

Structured Product Labeling Release 5 Implementation Guide for FDA Establishment Registration, Listing, and UDI Submission

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1 Introduction

This document provides technical conformance criteria for Structured Product Labeling (SPL) files based on the drug establishment registration and drug listing process at the United States Food and Drug Administration (FDA). Information on electronic submission may be found in guidance entitled *Providing Regulatory Submissions in Electronic Format – Establishment Registration and Drug Listing*. This document provides links to additional reference material. A link to the latest SPL schema and controlled terminology used in SPL and other technical documents and examples may be found on the FDA Data Standards Council web site at:

www.fda.gov/oc/datacouncil/spl.html. Outside the scope of this document is information

on the creation of SPL for a specific product and instructions on the use of extensible mark up language (XML).

The following changes have been made from SPL Release 4 Implementation Guide:

- Editorial changes only:
 - Layout modifications to show the XML examples more clearly.
 - Moved Route of Administration section 3.1.10 (but content unchanged)
- Clarifications
 - Describe different kinds of drug-device combinations.
- Changes
 - Minor corrections of previous material.
 - Changed the preliminary templates for device data elements
 - Replace the proposed way of conveying free text product descriptions to now use simply the <desc> element.
 - Author <time/> no longer required.
- Additions
 - Additional product characteristics
- Deletions
 - Device model, lot and serial number section has been removed for now as it is currently not implemented with specific use cases anywhere.

2 SPL Header

2.1 Stylesheet and schema location

Information: This information includes the location of the current stylesheet for the FDA view of the SPL and the location of the current schema.

Terminology: None

SPL location: This information is in the beginning of the SPL file.

XML details: The instructions at the start of SPL are the same for every SPL document (the encoding set is dependent on the character encoding used in the SPL) and are in the following form:

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet
  href="http://www.accessdata.fda.gov/spl/stylesheet/spl.xsl"
  type="text/xsl"?>
<document xmlns="urn:hl7-org:v3"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:hl7-org:v3
  http://www.accessdata.fda.gov/spl/schema/spl.xsd">
```

2.2 SPL identifying information

Information: This information provides basic information for identifying the SPL document.

Terminology: The SPL document types are from LOINC. This code provides information about the subject matter of the document e.g., prescription animal drug.

SPL location: This information is in the beginning of the SPL file.

XML details: The identifying information is in the following form:

```
<id root="GUID for the document"/>
<code code="code for the document type"
  codeSystem="2.16.840.1.113883.6.1"
  displayName="display name for document type"/>
<title>title for the document</title>
<effectiveTime value="yyyymmdd"/>
<setId root="GUID for the set of documents"/>
<versionNumber value="version number"/>
```

- The <id root> is a Globally Unique Identifier (GUID) and is unique for each version of the document. Letters used in a GUID are lower case.
- The <code> is the LOINC code which provides information on the document type.
- The <title> data element is used for the title for the document, if necessary. Images are not included in the title. Multiple lines may be used in the title with each line separated by the line break
 tag. (note: all titles can also be as follows: <title mediaType="text/x-hl7-title+xml">).
- The <effectiveTime> provides a date reference to the SPL version including the year, month and day as yyyymmdd.
- The <setId> is a GUID and is a unique identifier for the document that remains constant through all versions/revisions of the document.

- The <versionNumber> is an integer greater than zero that provides a sequence to the versions of the document.

2.3 *Labeler and manufacturing information*

Information: The labeler and manufacturing information includes details on the businesses responsible for the product. This includes the labeler and registrant and establishments involved in manufacturing..

Terminology: The National Drug Code (NDC) and National Health Related Items Code (NHRIC) Labeler Code comes from the FDA NDC System. The Data Universal Numbering System Number (DUNS Number) comes from Dun and Bradstreet DUNS Number system. Business operations come from the National Cancer Institute Thesaurus (NCIt). HL7 confidentiality code “B” is for business confidential information. ISO 3166-1 is used for the country codes. Postal service provides the two letter state codes for US addresses. For non US addresses, no specific terminologies are defined. Telephone number structure follows the Internet Engineering Steering Group RFC 2806.

Location in SPL: This information is in the SPL header

XML details: The labeler and manufacturing information is represented in the <author> child of the <document> element. The labeler is included under <representedOrganization> which is a child of <author>. The registrant is an <assignedOrganization> of the labeler. An establishment is an <assignedOrganization> related the registrant. A US agent and importer are <assignedOrganization> of an establishment. The text for displayName is case insensitive.

The relationship between the labeler, manufacturer and establishment is as follows:

```

<author>
  <assignedEntity>
    <representedOrganization> <!-- labeler -->
      <assignedEntity>
        <assignedOrganization> <!-- registrant -->
          <assignedEntity>
            <assignedOrganization> <!-- establishment -->
              <assignedEntity>
                <assignedOrganization><!-- US agent and importers -->

```

The following is representative coding for <author>:

```

<document>
  ...
  <author>
    <time/>
    <assignedEntity>
      <representedOrganization><!-- labeler -->
        <id extension="DUNS Number" root="1.3.6.1.4.1.519.1"/>
        <id extension="NDC Labeler Code" root="2.16.840.1.113883.6.69"/>
        <name>Labeler business name</name>

```

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```

<contactParty>
  <addr>
    <streetAddressLine>address</streetAddressLine>
    <city>city</city>
    <state>state</state>
    <postalCode>postal code</postalCode>
    <country>country</country>
  </addr>

  <telecom value="tel: contact telephone number"/>
  <telecom value="mailto: email address"/>

  <contactPerson>
    <name>contact name for labeler</name>
  </contactPerson>
</contactParty>

<assignedEntity>
  <confidentialityCode code="'B' if necessary"
    codeSystem="2.16.840.1.113883.5.25"/>
  <assignedOrganization> <!-- registrant -->
    <id extension="DUNS number" root="1.3.6.1.4.1.519.1"/>
    <name>Registrant business name</name>

    <contactParty>
      <addr>
        <streetAddressLine>address</streetAddressLine>
        <city>city</city>
        <state>state</state>
        <postalCode>postal code</postalCode>
        <country>country</country>
      </addr>

      <telecom value="tel: contact telephone number"/>
      <telecom value="mailto: email address"/>

      <contactPerson>
        <name>contact name for registrant</name>
      </contactPerson>
    </contactParty>

    <assignedEntity>
      <confidentialityCode code="'B' if necessary"
        codeSystem="2.16.840.1.113883.5.25"/>
      <assignedOrganization> <!-- establishment -->
        <id extension="DUNS number" root="1.3.6.1.4.1.519.1"/>
        <id extension="FDA establishment identifier"
          root="2.16.840.1.113883.4.82"/>
        <name>Establishment name</name>
        <addr>
          <streetAddressLine>address</streetAddressLine>
          <city>city</city>
          <state>state</state>
          <postalCode>postal code</postalCode>
          <country>country</country>
        </addr>

        <contactParty>
          <addr>
            <streetAddressLine>address</streetAddressLine>
            <city>city</city>
            <state>state</state>
            <postalCode>postal code</postalCode>
            <country>country</country>
          </addr>

```

```

<telecom value="tel: contact telephone number"/>
<telecom value="mailto: email address"/>

<contactPerson>
  <name>contact name for labeler</name>
</contactPerson>
</contactParty>

<assignedEntity>
  <assignedOrganization>
    <id extension="DUNS Number" root="1.3.6.1.4.1.519.1"/>
    <name>US agent business name</name>
    <telecom value="tel: telephone number"/>
    <telecom value="mailto: email address"/>
  </assignedOrganization>

  <performance>
    <actDefinition>
      <code code="US agent business operation code"
        codeSystem="2.16.840.1.113883.3.26.1.1"
        displayName="display name"/>
    </actDefinition>
  </performance>
</assignedEntity>

<assignedEntity>
  <assignedOrganization>
    <id extension="DUNS number" root="1.3.6.1.4.1.519.1"/>
    <name>importer business name</name>
    <telecom value="tel: telephone number"/>
    <telecom value="mailto: email address"/>
  </assignedOrganization>

  <performance>
    <actDefinition>
      <code code="Importation business operation code"
        codeSystem="2.16.840.1.113883.3.26.1.1"
        displayName="display name"/>
    </actDefinition>
  </performance>
</assignedEntity>
</assignedOrganization>

<performance>
  <actDefinition>
    <code code="establishment business operation code"
      codeSystem="2.16.840.1.113883.3.26.1.1"
      displayName="display name"/>
  </actDefinition>
</performance>
</assignedEntity>
</assignedOrganization>
</assignedEntity>
</representedOrganization>
</assignedEntity>
</author>
</document>

```

3 SPL Body

Information: The SPL body includes the product data elements and the content of labeling (e.g., Full Prescribing Information (FPI) and Highlights text or Drug Facts or equivalent and other information on a container or carton label).

