Guidance on the Content of Premarket Notification [510(k)] Submissions for External Infusion Pumps (Text Only)

This guidance was written prior to the February 27, 1997 implementation of FDA's Good Guidance Practices, GGP's. It does not create or confer rights for or on any person and does not operate to bind FDA or the public. An alternative approach may be used if such approach satisfies the requirements of the applicable statute, regulations, or both. This guidance will be updated in the next revision to include the standard elements of GGP's.

March 1993

GUIDANCE ON THE CONTENT OF PREMARKET NOTIFICATION [510(K)] SUBMISSIONS FOR EXTERNAL INFUSION PUMPS

I. Introductory Information

A. Scope

This document establishes the 510(k) review requirements for external infusion pumps. The external infusion pump may be electrically powered, mechanically powered, or use an alternate energy source. Examples of devices within this generic type include peristaltic, piston, spring-driven, syringe, and elastomeric types of pumps. Accessory devices, such as carrying cases, are also included within this type of device. Disposable functional components such as infusion sets or cassettes, provided or specifically recommended for use with these devices, must be identified and demonstrated to be either: 1) substantially equivalent, or 2) legally marketed medical devices. If these functional components are included for evaluation in this submission they should meet all other applicable guidance.

EXCLUSIONS

This document does not address submissions for implantable infusion pumps or closed-loop devices, which both require premarket approval. This document also does not cover pressure infusors for I.V. bags (as described in 21 CFR 880.5420).

B. Purpose This guidance is intended to:

1. assist persons (manufacturers, distributors, or importers) in organizing premarket notifications for external infusion pumps;

2. achieve consistency in meeting of requirements and in the presentation of information; and

3. guide FDA review staff in conducting and documenting the review of premarket notifications for external infusion pumps.

C. Definitions

1. Infusion Pump: described in FDA regulation, 21 CFR 880.5725, as "a device used in a health care facility to pump fluids into a patient in a controlled manner. The device may use a piston pump, a roller pump, or a peristaltic pump and may be powered electrically or mechanically. The device may also operate using a constant force to propel fluid through a narrow tube which determines the flow rate. The device may include means to detect a fault condition, such as air in, or blockage of, the infusion line and to activate an alarm."

2. Cassette: a specially designed disposable component/accessory that mates with the infusion pump to complete the pumping or controlling mechanism.

3. Elastomeric Pump: an infusion pump which utilizes the energy in an elastic membrane to provide the force for fluid delivery.

4. Flow Profile: a graph or table representing numerically the flow rate versus time over the course of an infusion.

5. Fluid Pathway: all portions of the device or any accessories which contact the fluid being infused.

6. Patient Controlled Analgesia (PCA) Pump: an infusion pump, intended for the delivery of analgesics, which is equipped with a component which allows for additional limited delivery upon patient demand.

7. Syringe Pump: an external infusion pump which utilizes a piston syringe as the fluid reservoir and to control fluid delivery.

8. Intended Use: the objective intent of the persons legally responsible for the labeling of the device. The intent is determined by their expressions or may be shown by the circumstances surrounding the distribution of the device. The objective intent may, for example, be shown by labeling claims, advertising matter, or oral or written statements by such representatives. It may be shown by the offering or the using of the device, with the knowledge of such persons or their representatives, for a purpose for which it is neither labeled nor advertised (801.4). Some use conditions for infusion pumps may include single use only, home use, reusable, intravenous and intra-arterial delivery.

9. Abbreviations:

AAMI - Association for the Advancement of Medical Instrumentation

ANSI - American National Standards Institute

CBER - Center for Biologics Evaluation and Research

CDER - Center for Drug Evaluation and Research

CDRH - Center for Devices and Radiological Health

CFR - Code of Federal Regulations

DSMA - Division of Small Manufacturers Assistance

FDA - Food and Drug Administration

FR - Federal Register

IEC - International Electrotechnical Commission

ISO - International Organization for Standardization

OCS - Office of Compliance and Surveillance

ODE - Office of Device Evaluation

SMDA - Safe Medical Devices Act of 1990

UL - Underwriters Laboratory

D. General Principles Regarding Presentation of Data

1. Editorial Considerations: The 510(k) should be carefully edited, as well as scientifically reviewed before it is submitted to FDA. It should be proofread to assure that all pages/sections are included and are properly indicated, consecutive, distinctly copied, and legible.

2. Abbreviations: Standard abbreviations acceptable to a significant peer reviewed journal should be used wherever possible. All other abbreviations should be identified at the beginning of each section in which they are used or in footnotes to tables and graphs.

