Adult Cardiac Surgery National Database
of the
Society of Thoracic Surgeons

Software Specifications

Version 2.73

Current as of January 14, 2011

Note: Some portions of this document are highlighted in gray. Although it is critical for the success of the developer's software that all of the information in this document be understood and followed, the highlights are used to point out areas that have changed since previous versions or areas of extreme importance to the functionality of the software.

Purpose:

The purpose of this document is to describe the features that are required to exist in software certified by The Society of Thoracic Surgeons (STS) for the collection and submission of adult cardiac surgery data. The STS is making an effort to set minimum standards for the software to be used by its members, while allowing enough flexibility so that developers can produce competitive features for the members' benefit.

The intended audience for this document is the software developers who are designing and maintaining the code used by participants to collect and submit data to the STS database. This information will be essential for developers working for vendors who will distribute their software to many members as well as developers working for an individual member designing a package to be used only by themselves (Participant Generated Software).

Note: All software used to collect data to be submitted to the STS Data Warehouse must go through a certification process before data will be accepted into the national database. Developers must also have a signed contract on file with the STS before the certification process can begin.

Since the functionality of the software will revolve around the data specifications, this document will start by providing some information about the specifications.

Data Specifications:

1. Structural changes between versions 2.61 and 2.73.

   Some changes have been made to the structure and the information presented in the Data Specifications database to help make the information more usable and to make the format more consistent with the specifications for other STS databases.

   The changes made include, but are not limited to:
   - The name of the field DCFSection was changed to SectionName.
   - The name of the field FieldName was changed to LongName.
   - The field Status was removed
   - The field ValidData was removed and replaced with the two new fields LowValue and HighValue.
   - The field UsualRange was removed and replaced with the two new fields UsualRangeLow and UsualRangeHigh.
   - The field HarvestCodes was removed and this information is now in a separate table.
   - The name of the field ParentField was changed to ParentLongName.

2. Purpose of the Data Specifications

   The data specifications describe the data fields that are required to exist in certified software. It details the field names, definitions, dependencies, acceptable values, the harvest codes associated with those values, etc. Developers of certified software should use the data specifications to ensure their software:

   a. includes all core fields in the application (see description of Core fields below),
   b. uses the correct programmatic name (Short Name) for each field,
   c. follows the defined field dependency rules (see description of Parent / Child relationships below),
   d. accepts only the defined valid values appropriate to each field and ensures that the values are in the correct format,
   e. provides the user with appropriate field definitions, and
   f. includes only the appropriate fields in the extracted data files the site will submit to the Data Warehouse.

3. Data Version Numbers

   As medicine, technology and interest in research areas change, the data specifications have and will change to collect additional and more detailed information. A Data Version number is assigned by the STS to each official version of the data specifications. This number will play a key role in how the data is handled and processed (see Software Specifications below).

   STS members were required to start using certified software as of January 1, 2000. At that time, version 2.35 of the data specifications was put into affect and any data collected for procedures performed before January 1, 2000 were converted as closely as possible to the 2.35 format.

   Since that time, the data specifications have been upgraded four times; first to version 2.41 and then to 2.52.1, 2.61, and now 2.73. For the upgrades to versions 2.41, 2.52.1, and 2.61, there was a conversion period when the data could be recorded following either the version being replaced or the newer version. This allowed sites to continue entering their data into an old version of their software while they are waiting to have their software upgraded.

   Beginning with the upgrade to version 2.73, the data version of the record is determined by the date of surgery. When users indicate they want to create a new data record, the software must first prompt the user for the surgery date. If the date supplied by the user is on or after January 1, 2008 and on or before June 30, 2011, the new record must follow the v2.61 specifications. If the date is on or after July 1, 2011, the data record

must follow the v2.73 specifications. This process will ensure that all records in the national database for procedures performed during a specific time period will follow the same data version, regardless of when the record was created.

