# The FDA EFS Program: Ideation Through the First 10 Years

Guiding principles, clinical strategy, and program challenges to informing broader early feasibility study strategy and implementation.

**By Dorothy B. Abel and Aditi Upadhye, RAC**

An early feasibility study (EFS) is a limited clinical investigation of a device early in development, typically before the device design has been finalized, for a specific indication. Generally, an EFS is conducted when information to advance device development cannot practically be provided via additional nonclinical assessments or when appropriate nonclinical tests are unavailable.

Early clinical studies support medical device innovation, which can address unmet clinical needs and improve patient care. Having a system to support these studies, like the FDA's EFS Program, helps regain or maintain leadership in innovation for a geography. A successful EFS Program provides patients with earlier access to promising novel technologies, allows health care providers to gain earlier experience with new products, and facilitates transition to larger studies (eg, pivotal studies), as well as marketing authorization and adoption. Strengthening and streamlining the clinical trial enterprise is key to promoting collaboration between inventors, sponsors, investigators, and regulators.

The early clinical evaluation of medical devices has ebbed and flowed across geographies over time, including in the United States (US). The evaluation of endovascular grafts for aortic aneurysm repair is an illuminating example. Early clinical studies of virtually all endovascular grafts started in the US or were run concurrent with studies outside of the US in the 1990s and early 2000s. First-in-human (FIH) studies outside the US to establish feasibility then became the norm. Due in part to the EFS Program, initial clinical studies have returned to being more global, including clinical sites inside and outside the US.

During the slump in US participation in early clinical studies, the Center for Devices and Radiological Health (CDRH) within FDA made it one of their core goals to facilitate the approval of these studies in the US, encouraging the development of useful devices while providing protection of public health and safety under the investigational device exemption (IDE) regulations. These IDE regulations provide the framework for clinical studies using unapproved medical devices. Accomplishing this goal involved publication of a draft guidance document in November 2011, subsequent initiation of a pilot study of nine projects applying the guiding principles of the guidance, and issuance of the final document in October 2013.[1,2] The FDA EFS Program was launched in 2014, with representatives from each of the seven review divisions and from the engineering laboratories developing best practices and providing support to both manufacturers considering US EFS as well as the CDRH teams responsible for reviewing submitted EFS IDE applications. Notably, these review teams were not specific to the EFS Program but rather consisted of the same teams that would review all types of IDE submissions, as well as presubmissions and marketing applications.

Having passed the 10-year anniversary of the program's development, FDA is looking toward EFS 2.0 to further optimize the program. Information is available to evaluate the strengths and weaknesses of the tools described in the guidance document, including the willingness of various stakeholders to embrace the guiding principles. Additionally, trends in the program success and future improvements can be explored.

## KEY GUIDING PRINCIPLES OF THE FDA EFS GUIDANCE

For some new devices, exhaustive nonclinical testing would likely not provide the information needed to advance device development. In these cases, early clinical use of the device in a limited number of subjects is needed

to provide initial insights into clinical safety and device functionality, inform subsequent clinical and nonclinical testing, and/or improve device performance through iteration before finalizing the design to be used in a pivotal study.

Approval of an EFS IDE may be based on less test data, when appropriate, as compared to the data needed to support the approval of a pivotal clinical study. This is due to the incorporation of risk mitigation strategies in the study protocol and through appropriate, controlled study conduct. Like all clinical studies, initiation of an EFS must be justified by a benefit/risk analysis and adequate human subject protections.

The guidance introduces the concept of just-in-time testing (JITT) (ie, doing the right testing at the right time). The testing plan is to be supported by a device evaluation strategy that provides context for why the proposed testing is adequate to support study initiation.

Changes should be anticipated to the device and/or the investigational plan during the conduct of an EFS. As such, the guidance provides approaches unique to EFS to allow for timely modifications.

Use of the Q-Submission Program is important when working with FDA, throughout the preparation, and, as needed, during the conduct of an EFS.

## RISK MITIGATION STRATEGIES

Risk mitigation strategies are key to providing an appropriate benefit/risk profile for an EFS. For example, rigorous clinical study monitoring is specified in an EFS protocol to allow for early identification of any safety signals, with frequent and detailed reporting to FDA to enable appropriate, collaborative decisions regarding study continuation or the need to modify the protocol, device, or investigational procedure. Sequential enrollment is not emphasized. Rather, protocols allow for the selection of patients for initial clinical uses who may be at lower risk of experiencing unsatisfactory outcomes (eg, less challenging anatomy) or who have limited treatment options. These patients can expect individualized care and close monitoring when participating in an EFS.