Terminology: There is no controlled terminology for this information.

XML details: In addition to SPL header information, the <document> element contains a required <component> which contains the <structuredBody> element. The <component><structuredBody> tags enclose the body of the SPL document; the body consists of the data elements and the human readable content of labeling (text, tables and figures).

3.1 Product data elements

Information: The listing data elements for products are provided.

Terminology: FDA terminology is used for the proprietary, non proprietary and ingredient name. FDA NDC System is used for identifiers for the NDC Labeler Code (4 or 5 digit code (e.g., 0001 or 11111)), NDC Product Code (8 or 9 characters beginning with the NDC Labeler Code separated by a hyphen from the product segment of the code (e.g., 0001-0001 or 11111-001 or 11111-0001)) and NDC Package Code (10 characters beginning with the NDC Product Code separated by a hyphen from the package segment of the code (e.g., 0001-0001-01, 11111-001-01 or 11111-0001-1)). It is also used for identifiers for the NHRIC Labeler Code (4 or 5 digit code), NHRIC Product Code (8, 9 or 10 digits beginning with the NHRIC Labeler Code separated by a hyphen from the product segment of the code and NHRIC Package Code (10 digits beginning with the NDC Product Code separated by a hyphen from the package segment of the code). ISBT-128 site and product codes are for licensed minimally manipulated cell products. GS1 GTIN and HIBCC codes are used for device item codes. FDA Substance Registration System (SRS) is used for the ingredient and active moiety Unique Ingredient Identifier (UNII). The FDA submission tracking system is used for application numbers. The Code of Federal Regulations is used for monograph citations. The National Cancer Institute Thesaurus (NCIt) is used for dosage form, product characteristics, DEA schedule, unit of presentation, route of administration and equivalent codes. The Unified Codes for Units of Measure (UCUM) is used for the unit of measure. HL7 confidentiality code “B” is for business confidential information. The Global Medical Device Nomenclature (GMDN) is for device nomenclature codes.

SPL location: The product data elements are in the first section of the SPL Body.

XML details: The product data elements includes the product codes, proprietary and non proprietary name, dosage form, ingredient and active moiety name, ingredient identifier, ingredient strength, package quantity, type and code, marketing category, marketing status, dosage form appearance, DEA schedule, and route of administration.

The beginning of the product data elements section is as follows:

```

<document>
  ...
  <component>
    <structuredBody>
      <component>
        <section>
          <id root="GUID" />
          <code code="48780-1" codeSystem="2.16.840.1.113883.6.1"
            displayName="SPL listing data elements section" />
          <effectiveTime value="yyyymmdd" />
        <subject>
          <manufacturedProduct>
            ...

```

3.1.1 Product

The product consists of a product code, proprietary and non proprietary name, and dosage form. These are children of <manufacturedProduct>. The proprietary name is the name as it appears on the label divided between <name> and <suffix>. The <name> is the initial portion of the proprietary name describing the ingredients without any other descriptors including trademarks and dosage forms. If necessary, <suffix> is used for descriptors such as “extended release”. When using the <suffix>, a space after the proprietary name is added as necessary. If there is no proprietary name, the non proprietary name is used without any descriptors. The dosage form is described in <formCode>. The <genericMedicine><name> is the non proprietary name of the product. Device type codes and descriptions use <asSpecializedKind>.

The following is for a drug product:

```

<subject>
  <manufacturedProduct>
    <manufacturedProduct>
      <code code="NDC Product Code" codeSystem="2.16.840.1.113883.6.69" />
      <name>proprietary name <suffix>suffix to name</suffix></name>
      <formCode code="dose form code"
        codeSystem="2.16.840.1.113883.3.26.1.1"
        displayName="display name" />
      <asEntityWithGeneric>
        <genericMedicine>
          <name>non proprietary name</name>
        </genericMedicine>
      </asEntityWithGeneric>

```

The following is for a device:

```

<subject>
  <manufacturedProduct>
    <manufacturedProduct>
      <code code="Device Item Code" codeSystem="2.16.840.1.113883.6.69" />
      <name>proprietary name <suffix>suffix to name</suffix></name>
      <desc>Brief description of product (< 512 characters)</name>
      <asSpecializedKind>
        <generalizedMaterialKind>
          <code code="GMDN code" codeSystem="2.16.840.1.113883.6.276"
            displayName="GMDN display name" />
        </generalizedMaterialKind>
      </asSpecializedKind>

```


A brief description is added in the <desc> element that states succinctly the kind of device. This text should be brief to be able to list it in short summary listings. While the text can be up to 512 characters in length, it should normally be much shorter so that it will be useful for listing in tables. A device also has a device-nomenclature code in the <asSpecializedKind> element. This code comes from the GMDN terminology.

Drug or Device? Notwithstanding any regulations or guidances, for the purpose of the SPL data structure, a product is a drug if it has a <asEntityWithGeneric> data element, and it is a device if it has a GMDN code in the <asSpecializedKind> element. A kit (see below) may be conceived of as a drug-kit (having <asEntityWithGeneric>) or a device-kit (having <asSpecializedKind> with a GMDN code. For a device, formCode is not currently used.

Item Code: In general, item codes in the ISO 15459 system are composites of a company prefix (or labeler segment) followed by the item reference that is assigned by the owner of the company prefix to create a unique item code. As long as the item code is unique, the digits (and letters) in it need not convey any other information.

Additional Identifiers for this Product: A multitude of other identifiers may be assigned to the device by various parties, manufacturers, distributors, wholesalers, regulators. These identifiers are of a varying quality in terms of control for uniqueness and meaning. They may be unique item codes from other ISO 15459 item code systems, or they may be less well defined codes such as “model number” or “catalog number” etc. While those “model numbers” or “catalog numbers” are often not safe for referencing, such identifiers are customer facing and may encode minor product variants, which would be recognized by customers and hence listing such identifier cross references can aid in finding the correct item code.

```

<manufacturedProduct>
  <manufacturedProduct>
    . . .
  <asIdentifiedEntity classCode="IDENT">
    <id extension="other identifier" root="other identifier root"
    <code code="other identifier type code"
      codeSystem="2.16.840.1.113883.3.26.1.1"
      displayName="model number"/>

```

HL7 requires any identifier to be made globally unique, therefore submitters must acquire an OID of their own through any of several sources (e.g. HL7 provides a free OID assignment service). Submitters must not allow conflicting assignments of model numbers among their own products. Submitters can still create unique identifiers from these model numbers by giving different root OIDs for each kind of identifiers that may be in conflict. Once a company has acquired a root OID this root OID can be freely sub-divided. For example, ACME Fine Devices Inc. may have acquired the OID 2.16.840.1.113883.3.98765 from the HL7 registry. ACME then decided to use a sub-branch .2 under their OID to manage model numbers for the models from models release before 2007 and sub-branch .5 for models released after 2007. There is no specific rule that must be obeyed when sub-dividing OIDs as long as it results in the concatenation of model number code and codeSystem OID to be a unique identifier.

Different types of such identifications may be assigned different codes from the NCI Thesaurus for Model Number, Catalog Number and possibly other “types” of numbers:

Table 1: Miscellaneous Identified Types

Identifier Type	NCI Thesaurus Code
Model Number	C??????
Catalog Number	C??????
Reference Number	C??????

