Surgical Staplers and Staples for Internal Use - Labeling Recommendations

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Draft Guidance for Industry and Food and Drug Administration Staff

DRAFT GUIDANCE

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For questions about this document, contact the Division of Surgical Devices at 301-796-6970, and R. Dale Rimmer, Ph.D., at 240-402-4828.

U.S. Department of Health and Human Services
Food and Drug Administration
Center for Devices and Radiological Health

Preface

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Surgical Staplers and Staples for Internal Use - Labeling Recommendations

Draft Guidance for Industry and Food and Drug Administration Staff

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I. Introduction

The Food and Drug Administration (FDA) is issuing this guidance to provide labeling recommendations for surgical staplers and staples for internal use. These labeling recommendations are being issued because malfunctions and misuse associated with these devices have resulted in serious adverse events, including deaths.[1]

FDA believes that the labeling recommendations in this guidance would help promote the safe and effective use of surgical staplers and staples for internal use by helping manufacturers develop labeling with information about specific risks, limitations, and directions for use of the device.[2]

FDA's guidance documents, including this draft guidance, do not establish legally enforceable responsibilities. Instead, guidances describe the Agency's current thinking on a topic and should be viewed only as recommendations, unless specific regulatory or statutory requirements are

[1] See e.g., FDA Manufacturer and User Facility Device Experience (MAUDE) Database, search of the product codes GDW and GAG from January 1, 2011 – March 31, 2018.

[2] In addition, FDA is initiating the reclassification of surgical staplers for internal use from class I to class II with special controls. See https://www.federalregister.gov/documents/2019/04/24/2019-08260/general-and-plastic-surgery-devices-reclassification-of-certain-surgical-staplers.

cited. The use of the word *should* in Agency guidance means that something is suggested or recommended, but not required.

II. Background

Surgical staplers for internal use are specialized prescription devices used to deliver compatible staples to internal tissues during surgery for resection, transection, and creating anastomoses. Surgical staplers and staples for internal use may be indicated for use in a wide range of surgical applications, including but not limited to gastrointestinal, gynecologic, and thoracic surgery.

FDA has become aware of a large number of adverse events associated with use of both surgical staplers and staples for internal use. Between January 2011 – March 2018, FDA received over 41,000 adverse event reports associated with surgical staplers and staples for internal use, including over 360 deaths associated with the use of surgical staplers and staples for internal use.[3,4] Some of the most commonly reported problems in these adverse event reports include an opening of the staple line or malformation of staples, misfiring, difficulty in firing, failure of the stapler to fire the staple, and misapplied staples (e.g., user applying staples to the wrong tissue or applying staples of the wrong size to the tissue). Although the majority of the adverse events were reported under product code GDW (Staple, Implantable), FDA believes that many of the problems identified in these reports can be primarily attributed to surgical staplers for internal use, since proper staple formation is largely contingent on proper function and use of the stapler.

Stapler and/or staple malfunctions may result in prolonged surgical procedures or unplanned, additional surgical interventions, which may lead to other complications such as bleeding, sepsis, fistula formation, tearing of internal tissues and organs, increased risk of cancer recurrence, and death. Common causes for complications also include the use of incorrectly sized staples for the tissue, incorrect use of the device by the user and improper use of the device for the condition of the patient's tissues, which may result in reoperation or prolonged hospitalization.[5] For example, an early postoperative anastomotic leak due to such device issues may result in a septic patient with peritonitis, requiring immediate surgery with diversion of stool into a stoma. Minor or delayed anastomotic leaks due to such device issues may result in an intra-abdominal abscess requiring surgical or other invasive drainage procedures, temporary diversion of stool, and prolonged intravenous nutrition. These complications commonly result in prolonged hospital stays.[6]

[3] See https://www.federalregister.gov/documents/2019/04/24/2019-08260/general-and-plastic-surgery-devices-reclassification-of-certain-surgical-staplers.