Inclusion of experienced investigators and study sites is encouraged. They need to have evaluation and treatment plans in place to address anticipated risks, and they need to provide informed consent to potential study subjects that highlight the greater degree of unforeseeable risk associated with EFS participation.

## JITT

The EFS guidance does not recommend that sponsors prematurely initiate clinical testing when further nonclinical testing can advance device development. However, it does recognize that comprehensive testing during early phases of device development may add cost without return. Testing may have limited future applicability if the device is modified. Additionally, time-consuming, noninformative testing delays access to the device for patients who may have limited treatment alternatives.

Depending on the device and intended use, JITT supports that it may be appropriate and acceptable to defer some device testing until after the EFS, if the testing will not provide additional meaningful information regarding basic device safety or functionality. For some devices or intended uses, particularly for highly innovative devices, the guidance recognizes that appropriate nonclinical testing methodologies to assess some critical parameters may not be available or are impractical to complete and therefore these parameters would need to be evaluated clinically.

JITT relates to the type, timing, and amount of testing needed to justify study initiation, acknowledging that it may be acceptable to defer some testing until the device design has been finalized for use in a pivotal study. Fundamental to the application of JITT is the need for predictability of the information expected by FDA in the IDE application, which is justified through a device evaluation strategy.

## DEVICE EVALUATION STRATEGY

It is recommended that a device evaluation strategy be included within the report of prior investigations in the IDE application. The device evaluation strategy outlines and justifies the testing needed to support IDE approval.

Although not specified in the EFS guidance document, appropriate standards should be referenced to categorize the risk level and identify the number of samples required for bench tests. By incorporating risk mitigation strategies, the use of lower confidence and reliability for EFS testing may be possible as compared to that used for pivotal studies.

The guidance outlines an approach for presenting the device evaluation strategy in a tabular fashion; however, text and tables are optimal. If there are FDA guidance documents or voluntary standards, a table can be added to identify testing relevant to the investigational device, and this would serve as the rationale for conducting the standardized tests. The rationale for excluding any tests in the documents can be presented in text or in an additional table. For any testing performed as per recognized standards, a comment should be provided for any deviations from the standard (eg, regarding the number of cycles for fatigue testing).

The approach outlined in the guidance is helpful in identifying the appropriate testing associated with the unique characteristics or attributes of the investigational device. In general, this involves identifying the following:

- Attributes required for the device to achieve the desired performance,
- Potential failure modes that might occur if each attribute is not achieved
- Consequences (effects) to the device or study patient if the function or feature is not attained to put the significance of the potential failures in context
- Knowledge base to support that failure is unlikely to occur, or if it does, that it will not be associated with a catastrophic event (eg, based on the device design information and supportive nonclinical and clinical information obtained from previous experience)
- Mitigation strategies to minimize the frequency or severity of the potential clinical effects resulting from a failure to attain the attribute, which will help determine whether additional data (beyond the supportive information) are needed to complete the evaluation of the attribute or failure mode
- Bench, laboratory, analytical, and/or animal testing of the study device to complete the evaluation of each attribute and the potential failure modes

Notably, the knowledge base can include testing or information leveraged from internal or external sources relevant to the study device. For example, testing from a prototype may be sufficient to address a potential failure mode that might occur if an attribute is not achieved. Similarly, clinical experience from the study device used for a different indication or from a similar device may support using a smaller sample size or deferring some testing.

The level of detail to include for each attribute should be proportional to the importance of the attribute for the intended use, the potential severity of the failure modes, and whether the method of assessing the attribute or failure mode is generally understood. Summary knowledge base information should be included for the most critical attributes, for both achieving the intended function of the device and potentially catastrophic failure modes. Descriptive information should be included for novel methods of assessment. Conversely, for less critical attributes and less concerning failure modes, it may be adequate to identify the applicable information or tests without providing descriptive information in the table.

Per the guidance, there may be uncertainty regarding some elements of the device evaluation strategy, depending on the novelty of the device or intended use. The device evaluation strategy should be updated as new information emerges about the potential risks and appropriate assessment of the device.

With regard to animal studies, the guidance allows for answering specific questions through potentially shorter-term studies. Additional animal studies may be needed later in device development.