Equivalence to other Products: The following is for referencing information already submitted for a source drug:

```
<subject>
  <manufacturedProduct>
    <manufacturedProduct>
      <code code="NDC Product Code" codeSystem="2.16.840.1.113883.6.69"/>
      <name>proprietary name <suffix>suffix to name</suffix></name>
      <formCode .../>
      <asEntityWithGeneric .../>

      <asEquivalentEntity classCode="EQUIV">
        <code code="C64637" codeSystem="2.16.840.1.113883.3.26.1.1"
          <definingMaterialKind>
            <code code="source NDC Product Code"
              codeSystem="2.16.840.1.113883.6.69"/>
          </definingMaterialKind>
        </asEquivalentEntity>
```

This is a special case of referencing other products for various purposes. Another purpose is for products that are updated with improvement, where it may be useful to indicate a succession to a previous version of the product identified by the item code of the predecessor product. This can be done by using the equivalence relationship with <asEquivalentEntity> with a different Role code as in Table 2:

```
<manufacturedProduct>
  <manufacturedProduct>
    ...
  <asEquivalentEntity classCode="EQUIV">
    <code code="C?????" codeSystem="2.16.840.1.113883.3.26.1.1"/>
    <definingMaterialKind>
      <code code="81234567890008" codeSystem="1.3.160"/>
```

The following equivalence codes are defined:

Table 2: Equivalence Codes

Equivalence	Code
Same	C64637
Predecessor Product	C?????

3.1.2 Kits, Parts, Components and Accessories

Kits and Parts: When products have more than one part, each part is described under <partProduct>. The total amount of the part in the product is included as follows:

```

<part>
  <quantity>
    <numerator value="total amount of part in product" unit="UCUM code"/>
    <denominator value="1"/>
  </quantity>
  <partProduct>
    same as above for drug or device.

```

Currently, when a drug product has parts, it is considered a Kit indicated by the formCode for KIT:

```

<manufacturedProduct>
  <manufacturedProduct>
    <code code="11234560012349" codeSystem="1.3.160"/>
    <name>Easy-Go PreciFuse PorterPump Kit</name>
    <formCode code=" C47916" displayName="KIT"
      codeSystem="2.16.840.1.113883.3.26.1.1"/>

    <part> ...

```

Device products may also be kits (in this case a device with GMDN code but also with formCode specifying KIT. However, devices themselves may also be specified with parts, such as distinguishing component options or field replaceable parts, in this case the top-level device need not have a formCode for KIT:

```

<manufacturedProduct>
  <manufacturedProduct>
    <code code="item code of device" codeSystem="code system OID"/>
    <name>name of device</name>
    <descr>brief description of device</descr>

    <asSpecializedKind ... GMDN code structure for device.../>

    <part>
      <quantity>
        <numerator value="1"/>
        <denominator value="1"/>
      </quantity>
      <partProduct>
        <code code="item code of part" codeSystem="code system OID"/>
        <name>name of part</name>
        <descr>brief description of device part</descr>

```

Drug Kit with a Device Part: This sort of kit has been known from SPL R4 as well, examples being drugs sold as a kit with an applicator device.

```

<manufacturedProduct>
  <manufacturedProduct>
    <code code="NDC code of kit" codeSystem="2.16.840.1.113883.6.69"/>
    <name>name of kit</name>
    <formCode code="C47916" displayName="KIT"
      codeSystem="2.16.840.1.113883.3.26.1.1"/>
    <asEntityWithGeneric .../>

    <part>
      <quantity>
        <numerator value="amount of this part's content in one kit"
          unit="unit for amount"/>
        <denominator value="1"/>
      </quantity>

```

```

<partProduct>
  <code code="NDC code of drug part"
    codeSystem="2.16.840.1.113883.6.69"/>
  <name>name of drug part</name>
  <formCode code="form code of drug part"
    displayName="form name of drug part"
    codeSystem="2.16.840.1.113883.3.26.1.1"/>

  <ingredient ... />

  <asContent>
    <quantity>
      <numerator value="amount of this part in its package"
        unit="unit of amount"/>
      <denominator value="1"/>
    </quantity>

    <containerPackagedProduct>
      <code code="NDC code of part's package"
        codeSystem="2.16.840.1.113883.6.69"/>
      <formCode code="package type"
        displayName="package type name"
        codeSystem="2.16.840.1.113883.3.26.1.1"/>
    </containerPackagedProduct>
  </asContent>
</partProduct>
</part>

<part>
  <quantity>
    <numerator value="amount of this device part in one kit"/>
    <denominator value="1"/>
  </quantity>

  <partProduct>
    <code code="item code of this device part"
      codeSystem="item code system OID"/>
    <name>name of device part</name>
    <descr>description of device part</descr>

    <asSpecializedKind>
      <generalizedMaterialKind>
        <code code="GMDN code of device part"
          codeSystem="2.16.840.1.113883.6.276"
          displayName="GMDN display name of device part"/>
      </generalizedMaterialKind>
    </asSpecializedKind>
  </partProduct>
</part>

```

Device Kit with a Drug Part:

```

<manufacturedProduct>
  <manufacturedProduct>
    <code code="item code of device kit"
      codeSystem="item code system OID"/>
    <name>name of kit</name>
    <descr>brief description of kit</descr>
    <formCode code="C47916" displayName="KIT"
      codeSystem="2.16.840.1.113883.3.26.1.1"/>
    <asSpecializedKind>
      <generalizedMaterialKind>
        <code code="GMDN code of kit"
          displayName="GMDN display name of kit"
          codeSystem="2.16.840.1.113883.6.276"/>
      </generalizedMaterialKind>
    </asSpecializedKind>

    <part>
      same as device part above
    </part>

    <part>
      same as drug part above
    </part>

```

Device with an embedded drug: For example, a drug eluting stent with an embedded active ingredient. Notice that such products do not involve kits and parts:

```

<manufacturedProduct>
  <manufacturedProduct>
    <code code="device item code"
      codeSystem="device item code system OID"/>
    <name>device name</name>
    <descr>brief description</descr>

    <asSpecializedKind>
      <generalizedMaterialKind>
        <code code="GMDN code of device"
          displayName="GMDN display name of device"
          codeSystem="2.16.840.1.113883.6.276"/>
      </generalizedMaterialKind>
    </asSpecializedKind>

    <ingredient classCode="ACTIB">
      <quantity .../>
      <ingredientSubstance>
        <code code="UNII code of active ingredient"
          codeSystem="2.16.840.1.113883.4.9"/>
        <name>paclitaxel</name>
      </ingredientSubstance>
    </ingredient>

```

Drug in a delivery device: For example, drug in pre-filled syringe. Note that the syringe filled with the drug is a different product than the empty syringe. Hence it would not be correct to put the item code for the empty syringe on the one filled with the drug. In fact, since the pre-filled syringe already has (or should have) an NDC code, there is no need for another item code for it. However, one may want to refer to the item code for the empty syringe as a generalization of the filled syringe:

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```
<manufacturedProduct>
  <manufacturedProduct>
    <code code="NDC code drug"
      codeSystem="2.16.840.1.113883.6.69"/>
    <name>name of drug</name>
    <formCode code="form code of drug"
      displayName="form display name of drug"
      codeSystem="2.16.840.1.113883.3.26.1.1"/>
    <ingredient classCode="ACTIB">
      active ingredient
    </ingredient>
    <asContent>
      <quantity>
        <numerator value="amount of drug in prefilled device"
          unit="unit of amount"/>
        <denominator value="1"/>
      </quantity>
      <containerPackagedProduct>
        <code code="NDC code for prefilled device"
          codeSystem="2.16.840.1.113883.6.69"/>
        <formCode code="form code of prefilled device"
          displayName="form display name of prefilled device"
          codeSystem="2.16.840.1.113883.3.26.1.1"/>
        <asSpecializedKind>
          <generalizedMaterialKind>
            <code code="item code of empty device"
              codeSystem="item code system of empty device"/>
            <desc>brief description of empty device</syringe>
          <asSpecializedKind>
            <generalizedMaterialKind>
              <code code="GMDN code of device"
                displayName="GMDN display name of device"
                codeSystem="2.16.840.1.113883.6.276"/>
            </generalizedMaterialKind>
          </asSpecializedKind>
        </asSpecializedKind>
      </containerPackagedProduct>
    </asContent>
  </manufacturedProduct>
</manufacturedProduct>
```

Products sold separately but meant to be used together: when device products are used together but packaged separately, the data element <asPartOfAssembly> is used to identify the other product. The products could be drugs or devices.