3. Data Availability: This document outlines typical circumstances of data review. It is not possible to anticipate all situations that may require FDA review. Thus, those submitting applications should be aware that they may be asked to submit additional data, to present data in another format or to

provide more detailed explanations of the information submitted, if required to establish equivalence.

Applicants should keep data used for the 510(k) submission on file in a controlled and well-organized format. This will allow the applicant to expeditiously supply FDA with additional information or analysis if required. Errors in data that are identified by the applicant after submission to FDA should be brought to FDA's attention immediately.

4. Tables and Graphs: Well-constructed tables are fundamental to the reporting and evaluation of data. All tables should be clearly identified and captioned with symbols keyed to a footnote or accessible reference page that adequately indicates the nature of the data.

Graphs should supplement, not replace, data tables. They should be of a high quality.

5. Published Literature: Published methods or data referenced in study reports should be appended to the study report. Reprints of other referenced published reports or data should be appended to the section in which they are referenced. All referenced reports and data should be summarized including an explanation how it relates to the current submission. Reference citations should be complete (e.g., title, author, volume, year).

6. Protocols and Data Analysis: Test reports must include the protocol (objectives, precise description of materials, experimental methods, controls), observations, statistical methods and analyses, conclusions and comments. Do not submit raw data. Additional specific directions on protocols are included in sections that follow.

7. Reference to Submitted Data: In support of the 510(k) the applicant may reference any information previously submitted to FDA. If the applicant did not submit the referenced data he must provide, or have the submitter provide to FDA, a letter of authorization. Often, if the data are not extensive, resubmitting data in the 510(k) will facilitate the review of the document.

E. Document Availability

The following documents are available from DSMA [(800)638-2041 or (301)443-6597]:

Tripartite Biocompatibility Guidance for Medical Devices ODE Blue Book Memorandum #K90-1: 510(k) Sterility Review Guidance Reviewer Guidance for Computer Controlled Medical Devices Undergoing 510(k) Review.

II. Content and Organization of Information in a 510(k) for an External Infusion Pump

A. Cover Letter

The submission shall have a signed cover letter providing the following information described in 807.87 (Information required in a premarket notification submission):

1. The infusion pump's trade or proprietary name.

2. Common Name: Syringe Pump, Elastomeric Pump, etc.

3. Classification name: Infusion Pump

4. The establishment registration number, if applicable, of the sponsor, owner or operator submitting the premarket notification

5. Class: II Panel: 80

Procodes: list all the following that apply

FRN - Infusion Pump

MEA - PCA External Infusion Pump

MEB - Elastomeric External Infusion Pump

LZG - External Insulin Infusion Pump

LZH - External Enteral Infusion Pump

FPA - Intravascular (IV) Administration Set

6. A statement explaining the purpose of the submission (e.g., new device, significant modification of device previously found equivalent (new intended use, material, or manufacturing process, etc.)). Refer to 807.87(g) for additional information regarding changes to devices. The change may require some or all of the information needed for a new device. Please supply the previous 510(k) number(s), if applicable.

7. A brief statement indicating the device is similar to and/or different from other products of comparable type in commercial distribution.

8. Name, address, and phone number of a U.S. contact person, if available.

B. Labels and Labeling

1. The submission shall contain proposed labels, labeling, and advertisements sufficient to describe the device, its intended use, and the directions for use. Labels include the information affixed directly to the device or its container or packaging. Labeling also includes professional or patient package inserts, and any other information that accompanies the device.

2. The labeling must meet the requirements of 21 CFR Part 801 as it relates to a determination of intended use. ODE will concentrate on the following portion of Part 801:

Subpart A, 801.4 and 801.5, related to intended uses and adequate directions for use; and

Subpart B, 801.109 and 801.116, related to prescription devices and commonly known directions.

Other provisions of Part 801 are deferred for review to CDRH/OCS Device Labeling Compliance Branch.

3. Labeling for an infusion pump should include:

a. a list of device specifications including, but not limited to: reservoir volume, flow rates and profiles (if applicable), accuracy, residual volume, and the operational conditions (e.g., temperature, pressure, fluid viscosity) under which these are valid;

b. route(s) of administration as indicated in the statement of intended use (see section D.2.);

c. the fluid(s) to be administered by the pump as indicated in the statement of intended use (see section D.2.);

d. comprehensive directions for preparation and use for all possible functions of the device;

e. a description of all warning and alarm features;

f. a copy of patient instructions for use if the device is intended for home use, or would reasonably be expected to be used in a home setting;

g. the prescription statement found under 801.109(b)(1);

h. instructions for cleaning and maintenance which is to be done by the user; and

i. an identification of any dedicated administration set or the specifications and/or specific models of infusion sets which are appropriate for use with this pump.