## SUMMARY OF A DEVICE EVALUATION STRATEGY APPROACH

- **Device deconstruction:** Identify the attributes needed for the device to achieve the design goals, potential failure modes, and effects of failure
- **Knowledge base and mitigation strategies:** Describe what is known from the device design, leveraged nonclinical and clinical information from internal or external sources, and clinical study mitigation strategies applicable to the attributes and failure modes
- **Evidence gaps:** Identify gaps in existing information that indicate additional testing may be needed to justify study initiation, considering:
  - The knowledge base and attributes most important for the intended use
  - Potential failure modes most likely to be associated with catastrophic failures
  - Basic safety requirements (eg, biocompatibility)
- **Filling the gaps:** Identify the bench, laboratory, analytical, and/or animal testing to complete the evaluation of the device attributes and potential failure modes, considering:
  - Evidence gaps
  - Clinical context for the EFS
  - Potential types, frequency, and severity of the clinical effects of failure that may be associated with the device or procedure
  - Mitigation strategies

## Q-SUBMISSIONS

The Q-Submission Program allows for informal interactions between a potential sponsor, other stakeholders (eg, clinicians), and FDA.[3] Use of this program is particularly important to reach agreement on the information FDA expects in an EFS IDE application and can greatly influence the potential for obtaining timely IDE approval.

## EFS SUBMISSIONS: PERFORMANCE

The IDE review clock is 30 days for either an original or subsequent submission. FDA strives to approve EFS IDEs during the first 30-day review cycle. If not approved, additional information can be provided to address the FDA-communicated deficiencies, with the potential to eventually obtain approval.

Prior to the EFS Program, US early clinical study IDEs were not tracked separately from other types of IDE studies. Approximately 60 EFS IDEs have been approved per year since fiscal year 2017 (when the EFS Program was firmly established).[4] There have been > 4,000 EFS participants since these studies have been tracked.

Although a correlation between the number of novel devices evaluated under an EFS and their market authorizations has not been published, marketing authorization of novel devices has trended in a positive direction in the US.[4] This suggests that programs designed to increase access to novel devices have been effective in the US, including the EFS Program.

## EFS PROGRAM CHALLENGES

To enable the development of an optimal EFS Program, it is beneficial to assess the challenges under the current program. Perhaps one of the greatest limitations for the US EFS Program is a lack of clear evidence to support the premise that using the presubmission or EFS processes provides benefit with respect to the predictability of IDE approval, marketing authorization, or market adoption. In absence of this evidence, it is difficult to weigh the benefits and risks of these approaches when developing the business plan around a new device.

There is also uncertainty associated with applying the EFS principles as outlined in the guidance document to an individual project. For example, FDA can require the same level of testing that would be needed to support pivotal study initiation (ie, not JITT principle) under an EFS IDE, or they can require Good Laboratory Practices–compliant animal study data on the device iteration to be used in an EFS rather than leveraging existing animal study data. FDA may not allow for the necessary flexibility in patient selection, clinical study protocol, and device design required for an EFS to be nimble. Other challenges are associated with insurance coverage under EFS IDEs, as well as contracting and budgeting (eg, ethical committee reviews, indemnification, interpretation of fair market value).

A successful EFS Program is optimally transparent and predictable, addressing the broad range of potential limitations, including those associated with wrong assumptions and potential misunderstandings. Although there is uncertainty around the impact of conducting an EFS on timelines, an EFS should not add a significant burden that would be reflected in the development process timeline, as some believe. An EFS (including follow-up) does not need to be completed prior to pivotal study initiation. Additionally, a new IDE is not needed for transitioning to a pivotal study.

## LESSONS LEARNED, INDUSTRY INSIGHTS, AND BEST PRACTICES

Although there is no definitive evidence, it is appropriate to assume that (1) starting with an EFS facilitates transition to larger clinical studies in the same geography and (2) tools to aid in communication with regulators (eg, the US Q-Submission Program) help with the predictability of formal requests to conduct an EFS. Obtaining concurrence on the device evaluation strategy helps conduct the necessary testing and avoids using resources on testing that is unnecessary to support an approval to conduct a clinical study. Reaching alignment on the clinical study protocol through the Q-Submission Program process reduces time-consuming, formal interactions to finalize a protocol.

Feasibility data, which can consist of EFS data, are generally needed for novel technology or intended uses to support pivotal study initiation. Planning for an easy transition to a pivotal study can reduce delays in completing a device evaluation. For example, starting the clinical evaluation under an EFS while completing any additional required bench testing to support pivotal study initiation is efficient, and data from the EFS can inform the development of the pivotal study design. Prospectively proposing the amount of data needed to support the initiation of a pivotal study can help minimize or eliminate gaps in patient enrollment during the transition from the EFS to a pivotal study. Transitioning to the pivotal study can be achieved through submitting an IDE supplement that contains results from the EFS and any additional safety data and the investigational plan for the pivotal study. Notably, if a sponsor anticipates pooling of EFS data with pivotal study data, this should be proposed and discussed with the FDA, preferably prior to initiation of the EFS.