```
<manufacturedProduct>
  <manufacturedProduct>
    <code code="item code of device" codeSystem="code system OID"/>
    <name>name of device</name>
    <descr>brief description of device</descr>
    <asSpecializedKind ... GMDN code structure for device.../>
    <asPartOfAssembly>
      <quantity>
        <numerator value="1"/>
        <denominator value="1"/>
      </quantity>
    </asPartOfAssembly>
  </manufacturedProduct>
</manufacturedProduct>
```

```

<wholeProduct><!-- this is the assembly, but has no identifier -->
  <part>
    <quantity>
      <numerator value="1"/>
      <denominator value="1"/>
    </quantity>
    <partProduct>
      <code code="item code of accessory component"
        codeSystem="code system OID"/>
      <name>name of accessory component</name>
      <descr>brief description of accessory component</descr>
      <asSpecializedKind ... GMDN code for device.../>

```

3.1.3 Active ingredient

The active ingredient includes the active ingredient class code, ingredient name, identifier and strength, the active moiety name(s) and identifier and a reference drug name and identifier. The element <ingredient> is a child of <manufacturedProduct>. The class code for active ingredient is dependent on the basis of the strength. If the basis of strength is the active ingredient, the class code is “ACTIB”. If the basis of strength is the active moiety, the class code is “ACTIM”. If the basis of strength is a reference drug, the class code is “ACTIR”. The strength is represented as a numerator and denominator. The UCUM code is used for the unit of measure. The UCUM code for a unit that is an “each” is “1” Examples of “each” is in the table below.

```

<ingredient classCode="class code including basis of strength">
  <quantity>
    <numerator value="value" unit="UCUM code"/>
    <denominator value="value" unit=" UCUM code"/>
  </quantity>
  <ingredientSubstance>
    <code code="UNII " codeSystem="2.16.840.1.113883.4.9"/>
    <name>active ingredient name</name>
    <activeMoiety>
      <activeMoiety>
        <code code="UNII" codeSystem="2.16.840.1.113883.4.9"/>
        <name>active moiety name</name>
      </activeMoiety>
    </activeMoiety>
    <asEquivalentSubstance>
      <definingSubstance>
        <code code="UNII" codeSystem="2.16.840.1.113883.4.9"/>
        <name>reference substance name</name>
      </definingSubstance>
    </asEquivalentSubstance>
  </ingredientSubstance>
</ingredient>

```

In most cases, the strength used is that for a single dose following the conventions in the table 1. In the table, an example of “weight” is milligrams, an example of “volume” is milliliter, an example of “time” is hour, and an example of “each” is tablet)

Table 3: Conventions for expressing strength

Product	Numerator unit	Denominator unit
Oral solid	Weight	Each

Oral liquid	Weight	Volume
Oral powder for reconstitution with a known volume	Weight	Volume
Oral powder for reconstitution with a variable volume	Weight	Each
Suppository	Weight	Each
Injection liquid	Weight	Volume
Injection powder for reconstitution with a known volume	Weight	Volume
Injection powder for reconstitution with a variable volume	Weight	Each
Inhaler powder	Weight	Each
Inhaler liquid	Volume	Each
Inhaler blister	Weight	Each
Topical cream or ointment	Weight	Weight
Topical gel or lotion	Weight	Volume
Transdermal patch	Weight	Time
Bulk liquid	Weight	Volume
Bulk solid	Weight	Weight

3.1.4 Inactive ingredient

The inactive ingredient includes the inactive ingredient class code, ingredient name, identifier, and strength. The element <ingredient> is a child of <manufacturedProduct>. The class code for inactive ingredient is “IACT”. The strength, if needed, is represented as a numerator and denominator and is described using UCUM units of measure. If the inactive ingredient is confidential, the element <ingredient> includes <confidentialityCode code="B" codeSystem="2.16.840.1.113883.5.25"/>.

```
<ingredient classCode=' " IACT" >
  <confidentialityCode code="B" codeSystem="2.16.840.1.113883.5.25" />
  <quantity>
    <numerator value="value" unit="UCUM code" />
    <denominator value="value" unit="UCUM code" />
  </quantity>
  <ingredientSubstance>
    <code code="UNII" codeSystem="2.16.840.1.113883.4.9" />
    <name>inactive ingredient name</name>
  </ingredientSubstance>
</ingredient>
```

3.1.5 Other ingredient

Ingredients included in devices or foods that are not identified as active ingredients include the ingredient class code, ingredient name, identifier, and strength. The element <ingredient> is a child of <manufacturedProduct>. The class code for ingredient is “INGR”. The strength, if needed, is represented as a numerator and denominator and is described using UCUM units of measure.

```
<ingredient classCode="INGR">
  <quantity>
    <numerator value="value" unit="UCUM code" />
    <denominator value="value" unit="UCUM code" />
  </quantity>
  <ingredientSubstance>
    <code code="UNII" codeSystem="2.16.840.1.113883.4.9" />
    <name>ingredient name</name>
  </ingredientSubstance>
</ingredient>
```


3.1.6 Packaging

The packaging includes the quantity of product in the package and the package type and Package Item Code (such as NDC Package Code or other Item Code for the package). The packaging is described using a combination of <quantity> and <containerPackagedProduct> which are children of <manufacturedProduct><asContent>. If the UCUM code is “1”, then it is translated using FDA units of presentation from the NCI. Examples of Unit of presentation are the “each” is in table 1.

For example,

```
<asContent>
  <quantity>
    <numerator value="value" unit=" UCUM code">
      <translation code="value" codeSystem="2.16.840.1.113883.3.26.1.1"
        displayName="display name"/>
    </numerator>
    <denominator value="1"/>
  </quantity>
  <containerPackagedProduct>
    <code code="Package Item Code" codeSystem="2.16.840.1.113883.6.69"/>
    <formCode code="value" codeSystem="2.16.840.1.113883.3.26.1.1"
      displayName="display name"/>
  </containerPackagedProduct>
</asContent>
```

The data element <asContent> can be nested to represent packaging from the unit of use package to the outside retail packages, if any. When package includes different drug products, the <part> and <partManufacturedProduct> is used in addition to <quantity> and <containerPackagedProduct>.

3.1.7 Marketing category

The marketing category provides information on the product related to marketing regulations. For example, a drug product marketed under an approved application use the <id> to provide the application number <id extension> and document tracking system under <id root> and <code> for the marketing category. In another example, drugs marketed under a monograph provide the regulatory citation for the monograph <id extension> and the Code of Federal Regulations under <id root>. If there is no application number or monograph citation, the id element is omitted.

```

<subjectOf>
  <approval>
    <id extension="application or monograph number"
      root="FDA document tracking system OID or CFR OID"/>
    <code code="code for marketing category"
      codeSystem="2.16.840.1.113883.3.26.1.1"
      displayName="display name"/>
    <author>
      <territorialAuthority>
        <territory>
          <code code="USA" codeSystem="2.16.840.1.113883.5.28"/>
        </territory>
      </territorialAuthority>
    </author>
  </approval>
</subjectOf>

```

3.1.8 Marketing status

The marketing status provides information on when the product is on or off the market. The `<code>` is marketing. The status of the product is described in the `<statusCode>` as either “active” for being on the market or “completed” when marketing is done the drug is no longer going to be available on the market. The date when the product is on or off the market is included in the `<effectiveTime>`. The date when the product is on the market is characterized by the `<low value>`.