C. Standards

Listed are some, but not all, of the standards related to infusion pumps:

1. AAMI, Draft Infusion Device Standard

2. UL 544 Standards for safety, medical and dental equipment

3. IEC 601-1/ANSI ES1-1985 Safe Current Limits for Electromedical Apparatus

The applicant may certify that the device meets a standard. The applicant then is obliged to comply with the standard and maintain documentation of tests showing that the device meets the standard. Certification of meeting a specific standard and reference to standards in the 510(k) may

reduce the documentation needed in the 510(k) submission. This is noted in pertinent sections.

D. Device Description

The applicant must submit a complete description of the device, including all models and variations.

1. State the type of infusion pump (e.g., peristaltic, piston, syringe). Provide a labeled representation of the device in sufficient detail to facilitate the evaluation of the nature and operation of the device (e.g., photographs, detailed drawings, or engineering drawings). If the labeling already includes sufficient illustrations of the device, refer to the labeling.

2. Provide a clear statement of the intended use(s) of the infusion pump.

a. Specify the route(s) of administration.

b. If the infusion pump is labeled for use with a specific drug/biologic, the applicant must supply information demonstrating that use of the drug/biologic with the device is consistent with the approved drug/biologic labeling.

c. Identify any specific uses for the pump. For example, PCA is a generally accepted specific use for a pump used to deliver analgesics.

d. State whether the infusion pump is indicated for the delivery of blood or blood products.

3. Provide the following information for the device. The applicant may refer to relevant standards.

a. Physical Specifications and Descriptions

(1) Components: Identify and describe all major components or component groups (i.e., not individual electronic or mechanical components) and give dimensions. Each component/component group should be identified as reusable or disposable. Identify any component/component group which contacts the fluid path.

(2) Pumping Mechanism (Fluid Control Mechanism): Describe the physical method used to generate and control fluid flow. Identify and provide specifications for all major components involved in this process.

(3) Administration Sets & Drug Reservoir: Identify sets appropriate for use with the pump. Peristaltic and piston devices often have specialized administration sets which must be used with the individual pump. Describe the drug reservoir. Indicate if these are currently legally marketed devices or if they are included for evaluation in this submission.

(4) Power Requirements: Describe the energy/power requirements and characteristics. Indicate if device meets UL 544 (if applicable). If not, describe how it deviates from the standard.

(5) Materials: Identify the basic materials of construction. Provide the chemical formulation of all materials which contact the fluid path.

b. Operational Specifications and Descriptions

(1) Flow Rates and Profiles: State the accuracy for the device. Describe all possible delivery rates and flow profiles, and the operational conditions (e.g., temperature, pressure, fluid viscosity) under which the device will meet the stated accuracy figure. List the reservoir volume and residual volume.

(2) Safety/Alarm Functions: For electronic pumps describe all of the various alarm, warning and safety functions, both hardware and software, of the device. For mechanical devices describe any safety mechanisms built into the device.

(3) Other Capabilities: Describe any other capabilities the device may possess.

c. Biological Specifications State the biocompatibility category for all components and materials in the fluid pathway per the draft ISO 194 Biocompatibility Standard or the Tripartite Biocompatibility Guidance.

d. Chemical Specifications

(1) State the compatibility requirements for the device with any specific drug or biologic referenced in the device labeling.

(2) State the stability requirements for storage of any specific drug or biologic referenced in the device labeling.

E. Descriptive Comparison to a Legally Marketed Device

Identify a legally marketed infusion pump to which substantial equivalence is claimed. (If possible, identify the 510(k) number(s).) More than one infusion pump can be listed, but the device(s) chosen should be as close in intended use and technology to the new device as possible. Provide the information noted below to show how the new device is both similar to or different from the legally marketed device. Side by side comparisons, whenever possible are desirable (see Attachment 2). This information may be identical to that provided under Part D and the applicant may wish to combine some or all of Parts D and E information. Indicate how the differences may affect safety and effectiveness.

1. Provide labeling (labels, instructions for use, promotional material) for the legally marketed device(s) to which substantial equivalence is claimed. To facilitate comparison, also include clear representations of the legally marketed device(s), unless the labeling has ample information.

2. Compare and contrast the intended use for the new device to the predicate device(s).

3. Compare materials used to fabricate fluid path components. The precise materials of the fluid path of the new device, and if possible, the predicate device(s) should be identified to the extent possible.