[4] U.S. Food and Drug Administration, "Safe Use of Surgical Staplers and Staples – Letter to Health Care Providers," March 8, 2019, available at https://www.fda.gov/MedicalDevices/Safety/LetterstoHealthCareProviders/ucm632938.htm.

[5] Checkan E, Whelan RL. Surgical stapling device-tissue interactions: what surgeons need to know to improve patient outcomes. Med Devices (Auckl). 2014; 7:305-318.

[6] Betzold R, Laryea JA. Staple Line/Anastomotic Reinforcement and Other Adjuncts: Do They Make a Difference? Clin Colon Rectal Surg. 2014 Dec; 27(4): 156-161.

Both device misuse and device malfunctions are root causes of these adverse events.[7] Device misuse may be exacerbated by inadequate instructions for use, and insufficient warnings or precautions in the device labeling.[8] FDA believes that these problems may be mitigated by providing specific information about the risks, limitations, and directions for use in the labeling for the surgical staplers and staples for internal use. The inclusion of such information may also be helpful in developing labeling with adequate information for use under 21 CFR 801.109. For example, FDA believes the inclusion of important device technical characteristics and performance parameters in the labeling would help inform end users on device limitations, thereby increasing the likelihood of appropriate device use and helping to mitigate against device malfunctions. For these reasons, FDA recommends that the labeling of surgical staplers and staples for internal use contain the warnings, contraindications, instructions, and usage information identified below.

III. Scope

The scope of this document is limited to surgical staplers and staples for internal use with product codes listed in the table below:[9]

Product Code	Regulation Number	Name
GAG	21 CFR 878.4800	Stapler, Surgical
GDW	21 CFR 878.4750	Staple, Implantable
NLL	21 CFR 878.4750	Staple, Implantable, Reprocessed
NAY	21 CFR 876.1500	System, Surgical, Computer Controlled Instrument[10]

IV. Labeling Recommendations[11]

[7] Brown SL, Woo EK. Surgical stapler-associated fatalities and adverse events reported to the Food and Drug Administration. J Am Coll Surg. 2004; 199(3):374-380.

[8] Swayze S, Rich S. Promoting Safe Use of Medical Devices. The Online Journal of Issues in Nursing. 2011; 17(1).

[9] FDA is initiating the reclassification of surgical staplers for internal use from class I to class II with special controls that include specific labeling requirements. See https://www.federalregister.gov/documents/2019/04/24/2019-08260/general-and-plastic-surgery-devices-reclassification-of-certain-surgical-staplers. If the reclassification is finalized, this table will be updated to reflect changes as necessary due to the final reclassification order.

[10] An analysis of adverse events for robotic surgical staplers for internal use (i.e., "robotic staplers"), which are class II devices and assigned the product code NAY, indicate that the same risks apply to robotic staplers as surgical staplers for internal use. Therefore, FDA believes that the labeling recommendations in this guidance should also apply to robotic staplers.

[11] If the reclassification is finalized, some of the labeling recommendations in this guidance may be required as part of the special controls for surgical staplers for internal use. Therefore, if the reclassification is finalized with special controls that include labeling requirements, FDA will update this guidance accordingly to specify the labeling information that is required as part of any special controls for surgical staplers for internal use. FDA also intends to

Under 21 CFR 801.109, manufacturers of prescription devices, such as surgical staplers and staples for internal use, are required to provide labeling that contains adequate information for use, including relevant hazards, contraindications, and other information under which practitioners can use the device safely and for its intended purposes.[12] Based on FDA's review of the adverse event reports discussed above, the labeling for these devices may not contain all important information about the risks, limitations, and directions for use of the device, and therefore, may not contain adequate information for use.[13] To help manufacturers develop compliant labeling and to mitigate the safety issues for surgical staplers and staples for internal use, FDA is providing the following recommendations. We intend for the recommendations below to supplement and enhance the information that is often already included in labeling for these device types.