```

<subjectOf>
  <marketingAct>
    <code code="C53292" codeSystem="2.16.840.1.112883.3.26.1.1"/>
    <statusCode code="active"/>
    <effectiveTime>
      <low value="date when on the market"/>
    </effectiveTime>
  </marketingAct>
</subjectOf>

```

The date off the market such as the expiration date of the last lot released to the market is characterized by the `<high value>`.

```

<subjectOf>
  <marketingAct>
    <code code="C53292" codeSystem="2.16.840.1.112883.3.26.1.1"/>
    <statusCode code="completed"/>
    <effectiveTime>
      <low value="date when the product is on the market"/>
      <high value="date when the product is going to be off the market"/>
    </effectiveTime>
  </marketingAct>
</subjectOf>

```

3.1.9 DEA schedule

The DEA schedule, when applicable, is described under `<policy>` which is a child of `<subjectOf>` which is a child of `<manufacturedProduct>` as illustrated in the following example of a drug that is schedule II.

```

<subjectOf>
  <policy classCode="DEADrugSchedule">
    <code code="DEA code" codeSystem="2.16.840.1.112883.3.26.1.1"
      displayName="display name"/>
  </policy>
</subjectOf>

```

3.1.10 Route of administration

The routes of administration are described under <consumedIn> which is a child of <manufacturedProduct> as illustrated in the following example.

```

<consumedIn>
  <substanceAdministration>
    <routeCode code="code for route"
      codeSystem="2.16.840.1.113883.3.26.1.1"
      displayName="display name for route"/>
  </substanceAdministration>
</consumedIn>

```

3.1.11 Solid Oral Drug Product characteristics

Product characteristics include dosage form appearance. Dosage form characteristics are used to describe the appearance of the drug product and include the color, score, shape, size, imprint code and image. These are all under <subjectOf> which is a child of <manufacturedProduct>. Product characteristics also include product flavor and what the product contains.

```

<subjectOf>
  <characteristic classCode="OBS">
    <code code="SPLCOLOR" codeSystem="2.16.840.1.113883.1.11.19255"/>
    <value code="code for color" codeSystem="2.16.840.1.113883.3.26.1.1"
      displayName="display name for color" xsi:type="CE">
      <originalText>optional original color description text</originalText>
    </value>
  </characteristic>
</subjectOf>

<subjectOf>
  <characteristic classCode="OBS">
    <code code="SPLSCORE" codeSystem="2.16.840.1.113883.1.11.19255"/>
    <value value="value for score" xsi:type="INT"/>
  </characteristic>
</subjectOf>

<subjectOf>
  <characteristic classCode="OBS">
    <code code="SPLSHAPE" codeSystem="2.16.840.1.113883.1.11.19255"/>
    <value code="code for shape" codeSystem="2.16.840.1.113883.3.26.1.1"
      displayName="display name for shape" xsi:type="CE">
      <originalText>optional original shape description text</originalText>
    </value>
  </characteristic>
</subjectOf>

```

```

<subjectOf>
  <characteristic classCode="OBS">
    <code code="SPLSIZE" codeSystem="2.16.840.1.113883.1.11.19255"/>
    <value unit="mm" value="value for size in mm" xsi:type="PQ"/>
  </characteristic>
</subjectOf>

<subjectOf>
  <characteristic classCode="OBS">
    <code code="SPLIMPRINT" codeSystem="2.16.840.1.113883.1.11.19255"/>
    <value xsi:type="ST">imprint separated by semicolon</value>
  </characteristic>
</subjectOf>

<subjectOf>
  <characteristic classCode="OBS">
    <code code="SPLFLAVOR" codeSystem="2.16.840.1.113883.1.11.19255"/>
    <value code="code for flavor" codeSystem="2.16.840.1.113883.3.26.1.1"
      displayName="display name for flavor" xsi:type="CE">
      <originalText>optional flavor description text</originalText>
    </value>
  </characteristic>
</subjectOf>

<subjectOf>
  <characteristic classCode="OBS">
    <code code="SPLCONTAINS" codeSystem="2.16.840.1.113883.1.11.19255"/>
    <value code="code for contains" codeSystem="2.16.840.1.113883.3.26.1.1"
      displayName="display name for contains" xsi:type="CE">
      <originalText>optional original description text</originalText>
    </value>
  </characteristic>
</subjectOf>

<subjectOf>
  <characteristic classCode="OBS">
    <code code="SPLIMAGE" codeSystem="2.16.840.1.113883.1.11.19255"/>
    <value xsi:type="ED" mediaType="image/jpeg">
      <reference value="file name.jpg"/>
    </value>
  </characteristic>
</subjectOf>

```

3.1.12 Device Characteristics

Many more characteristics exist for devices and are listed here in tabular form. The characteristic structure allows specifying any properties of the product in a code-value pair, the code saying which property is being specified, the value saying what the property is for the given product. The characteristics structure connects to the product Role through the subjectOf element.

```

<manufacturedProduct>
  <manufacturedProduct>
    ...
  </manufacturedProduct>

  <subjectOf>
    <characteristic>
      <code code="characteristic code"
        codeSystem="characteristic code system"/>
      <value xsi:type="characteristic value type" ...>

```

Characteristics listed Characteristic of type Boolean (true/false value)

```

<subjectOf>
  <characteristic>
    <code code="characteristic code"
      codeSystem="characteristic code system"/>
    <value xsi:type="BL" value="true or false"/>
  
```

Table 4 use one of a number of different data types. Each data type uses slightly different XML elements and attributes as shown in the templates below:

Characteristic of type physical quantity (PQ):

```

<subjectOf>
  <characteristic>
    <code code="characteristic code"
      codeSystem="characteristic code system"/>
    <value xsi:type="PQ" value="quantity value" unit="quantity unit">
  
```

Characteristic of type number (REAL):

```

<subjectOf>
  <characteristic>
    <code code="characteristic code"
      codeSystem="characteristic code system"/>
    <value xsi:type="REAL" value="quantity value"/>
  
```

Characteristic of type integer number (INT):

```

<subjectOf>
  <characteristic>
    <code code="characteristic code"
      codeSystem="characteristic code system"/>
    <value xsi:type="INT" value="quantity value"/>
  
```

Characteristic of coded type (CV):

```

<subjectOf>
  <characteristic>
    <code code="characteristic code"
      codeSystem="characteristic code system"/>
    <value xsi:type="CV" code="value code"
      codeSystem="value code system OID"
      displayName="value code display name">
  
```

Characteristic of type character string (ST):

```

<subjectOf>
  <characteristic>
    <code code="characteristic code"
      codeSystem="characteristic code system"/>
    <value xsi:type="ST">value string</value>
  
```

Characteristic of type interval of physical quantity (IVL<PQ>):

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```

<subjectOf>
  <characteristic>
    <code code="characteristic code"
      codeSystem="characteristic code system"/>
    <value xsi:type="IVL_PQ">
      <low value="quantity value low boundary" unit="quantity unit">
      <high value="quantity value high boundary" unit="quantity unit">

```

Characteristic of type Boolean (true/false value)

```

<subjectOf>
  <characteristic>
    <code code="characteristic code"
      codeSystem="characteristic code system"/>
    <value xsi:type="BL" value="true or false"/>

```

Table 4: Characteristic codes and code systems.

