance and on the risk controls.

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If you have questions: Please Contact OTech at http://www.otechimg.com/contactus.cfm

[1] https://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM514737.pdf

[2] https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfCFR/CFRSearch.cfm?CFRPart=820

[3] https://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm514771.pdf

[4] https://www.fda.gov/downloads/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm356190.pdf
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