A. Contraindications

FDA recommends that manufacturers of surgical staplers and staples for internal use prominently display contraindications regarding use of the devices on tissues for which the risk of stapling clearly outweighs any reasonably foreseeable benefit due to known complications. FDA believes such contraindications include the following but recognizes that manufacturers may have data that demonstrate otherwise:

- A statement noting that the device should not be used to staple tissues that are necrotic, friable, or have altered integrity, e.g., ischemic or edematous tissues
- A statement noting that the device should not be used to staple tissue outside the labeled limits for maximum and minimum tissue thickness

B. Warnings

FDA further recommends that manufacturers prominently display appropriate warnings regarding how to avoid known hazards associated with the use of surgical staplers and staples for internal use. FDA believes such warnings include the following but recognizes that manufacturers may have data that demonstrate otherwise:

utilize this guidance to provide recommendations to help manufacturers comply with any labeling special controls identified in the final reclassification order.

[12] See 21 CFR 801.109 for a complete list of the required information in device labeling. There are also other labeling requirements under the regulations and the Federal Food, Drug, and Cosmetic Act (FD&C Act), e.g., section 502(f)(2) of the FD&C Act.

[13] While the recommendations are intended to help manufacturers develop labeling that contains adequate information for use under 21 CFR 801.109, the specific information required in device labeling to comply with this provision and other provisions in the regulations and the FD&C Act depends on the facts and circumstances regarding the particular device (e.g., the design of the device).

- A statement to visually inspect for inclusion of unintended anatomic structures within the staple line
- A statement to ensure that no obstructions, such as clips, are incorporated into the instrument jaws when positioning the stapler on the application site, and that firing over an obstruction may result in incomplete cutting action and/or improperly formed staples
- A statement to avoid use of the stapler on large blood vessels, such as the aorta
- A statement to establish and maintain adequate proximal control of blood vessels prior to stapling
- A statement that clamping and unclamping of delicate structures such as venous structures and bile ducts may result in damage to tissue irrespective of stapler firing
- A statement that if a stapler malfunction occurs while applying staples across a blood vessel, then the user should clamp or ligate the vessel before releasing the stapler, while the stapler is still closed on the tissue
- A statement to ensure that the staples are compatible with the stapler

C. Directions For Use

FDA recommends that the product labeling for surgical staplers and staples for internal use contain clear instructions for use addressing the following items:

- The procedures for preventing and mitigating the effects of the stapler jamming, locking, misfiring, or otherwise malfunctioning
- The procedures for evaluating staple line formation and integrity
- The procedures for determining that a tissue is appropriate for stapling
- The time required for adequate pre-firing compression

D. Technical Characteristics and Performance Parameters

FDA recommends that the product labeling for surgical staplers and staples for internal use clearly identify key technical characteristics and performance parameters. This information should include the following, as appropriate:

- Types of tissues on which the stapler and staples may be used
- Maximum and minimum tissue thickness for each staple type based on their open and closed staple heights
- Angle(s) of articulation
- Total length for a linear staple line
- The stapler's staple line strength, e.g., burst strength

- The stapler's firing force range
- Percentage of properly formed staples at the maximum and minimum tissue thickness, and worst-case performance at articulation limits
- Maximum number of consecutive firings the stapler can perform
- Staple line reinforcing materials with which the stapler is compatible
- Models of staples (e.g., identified by manufacturer, trade name, and model number) with which the stapler has been demonstrated to be compatible. (This may not be an exhaustive list of compatible staples, but should include at least one compatible model. The list should not preclude the use of staples that have independently demonstrated compatibility with the identified stapler.)