Name	Code System OID / Code	Data Type	Description
SPL Characteristics	2.16.840.1.113883.1.11.19255		Used early on with Existing SPL for drugs characteristics codes that are possibly applicable for devices:
	SPLSIZE	PQ	greatest (?) diameter in millimeter
	SPLCOLOR	CV	color code from NCI Thesaurus
	SPLCONTAINS	CV	A code specifying the presence (even in traces) of a substance which may be a concern to some users.
	SPLIMAGE	ED	Photographic image of the product for the purpose of identification, taken under standardized conditions.
LOINC	2.16.840.1.113883.6.1		Used for metrologically well defined properties.
NCI Thesaurus	2.16.840.1.113883.3.26.1.1		Used rarely (if at all) for characteristic codes.
- greatest length at rest	- SPLSIZE 2.16.840.1.113883.1.11.19255	PQ	millimeter – this code is used for drugs and implicitly understood as the greatest diameter.
- text	- SPLSIZETXT	ST	brief text specification (e.g., “small”, “medium”, “No 2”.)
LOINC	2.16.840.1.113883.6.1		Quantitative or defined ordinal length measurements
- Length, greatest diameter	- (TBD)	PQ	Length of longitudinal objects parallel to its longitudinal extension. For ellipsoid objects, this is also the greatest diameter.
- Height	- (TBD)	PQ	Length perpendicular to the surface on which the object rests.
- Width	- (TBD)	PQ	Length parallel to the surface on which the object rests, and parallel to the front facing the user.
- Depth	- (TBD)	PQ	Length parallel to the surface on which the object rests, and perpendicular to the front facing the user.
- Second greatest diameter	- (TBD)	PQ	For objects that do not have a fixed orientation in space, the length perpendicular to the greatest diameter and parallel to the second greatest extent.
- Third greatest diameter	- (TBD)	PQ	For objects that do not have a fixed orientation in space, the remaining length perpendicular to both the greatest and second greatest diameter.
- Circumference	- (TBD)	PQ	Outer circumference of a longitudinal object, for ellipsoid objects, this is the

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- Needle gauges	- (TBD)	PQ	smallest circumference of a hole through which the object could be pushed. Ordinal or quantitative measure of needle size, lumen, diameter. Each gauge measure should be well defined such as the French catheter gauge. Needle gauge units can be added to UCUM if quantitative definitions can be found.
- French catheter gauge	- (TBD)	PQ	The French or Charrière measure of catheters is equal to the circumference (defined above) in millimeter, the UCUM unit [Ch] is defined in terms of the outer diameter.
- Lumen diameter	- (TBD)	PQ	Average inner diameter of a longitudinal round hollow object
- Nominal inner volume content	- (TBD)	PQ	For hollow container object the nominal fill volume not including overage volumes and residual unused volume. Further specific measures such as “to contain” vs. “to deliver” may be specified.
- Total inner volume	- (TBD)	PQ	For hollow container object, the total inner volume including normally used and residual unused volume.
- Total volume	- (TBD)	PQ	For irregular shaped objects the volume, e.g., may be measured by water-volumetry.
- Tailor's measurements	- (various TBD)	PQ	Tailor's measurements such as, inseam, shoulder width, waist, etc. are well-known and can be defined (about a dozen different such measurements exist.)
- Clothing sizes	- (various TBD)	CV, REAL	Various fairly well defined ordinal clothing size scales exist in the industry. Often they are country specific (US, UK, Germany). The measures are different for different kinds of clothing (shoes, pants, dress). Often stratified into gender and age groups (Men, Women, Children's, Girls, Boys), and with quantitative (2, 4, 8) possibly with subdivisions (10.5) or mere ordinal values (e.g., XS - S - M - L - XL - XXL). Fully specified there may well be around 10 ² different such size scales, but they are fairly well standardized in the industry and worth capturing as terminologically distinct size properties.
Control by Serial Number	- SPLPRDCTLSN 2.16.840.1.113883.1.11.19255	BL	Specifies if the product instances are identified by a serial number (“serialized device”)
Control by Lot Number	- SPLPRDCTLLN 2.16.840.1.113883.1.11.19255	BL	Specifies if the product instances are identified in part by a lot or batch number.
Control by Manufacturing Date	- SPLPRDCTLMD 2.16.840.1.113883.1.11.19255	BL	Specifies if the product instances are identified in part by the manufacturing date.
Control by Expiration date	- SPLPRDCTLED 2.16.840.1.113883.1.11.19255	BL	Specifies if an expiration date is provided for the product instances.
Number of times useable.	- SPLUSE 2.16.840.1.113883.1.11.19255	INT	Specifies how often a product may be re-used. While a number could be specified, the common distinction is between single disposable and multiple use products. A product that has unlimited reuses uses the <value nullFlavor="PINF" xsi:type="INT"/>.
Sterile Status	- SPLHYG 2.16.840.1.113883.1.11.19255	BL	Specifies whether the device is a sterile package ready for use (e.g., catheter kits),

			sterile package to be sterilized before use, no sterile packaging to be packaged and sterilized before use (e.g. multiple use surgical instruments), or not intended to be used where sterile conditions are necessary (e.g., pens). More generally the characteristic "hygienic status" (SPLHYG) includes the sterile status but can also values such as "rinse before use", "wash before use", etc.
Storage environment temperature range	TBD 2.16.840.1.113883.6.1	IVL< PQ>	The temperature under which the product should be stored at rest, e.g., room temperature 15 – 35 °C, refrigerated 0 – +8 °C, frozen -80 °C ± 10 °C. temperature conditions are specified as a quantitative temperature range.
Operating environment temperature range	TBD 2.16.840.1.113883.6.1	IVL< PQ>	The environmental temperature range under which the device may be operated. Same value type as for storage temperature range, may be a more narrow range required to actually operate the device.
Storage environment humidity range	TBD 2.16.840.1.113883.6.1	IVL< PQ>	The relative humidity in volume percent under which the product should be stored, e.g., 0 - 20 %.
Operating environment humidity range	TBD 2.16.840.1.113883.6.1	IVL< PQ>	The relative humidity in volume percent under which the device should be operated, e.g., 0 - 20 %.
Storage environment atmospheric pressure	TBD 2.16.840.1.113883.6.1	IVL< PQ>	The atmospheric pressure under which the product should be stored, e.g., 1000 – 1100 hPa.

Note the sterility concept is never associated with just a product outside of its packaging, because that is not possible. Every sterile product will be inside at least an inner sealed package, so the sterility property is associated with the <asContent> role that links that inner package to the product:

```

<asContent>
  <containerPackagedProduct .../>

  <subjectOf>
    <characteristic>
      <code code="SPLHYG" codeSystem="2.16.840.1.113883.1.11.19255"/>
      <value code="C?????" codeSystem="2.16.840.1.113883.3.26.1.1"
        displayName="sterile" xsi:type="CE"/>
    </characteristic>
  </subjectOf>
</asContent>

```

3.1.13 UDI Device Identifier Marker

Products may be packaged in multiple levels and each packaging level may have a different item code. However, for the purpose of UDI submissions, only some of these item codes might be considered “UDI Device Identifiers”. To mark a product or package as the item bearing the UDI Device Identifier, one attaches a <productOf><potentialSupply> element:


```

<subject>
  <manufacturedMaterial>
    <manufacturedMaterial .../>

    <productOf>
      <potentialSupply classCode="SPLY" moodCode="DEF" />
    </productOf>
  </manufacturedMaterial>
</subject>

```

If a package bears that UDI:

```

<asContent >
  <containerPackagedProduct .../>

  <productOf>
    <potentialSupply classCode="SPLY" moodCode="DEF" />
  </productOf>
</asContent>

```

3.2 Content of labeling

3.2.1 Sections and subsections

Information: Sections and subsections have titles and codes.

Terminology: LOINC codes are used for sections and subsections codes.

SPL location: The title and LOINC codes are associated with the section and subsection.

XML details: The <title>, if necessary, of the sections and subsections and order of the sections and subsections in the SPL are used to render the labeling contents. The numbering for the sections and subsections are included in the <title> text.

In the SPL schema, the <structuredBody> element contains multiple <component>s, and each

<component> contains a <section>. Sections are used to aggregate paragraphs into logical groupings. The order in which sections appear in an SPL document is the order the sections will appear when displayed (rendered) using the standard stylesheet. Major sections defined by the appropriate labeling regulations (e.g., 21 CFR 201.56 and 57 for human prescription drugs and 201.66 for human over the counter drugs) such as Indications and Usage are assigned LOINC codes. Sections that have not been assigned a LOINC code are assigned the LOINC code for “SPL Unclassified Section”. Major sections may also be defined by parts of a container or carton label (e.g., Principal Display panel).

Each section has a unique identifier (<id>), an <effectiveTime>, and a LOINC code (i.e., the <code> element). A section may or may not contain a <title>.