4. Compare the operational principles including mode of action.

5. Compare physical, operational, biological, and chemical specifications.

F. Performance Data Supporting Substantial Equivalence

Provide the protocols and results of the tests indicated below. If the stated test is taken from a standard that specifically addresses the performance criterion, then the applicant should reference the standard and certify that the device will meet the criterion. Data need not be submitted in this instance.

The studies should be well-designed to meet the stated objectives. This will include rigorous attention to: statistical elements (hypotheses, test statistics, analyses, sample size and sampling, power, etc.), inclusion/exclusion criteria, controls, minimization of bias, test parameters (endpoints), follow-up, evaluation criteria, etc. Some of the above points may overlap. Ample reference material exists on study design and methods upon which the applicant may rely (e.g., biocompatibility).

1. Bench Data

The following bench data is generally necessary for a non-electronic pump or any pump with a unique design unless the sponsor can completely address all of the following issues using device specifications.

a. For a pump intended only to maintain a constant set flow rate, this data should demonstrate that the device can maintain a set flow rate over the complete course of the infusion within the designated accuracy. The testing should demonstrate adherence to specifications at the limits of the operational parameters.

b. For a pump which does not maintain a constant flow rate, testing results should be used to generate a representative flow profile. This representative flow profile must be included in the device labeling.

c. Testing should also demonstrate that the device can maintain the specified flow characteristics despite changes in ambient temperature, pressure, or fluid viscosity, which would reasonably be expected to be encountered according to the intended use of the device. If significant, the effects of these factors should be discussed quantitatively in the labeling so the user is made aware of the effects of these factors.

2. Comparative Claims

Additional data may be needed to support comparative claims.

3. Unique Designs

Additional data may be needed to support designs that are significantly different from typical designs.

4. Biocompatibility Data

For all fluid path materials certify that the identical materials have been used in other legally marketed devices under the same use conditions, or provide documentation attesting to the biocompatibility of the component materials in the finished product according to the 1987 Tripartite Biocompatibility Guidance for Medical Devices and 1992 draft ISO 194 standard (Biological testing of medical and dental materials and devices). With regard to metals, the applicant may simply identify device components made of an ASTM grade of metal that ASTM certifies is biocompatible, e.g., ASTM 316 stainless steel.

Biocompatibility test data may be required for colors that are not listed in FDA regulations or are not used in other legally marketed devices for a similar intended use.

5. Drug/Biologic and Device Compatibility

Data demonstrating drug or biologic and material compatibility is required if a specific drug or biologic is referenced in the device labeling.

6. Drug/Biologic Stability

If the device labeling indicates that the drug or biologic is to be stored in the reservoir, stability data for the recommended storage period and conditions is required.

G. Software

The sponsor must indicate the level of concern (see p.16 of the document indicated below) for pumps which are software controlled and provide appropriate software information according to the "Reviewer Guidance for Computer Controlled Medical Devices Undergoing 510(k) Review."

H. Sterilization Information

See Attachment 1

I. SMDA Information

Summary or Statement of Safety and Effectiveness

All persons submitting a 510(k) must include either a summary of safety and effectiveness information in the 510(k) upon which an equivalence determination could be based OR a statement that safety and effectiveness information about the [device name] will be made available to any interested person upon request. Safety and effectiveness information refers to adverse safety and effectiveness information, descriptive information about the new and predicate devices, and performance/clinical testing information.

If the summary option is selected, it should be included on a separate page and identified as the Summary of Safety and Effectiveness for [device name].

If the statement option is selected, do not include the word "summary" in the statement.

The content and format of this information is specified in 57FR No. 82, Tuesday, April 28, 1992, page 18062.

III. COMMENTS Address any comments regarding this guidance to:

Chief, General Hospital Devices Branch

10902 New Hampshire Avenue

Silver Spring, MD 20993

Attachments

ATTACHMENT 1

STERILITY INFORMATION

For a device sold sterile, provide the following information as detailed in the ODE Blue Book Memorandum #K90-1.

1. Sterilization method that will be used.

2. A description of the method that will be used to validate the sterilization cycle, but not the validation data itself. Reference to a standard method (e.g., AAMI Radiation Standard) usually is sufficient.

3. The sterility assurance level (SAL) for the device which the firm intends to meet. An SAL of 10-6 is required for devices which contact normally sterile areas of the body.

4. A description of the packaging to maintain the device's sterility (this is not to include packaging integrity testing data).