In the US, respecting the FDA review teams' commitment to protecting and promoting public health is key in establishing a mutually respectful relationship. If the team is reticent to apply the principles of the EFS guidance after clear rationales are provided for supporting an IDE approval, engaging with upper management and EFS leadership is appropriate and will not undermine the existing relationship with the team. Consultation with the Centers for Medicare & Medicaid Services regarding EFS coverage is highly recommended.

## REFERENCES AND RESOURCES

There are resources available to aid in preparing and conducting an EFS IDE, including information provided by FDA and by the Medical Device Innovation Consortium (MDIC):

- EFS Guidance: www.fda.gov/media/81784/download
- EFS Program web page: www.fda.gov/medical-devices/investigational-device-exemption-ide/early-feasibility-studies-efs-program
- MDIC tool kit: https://mdic.org/efs-toolkit/

## MOVING FROM EFS 1.0 TO EFS 2.0

Acknowledging existing barriers to conducting a US EFS, FDA is actively supporting EFS Program growth by optimizing the US EFS ecosystem in collaboration with other stakeholders. EFS leadership is promoting application of the EFS guidance guiding principles. There are also efforts to integrate compassionate uses into EFS interactions to further promote development of devices intended to address unmet needs, as well as clarify the options for transitioning from EFS to pivotal studies. Realizing the benefits of conducting studies in multiple geographies and the recognition of EFS in the International Organization for Standardization ISO 14155, FDA is encouraging global studies rather than focusing only on US studies. Finally, enhancing synergies with other programs intended to promote innovation (eg, the Breakthrough Devices and Total Product Life Cycle Advisory Programs) has become a focus for EFS Program leadership.

## SELECTING A GEOGRAPHY FOR EFS

Processes, benefits, and limitations of US EFS are described previously. When considering conducting studies outside of the US, the following list can aid in understanding the process and time needed to initiate research in each country:

- Ability for external investigators to participate in procedures
- Import/export requirements
- Technical capabilities (eg, MR, CT, cath labs)
- Types of specialties available at each site
- Experience with early feasibility/FIH studies
- Intellectual property/publication/ownership of data
- Study registration requirements
- Insight into required device testing requirements
- Ability to obtain patient recruitment and follow-up at sites
- Cost/trial insurance needs
- Acceptability of data by investors, FDA, and future users
- Clinical study infrastructure

Ideally, each geography would have a transparent, predictable process that incorporates the ability to pivot and/or modify the device and/or clinical evaluation.

## CONCLUSION

The importance of EFSs is universal, supporting innovation and improving access to potentially beneficial medical devices. The US FDA EFS Program informs key aspects needed for success, the breadth of influences on the potential for success, and challenges that can be anticipated in developing or maintaining an EFS Program. Central to any successful program are flexibility, transparency, predictability, collaboration, options for efficient communication, appropriate tools to ensure patient safety as well as program success, and a reasonable acceptance for uncertainty. ■

1. Federal Register. Draft guidance for industry and Food and Drug Administration staff; investigational device exemptions for early feasibility medical device clinical studies, including certain first in human studies; availability. November 10, 2011. Accessed March 18, 2026. https://www.federalregister.gov/documents/2011/11/10/2011-29117/draft-guidance-for-industry-and-food-and-drug-administration-staff-investigational-device-exemptions
2. US Food & Drug Administration. Guidance document: investigational device exemptions (IDEs) for early feasibility medical device clinical studies, including certain first in human (FIH) studies. October 2013. Accessed March 18, 2026. https://www.fda.gov/regulatory-information/search-fda-guidance-documents/investigational-device-exemptions-ides-early-feasibility-medical-device-clinical-studies-including
3. US Food & Drug Administration. Guidance document: requests for feedback and meetings for medical device submissions: the Q-Submission Program. May 2025. Accessed March 19, 2026. https://www.fda.gov/regulatory-information/search-fda-guidance-documents/requests-feedback-and-meetings-medical-device-submissions-q-submission-program
4. Farb A. Early feasibility studies: an FDA perspective. Presented at: BEST Clinical & Regulatory Practices Conference; October 21-22, 2024; Buffalo, New York.

**Dorothy B. Abel**
Abel and Wolf Consulting
Santa Rosa, California
dabel@abelandwolf.com
*Disclosures: None.*

**Aditi Upadhye, RAC**
Founder & Principal Consultant
AURA Regulatory Consulting LLC
Santa Rosa, California
*Disclosures: None.*