The human readable content of labeling is contained within the <text> element in the <section>. The <section> can be nested to form sub-sections. The schema for subsections

in SPL requires that the nested <section> tag first be nested inside a <component> tag. Use nested sections to relate paragraphs. The section tag applies to all of the nested sections. By nesting sections, computer systems can use the section tags in SPL to display information useful for the care of patients. If information is not associated with the tag, it will not be displayed.

Using the following principles for markup of text information improves access to information in labeling:

- Capture the section heading using the <title> element rather than placing the text of the title within the <text> element. This allows computer systems to use and display this information properly.
- Capture the section heading even when the printed label does not include a heading. For example, tagging a pregnancy statement as a section in a label that does not have a heading for pregnancy is useful. Computer systems will be able to use the tag to capture the pregnancy use statement. Omitting the <title> would prevent the heading from appearing when the SPL is rendered.
- Link different parts of the labeling using the ID attribute to the <section> element. For example, <section ID="Clin_Pharm_Section"> serves as the target of a <linkHtml> element. Linking to the ID attribute of a section allows the link to 'reference' the section entirely, e.g., for retrieval of a whole section in a non-browser interface.
- For container or carton labels, when capturing text and figures outside the Drug Facts or equivalent sections, separate the text and figures for each concept using <paragraph> tags.
- The order of the placement of information is the content of the package insert, the content of the patient information and the carton and container labels with images.

3.2.2 Labeling text

Information: This is the human readable content of labeling.

Terminology: There is no controlled terminology for this information.

SPL location: This is provided in the appropriate sections and subsections of labeling.

XML details: The human readable content of labeling (the narrative) is contained within the <text> element. The actual content is contained within a <paragraph>, <table>, and/or <list>. If a section consists only of nested sections, the <text> tag is not included. Elements that can be used within the <text> element to capture the human readable content of SPL include paragraphs (<paragraph>), lists (<list>), tables (<table>) and images (<renderMultimedia>). Elements permitted as children of the <text> element,

used as children of the <paragraph> element or within <table> and <list> include superscripts (<sup>), subscripts (<sub>), links (<linkHtml>), line breaks (
), footnotes (<footnote>), footnote references (<footnoteRef>). Images may be included in the content of labeling using the <renderMultiMedia> tag. This tag may be used as a direct child of <text> for ‘block’ images or as a child of <paragraph> for inline images.

3.2.2.1 Font effects

There are certain aspects of the rendering of SPL that must be specified in the SPL source to insure that the content of labeling is formatted correctly when rendered. For example:

```
<paragraph>The next snippet <content styleCode="bold italics">will appear
as bold italics</content> in the rendering.</paragraph>
```

Will be rendered as:

The next snippet *will appear as bold italics* in the rendering.

The <content styleCode=""> can also be nested, for example:

```
<content styleCode="bold italics"> will appear as bold italics</content>
```

Can also be represented as:

```
<content styleCode="bold"><content styleCode="italics"> will appear as bold
italics.</content></content>
```

The values for <styleCode> for font effect are bold, italics and underline. To assist people who are visually impaired, the <styleCode=""emphasis""> is used to prompt computer screen reader programs to emphasize text such as text in a box warning. The bold, italics and underline font effects may be used together with each other and the emphasis styleCode. For example, <content styleCode=""bold""><content styleCode=""emphasis""> </content></content> will appear as bold and will be emphasized by the screen reader programs.

A special <styleCode> is used for recent major changes (see below).

3.2.2.2 Symbols and special characters

Special characters can be included in the text. Superscripts and subscripts are accomplished using the <sup> and <sub> tags. Unicode character references are used for special characters. Unicode characters in SPL XML are inserted as either &#dddd; where dddd is the Unicode value for decimal values or � where dddd is the Unicode value for hexadecimal values. The font used in the standard stylesheet is a Unicode font assuring that Unicode values in SPL content will be rendered correctly if viewed by a browser supporting this font. Because SPL XML tags begin with the less than symbol (<), use of this symbol in text content must be replaced by the XML entity <. For example, “<paragraph>The mean for group 1 was < 13. </paragraph>” will render as “The mean for group 1 was <13.”

3.2.2.3 Footnotes

The SPL schema includes a specific footnote element `<footnote>`. Footnotes are rendered automatically by the standard SPL stylesheet. `<footnoteRef>` is used to refer to another (usually earlier) footnote. For example, “`<footnote ID=’testNote’>This is the footnote content</footnote>`” will generate the following footnote at the appropriate end of a section. “This is footnote content”

The `<footnoteRef>` element with the appropriate IDREF attribute, e.g., `<footnoteRef IDREF=’testNote’/>` will display the footnote reference in the text corresponding to the footnote with the same ID, e.g., in this example footnote 6.

Footnotes are rendered by the default stylesheet using Arabic numbers (e.g., 1,2 3,). Within tables, footnotes are rendered using footnote marks in the series: * † ‡ § ¶ # ♠ ♥ ♦ ♣, effectively separating numbered footnotes within general text and footnotes within tables. Footnotes within tables are rendered at the bottom of the table.

3.2.2.4 Lists

All lists are marked up using the `<list>` tag, and each item in a list is marked with an `<item>` tag. The ‘listType’ attribute identifies the list as ordered (numbered) or unordered (bulleted). The default numbering and bulleting are controlled by the stylesheet.

Lists featuring a standard set of specialized markers (standard specialized lists) can be created using the styleCode attribute with the `<list>` element. Options available for ordered lists are:

- Arabic (List is ordered using Arabic numerals: 1, 2, 3)
- LittleRoman (List is ordered using little Roman numerals: i, ii, iii)
- BigRoman (List is ordered using big Roman numerals: I, II, III)
- LittleAlpha (List is order using little alpha characters: a, b, c)
- BigAlpha (List is ordered using big alpha characters: A, B, C)

For example: `<list listType=’ordered’ styleCode=’LittleRoman’>`

For unordered lists the following options exist:

- Disc (List bullets are simple solid discs: ●)
- Circle (List bullets are hollow discs: ○)
- Square (List bullets are solid squares: ■)

For example: `<list listType=’unordered’ styleCode=’Disc’>`

In addition to the standard specialized lists, user-defined characters are also permitted as markers by nesting `<caption>` within the `<item>` tag. Note that any character, XML entity, or Unicode symbol, may be used in the `<caption>`, and that the `<caption>` for each `<item>` are not restricted to the same character.

For example: `<item><caption>*</caption>` the asterisk is used as item marker here.`<item>`

3.2.2.5 Tables

Tables can be created with the full structure (header (e.g., for column names), body (e.g. for the rows of the table) and footer e.g. for table footnotes)). The element `<tbody>` is required for an SPL table while the elements `<thead>` and `<tfoot>` are optional in the SPL schema. The structure will display a standard typographical table with rules between the caption (table title) and head, the head and body, and the body and `<tfoot>`. If a `<tfoot>` element is included and footnotes are present in a table, then footnotes are rendered after the existing content of the `<tfoot>` element.

It is recommended to always start with a standard table (i.e., `<thead>` and `<tbody>` elements) and test to see whether the rendering is unambiguous and interpretable. It is important that the table communicate labeling content not that it duplicates the presentation in word processed or typeset versions of the package insert. In the unusual situation where additional formatting is needed, the rule `styleCode` specified or certain attributes may be used to modify the table.

The rule codes are as follows (note that the control names are case sensitive).

- Rule on left side of cell is `Lrule`
- Rule on right side of cell is `Rrule`
- Rule on top of cell is `Toprule`
- Rule on bottom of cell is `Botrule`

Note: More than one rule control may be used in a cell, e.g., `<td styleCode code="Botrule Lrule">Cell content </td>`.

Rule control codes should be used only when necessary for the interpretability of the table. Use of these codes may result in overriding the default rules for tables. Rather than setting the rule for each cell, table rules may also be controlled according to entire rows or columns by use of the `styleCode` attributes with `<col>`, `<colgroup>`, `<thead>`, `<tfoot>`, `<tbody>` and `<tr>` elements.