5. If sterilization involves EtO, the maximum levels of residues of ethylene oxide, ethylene chlorohydrin, and ethylene glycol which remain on the device. The levels should be consistent with the draft Federal Register Notice on EtO limits.1

6. Whether the product is "pyrogen free" and an identification of the method used to make that determination.2

7. The radiation dose, if radiation sterilization will be used, and if it has been determined. Otherwise, amend the 510(k) file at FDA when the dose has been determined. References 1. FDA Proposed Rule, 43 FR 27482 (June 23, 1978), Maximum Residue Limits for Ethylene Oxide, Ethylene Chlorohydrin, and Ethylene Glycol. 2. FDA Guidelines on Validation of the Limulus Amebocyte Lysate (LAL) Test as an End-Product Endotoxin Test for Human and Animal Parenteral Drugs, Biological Products, and Medical Devices.

ATTACHMENT 2
EXAMPLE OF SIDE BY SIDE COMPARISON TABLE

ELEMENT OF COMPARISON	**SUBJECT DEVICE**	**CLAIMED SE DEVICE #1**	**(CLAIMED SE DEVICE (#2)**
pump type			
intended use(s)			
specific drug.biologic use			
labeling			
components			
pumping mechanism			
administrative sets & reservoir			
power requirements			
materials			
flow rates and profiles			
safety/alarm functions			
other capabilities			

SE=Substantially equivalent
The applicant may reference relevant standards in theTable .

ATTACHMENT 3 EXTERNAL INFUSION PUMP REVIEW CHECKLIST 510(k)#:_____ Sponsor:_____ Date:_____ Reviewer:_____ ELEMENT ADEQUATE COMMENTS (e.g., N/A, page #, 30ml, YES NO 18g, PVC, EtO, 10^{-6}, ¾: ") Cover Letter

- trade name
- common name
- classification name
- establishment reg. #
- procode(s)
- purpose of submission
- previous files referenced
- statement that device is similar to and/or different from other products

Labeling

- specifications reservoir volume flow rates flow profiles accuracy operational conditions
- statements route of administration fluids to be administered directions for preparation and use for all possible functions of the device description of all warning and alarm features prescription statement dedicated administration set or compatible sets
- patient instructions
- cleaning/maintenance instructions

Description of Device

- type
- basic description
- photograph/drawing

Intended Use(s)

- clear statement
- route of administration
- specific drug/biologic
- other specific use(s)
- blood or blood products

Physical Specifications

- components/component group reusable/disposable fluid path contact
- pump mechanism (fluid control mechanism)
- administration sets & drug reservoir
- power requirements
- materials identification

Operational Specifications

- flow rates
- flow profiles
- accuracy
- operational conditions
- reservoir volume
- residual volume
- safety/alarm functions
- other capabilities

Biological Specifications

- biocompatibility require- ments for all components and materials in fluid pathway

Chemical Specifications

- compatibility requirements specific drug/biologic
- stability requirements drug/biologic storage

Descriptive Comparison to Legally Marketed Device

- identified appropriate legally marketed device(s)
- labeling
- description
- intended use(s)
- materials
- operational principles
- physical specifications
- operational specifications

- biological specifications
- chemical specifications
- side by side comparison
- discussion of how differences may affect safety and effectiveness

Performance Data Supporting Equivalence

- bench data flow rate flow profile maintain flow despite changes in environment or fluid
- comparative claims
- unique designs
- biocompatibility
- compatibility
- stability

Software Information

- level of concern
- documentation

Sterilization Information

- method
- validation method
- SAL
- packaging description
- EtO residuals
- pyrogen free method
- radiation dose

SMDA Information

- summary
- statement

More in Guidance Documents (Medical Devices and Radiation-Emitting Products) (/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/default.htm)

Cross-Center Final Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm081752.htm)

Office of Compliance Final Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm070269.htm)

Office of the Center Director Final Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm110228.htm)

Office of Communication and Education Final Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm070271.htm)

Office of Device Evaluation Final Guidance 2010 - 2016
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm198577.htm)

Office of Device Evaluation Final Guidance 1998 - 2009
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm070272.htm)

Office of Device Evaluation Final Guidance 1976 - 1997
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm080283.htm)

Office of In Vitro Diagnostics and Radiological Health Final Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm070274.htm)

Office of Surveillance and Biometrics Final Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm070275.htm)

Office of Science and Engineering Laboratories Final Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm070277.htm)

Draft Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm407274.htm)

Radiation-Emitting Products Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm283507.htm)

Withdrawn Guidance
(/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm425025.htm)