In addition, users should be able to easily look at the package label for surgical staplers for internal use and obtain critical information necessary for proper device selection:

- For manual and powered linear cutting staplers for open/endoscopic surgery, and transverse approximator non-cutting open staplers, this information should include the following, as appropriate:
    - Cartridge color(s) and corresponding open and closed staple heights and intended tissues for approximation
    - Jaw length (i.e., cartridge size)
    - Shaft length
    - Tissue gap or distal jaw opening
    - Angle(s) of articulation
    - Force-to-fire
    - Total number of staple rows per cartridge
    - Staple pattern(s)
    - Maximum number of reloads
    - Pre-fire compression time
    - Number of incremental firings required to complete a staple line
    - Safety mechanism(s) for tissue thickness
- For manual and powered circular staplers for open/endoscopic surgery, this information should include the following, as appropriate:
    - Cartridge color(s) and corresponding open and closed staple heights and intended tissues for approximation
    - Cartridge size (i.e., diameter)
    - Total number of staple rows per cartridge
    - Staple pattern(s)
    - Pre-fire compression time

- Turns of handle knob counterclockwise required to remove the stapler after firing
- Safety mechanism(s) for tissue thickness

Additionally, the package label for surgical staples for internal use should clearly identify the following technical characteristics and performance parameters:

- Cartridge color(s) and corresponding open and closed staple height(s) and intended tissues for approximation
- Number of staple rows per cartridge
- Models of staplers (e.g., identified by manufacturer, trade name, model number) with which the staple has been demonstrated to be compatible

Please see Appendix A for examples of package labels containing recommended technical characteristics and performance parameters for surgical staplers and staples for internal use.

FDA believes that the technical characteristics and performance information, warnings, contraindications, and specific directions for use identified above will help mitigate the safety issues associated with surgical staplers and staples for internal use and help manufacturers develop labeling with adequate information for use under 21 CFR 801.109. FDA encourages manufacturers of existing surgical staplers and staples for internal use to make any appropriate changes to their product labeling in a timely manner. FDA recognizes that it may take some time to revise the product labeling but believes changes can be made within 180 days of the publication of this guidance in final form. Further, manufacturers should evaluate their labeling changes according to FDA's guidance, "Deciding When to Submit a 510(k) for a Change to an Existing Device."[14]

[14] https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM514771

Appendix A. Examples of Package Labels

This section provides example package labels for different types of surgical staplers and staples for internal use containing the technical characteristics and performance parameters recommended for the package label, as described in Section IV.D.

Table 1. Example package label for an endoscopic linear cutting stapler.

Endoscopic Linear Cutting Stapler	
Cartridge color(s) and corresponding open and closed staple heights and intended tissues for approximation	Blue (3.5 mm open; 1.5 closed) – bowel White (2.5 mm open; 1.0 closed) – vascular Green (4.1 mm open; 2.0 closed) – stomach
Jaw length (i.e., cartridge size)	45mm
Shaft length	38 cm
Tissue gap or distal jaw opening	12 mm
Angle(s) of articulation	90 degrees, 45 degrees, and 30 degrees in each set direction
Force-to-fire	24-30 ft·lbf
Total number of staple rows per cartridge	Blue – 4 or 6 White – 4 Green – 6
Staple pattern(s)	Staggered, non-staggered
Maximum number of reloads	15
Pre-fire compression time	20 – 30 seconds
Number of incremental firings required to complete a staple line	3
Safety mechanism(s) for tissue thickness	Lock-out, color firing zone

290 **Table 2.** Example package label for a circular stapler
291 for open/endoscopic surgery.
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Circular Stapler for Open/Endoscopic Surgery	
Cartridge color(s) and corresponding open and closed staple heights and intended tissues for approximation	Purple (3.5 mm open; 1.5 closed) – bowel
Cartridges size (i.e., diameter)	31 mm
Total number of staple rows per cartridge	2
Staple pattern(s)	Staggered, non-staggered
Pre-fire compression time	1 – 2 minutes
Turns of handle knob counterclockwise required to remove the stapler after firing	1½ turn
Safety mechanism(s) for tissue thickness	Lock-out, color firing zone

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295 **Table 3.** Example package label for surgical staples
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Surgical Staples	
Cartridge color(s) and corresponding open and closed staple heights and intended tissues for approximation	White (2.5 mm open; 1.0 mm closed) – vascular
Number of staple rows per cartridge	2
Models of staplers (identified by manufacturer, trade name, model number) with which the staple has been demonstrated to be compatible	ABC Endoscopic Linear Cutting Stapler (Model # XYZ)

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