To make rowgroups appear with horizontal rules, use the `styleCode` attribute `"Botrule"` with the appropriate `<tr>` element. The `Botrule` value is rarely needed on the `<td>` element.

The preferred method for using vertical rules is to define colgroup with styleCode="Lrule" or "Rrule" (or both). Only if this does not yield the desired vertical rule should the Lrule or Rrule code value with styleCode attributes on the <td> or <th> element itself be used. Note: In general, vertical rules should not be used. Good typography for tables means using few vertical rules.

To merge cells vertically and horizontally, the rowspan and colspan attributes should be used on the <td> element.

To determine the width of a table, the width attribute may be used on the <table> element and to determine the width of a table column, the width attribute may be used on the <col> and <colgroup> elements.

For horizontal alignment, the preferred method for aligning cell content within the margins is to use <col align=".." /> in the <colgroup> element, though this can be used in the <colgroup> element as well. Valid values for align are "left", "center", "right", "justify" (for full justification of contents within the cells), and "char" (for character alignment within the cells). Using the <col align=".." /> markup ensures that the contents for all cells in the column share the same alignment.

For vertical alignment, the valign attribute can be used within cells. For cases in which the cell alignment must be different from other cells in the column, align is also available as an attribute on the other table elements, including <td>.

Markup for table footnote is rendered in the <tfoot> tag. This element does not need to be included in SPL; the standard stylesheet will include a <tfoot> tag if a <footnote> element is present within either the <thead> or <tbody> sections. A <tfoot> section should be included in SPL only if there is additional information other than footnotes that needs to be rendered in this section.

For table text spacing, in some instances, the use of a "tab" or text indentation is desirable in a given table cell. In an SPL document, this effect is achieved by using the nonbreaking space () as if it were a "tab" space. As the following snippet of XML shows, two nonbreaking spaces were used to offset the word "Male" from the margin: <td> Male</td>. The nonbreaking space can also be used to keep text in a table from breaking inappropriately due to browser resizing.

3.2.2.6 Image

The SPL schema uses <observationMedia> elements to identify graphic files to be rendered at the locations where they are referenced by <renderMultiMedia> elements in the <section>. In other words, an image in an SPL will be rendered wherever it is referenced by the renderMultimedia markup, no matter where the observationMedia markup appears. The referencedObject attribute of the renderMultiMedia element identifies the corresponding observationMedia instance by means of its ID identifier such as <renderMultiMedia referencedObject="MM1"/>

The <observationMedia> element does not contain the graphic file, but instead points at the file. The <reference> value is the file name. The file name should not include spaces. The observationMedia identifies the graphic media type (i.e., JPEG). In addition, the observationMedia element includes the text description of the image used by screen reader software for visually impaired users. This is included in the <text> child of <observationMedia>. Note also that observationMedia is always contained within a <component> element as illustrated.

```
<component>
  <observationMedia ID="MM1">
    <text>descriptive text</text>
    <value xsi:type="ED" mediaType="image/jpeg">
      <reference value="drug-01.jpg"/>
    </value>
  </observationMedia>
</component>
```

For image placement, if an image is a block image (i.e., should appear in its own space), insert the renderMultimedia tag after the closing </paragraph> tag. If an image is inline (i.e., should appear alongside text), insert the renderMultimedia tag in the text of a <paragraph> as appropriate. Inline images are expected to be uncommon and basically represent symbols that cannot be represented by Unicode characters. In addition, <caption> are not applicable for inline images since these are not offset from the surrounding text.

The SPL schema does not allow for resizing graphics or changing the resolution of graphics files. Thus, all images are rendered in the browser as-is, with all characteristics of the actual graphic file itself. To ensure that a graphic will appear as desired, it is very important that the graphic file is edited to a dimension appropriate for its presentation within the browser. If this is not done, the appearance of the graphic may not be consistent with the narrative content reducing the readability of the file. JPEG image file type using appropriate pixels per inch for images for viewing in a browser using the standard stylesheet.

3.2.2.7 Hypertext links

SPL offers hypertext linking capabilities generally similar to those found in the HTML specification.

Links are specified by the <linkHtml> construct, where the value for the href attribute of <linkHtml> (the target of the link) is the ID attribute value of a <section>, <paragraph>, <table>, <list>, <content>, <renderMultimedia> element. The stylesheet does not support the styleCode attribute of the <linkHtml> element; if a styleCode is needed for a link, this should be coded via the <content> element within the link as with other text.

3.2.2.8 Recent major changes in labeling text

SPL offers a notation to identify recent major changes in the labeling text including table elements <table> and table data <td>. The recent major text is tagged using the <content styleCode="xmChange">. For example,

```
<text>This is an example of text that is not changed.<content styleCode="xmChange">This is an example of text that is a recent major change</content>This is an example of changed text that is not considered a recent major change</text>
```

3.2.3 Highlights text

Information: The actual Highlights of a rendered SPL are constructed from four sources: “boilerplate” text rendered directly from the stylesheet, information from data elements inserted into the boilerplate text, <title> in the header which includes the drug names, dosage form, route of administration, controlled substance symbol and year of initial US approval, and text blocks corresponding to each major highlights part (Highlights text). Highlights section titles are derived from the FPI section LOINC codes. The Highlights text is captured for the following sections: Microbiology, Boxed Warning, Recent Major Changes, Indications and Usage, Dosage and Administration, Dosage Forms and Strengths, Contraindications, Warnings and Precautions, Adverse Reactions, Drug Interactions and Use in Specific Populations.

Terminology: There is no controlled terminology for this information.

SPL location: The text blocks for Highlights are coded with the <excerpt> <highlight> elements of the major section of labeling in which they are contained. For example, the Highlights for Indications and Usage are located with the Indications and Usage section of the labeling. The Highlights text is placed under the main section and not under subsections.

XML details: The text blocks of Highlight are coded with the <excerpt> <highlight> elements of the section in which they are contained. The following is sample coding:


```

<component>
  <section>
    <id root="47ef84cd-8314-48c3-8ee2-bdff3087f83f"/>
    <code code="43685-7" codeSystem="2.16.840.1.113883.6.1"
      displayName="warnings and precautions section"/>
    <title>5 WARNINGS AND PRECAUTIONS</title>
    <excerpt>
      <highlight>
        <text>
          <list listType="unordered">
            <item>Aplastic anemia has been observed in 8% of recipients and
is irreversible in the majority of patients who experience this. (<linkHtml
href="#Section_5.1">5.1</linkHtml>)</item>
            <item>Monitor for hematological adverse reactions every 2 weeks
through the second month of treatment (<linkHtml
href="#Section_5.2">5.2</linkHtml>)</item>
          </list>
        </text>
      </highlight>
    </excerpt>
    <component>
      <section ID="Section_5.1">
        <id root="a857689e-9563-43c0-a244-8a6d5a25966a"/>
        <title>5.1 Aplastic anemia</title>
        <text>
          <paragraph>Aplastic anemia has been observed in....</paragraph>
        </text>
      </section>
    </component>
  </section>
</component>

```

The following principles are illustrated by this example:

- a. The <text> block for the Highlights is included as the <excerpt> <highlight> <text> children of the respective section. In the example above, the text block rendered in the highlights section is the child of the “Warnings and Precautions” section.
- b. The coding of the highlights text block is not in a subsection.
- c. The text block is rendered similar to any other text block, although in a location separate from its actual position in the rendered SPL document.
- d. Links to the section or subsection where the primary content exists are explicitly entered in the Highlights text block.
- e. Section numbering is included in the title of sections and subsections (e.g., ‘5’ and ‘5.1’, above).

Highlights and labeling boilerplate items include:

- Statement -“Highlights of Prescribing Information”
- Highlights section titles

SPL R5 IG for FDA Establishment Registration, Listing, and UDI Submission

- Patient counseling statement with information taken from FPI section LOINC codes for patient information sections, specifically information for patient section (34076-0), SPL Medguide section (42231-1), SPL patient package insert section (42230-3) and SPL supplemental patient material (38056-8)
- Revision date is taken from the effective time
- Full Prescribing Information: Contents
- Statement – “Full Prescribing Information”