The following table defines which version of the data specifications will be accepted into the national database for procedures performed during the specified time periods:

Surgery date	Data Specifications version number
Any dates up to December 31, 1999	Data converted to 2.35 format
January 1, 2000 through December 31, 2001	2.35
January 1, 2002 through June 30, 2002	2.35 or 2.41
July 1, 2002 through December 31, 2003	2.41
January 1, 2004 through June 30, 2004	2.41 or 2.52.1
July 1, 2004 through June 31, 2007	2.52.1
July 1, 2007 through December 31, 2007	2.52.1 or 2.61
January 1, 2008 through June 30, 2011	2.61
July 1, 2011 through the current date	2.73

4. Sequence Number

The sequence number field (SeqNo) is provided in the data specifications solely for identifying fields and sorting fields within the data specification database and documentation. They are not intended as a permanent identifier for individual fields and a number assigned to a field in one version of the data specifications might be assigned to a different field in another version. Because of this, it is highly recommended that developers should not use the SeqNo value as a field identifier in any of their programs. See Appendix B for a list of SeqNo values for each field for each of the most recent versions of the data specifications.

5. Future Upgrades

As the need arises, new versions of the data specifications will be distributed by the STS. In the interest of keeping major software upgrades and testing down to a minimum, the STS does not expect to upgrade the specifications more frequently than once every other year. Developers should anticipate these upgrades and design their software in such a way that the new versions can be incorporated with minimal software changes and that records created under different data versions will be handled properly, as described below.

6. Data Specifications field descriptions

The data specifications are maintained in a table in an Access database to allow the information to be cut and pasted, sorted and reported on in a variety of ways to make incorporating the information easier for the developer. The table for the 2.73 version of the specifications contains 20 fields which are described here:

Table name: tblDataSpecificationsV2_73

A. SectionName – The name of the section of the DCF where the field is located.
B. SectionSeqNo – The order number of the section of the DCF where the field is located.
C. SeqNo – An arbitrary number (sequence number) used for ordering the fields within a specific version of the data specifications. The ordering of the numbers is set to loosely follow the order in which the fields appear in the DCF. As described above, the SeqNo value for one field can change from one version of the specifications to the next. The values, therefore, should never be used in any reports, queries or programs to refer to a specific field.
D. LongName – The longer and more descriptive name of the field. In most cases, the LongName does not change from one version of the specifications to the next, but they do change in some instances. Because of this, the LongName value should never be used to refer to a field in reports, queries or programs.
E. ShortName – The short, programmatic name assigned to the field. The ShortName value should be used in all reports, queries and programs to refer to a given field as this value will not change from one version of the specifications to another.
F. Core – This field contains a value of Yes or No to define whether or not the field should be available to the users for data entry. Whether or not the field is included in data files exported for submission to the STS database depends on what other data versions are being included in the data extract. (See the "Data export for harvest to the data warehouse" section of the Software Specifications below.) The values in this field have the following meanings:
   ▪ Yes = Field must be available to the users for entering data for records following this version of the data specifications and the field must be included in the data files exported for submission to the STS database that contain records following this data version.
   ▪ No = Field is not required to be available to the users for entering data for records following this version of the data specifications. Fields defined with Core=No are in the specification only to be able to express that the field was being collected in the previous version of the specifications, but is no longer being collected. A field defined in this way in one version of the specifications, will not appear at all in the next version.

G. Harvest – This field contains a value of Yes, No or Optional to define whether or not the data for this field is included in the export file to be submitted to the data warehouse. (See the "Data export for harvest to the data warehouse" section of the Software Specifications below for more details about the contents of the files submitted to the data warehouse.) The values for this field have the following meanings:

- Yes – Data from this field must be included in the data file for all records following this version of the data specifications.
- No – Data from this field must not be included in the data file for all records following this version of the data specifications.
- Optional – The individual users determine whether or not the data from this field is included in the data file. By default, the software should treat this as a Yes and include the data in the extract. The users must explicitly state that they do not want the data for this field included. This distinction is defined for fields the STS would prefer to have included in the harvest, but the site might have reasons (such as not being allowed by state laws) for not including the values in the harvest file.

H. Format – The format in which the values for the field should be collected. The options for this field are:

- Date - mm/dd/yyyy: Date values only with the month specified as a 2-digit numeric value, day specified as a 2-digit numeric value, and year specified as a 4-digit numeric value.
- Time - hh:mm (24-hour clock): Time values only with the hours specified as a 2-digit numeric value (in 24-hour format), and the minutes specified as a 2-digit numeric value.
- Date/Time - mm/dd/yyyy hh:mm : Date and time values in one field with the month specified as a 2-digit numeric value, day specified as a 2-digit numeric value, and year specified as a 4-digit numeric value, followed by a single space and then the hours specified as a 2-digit numeric value (in 24-hour format), and the minutes specified as a 2-digit numeric value.
- Integer: Numeric values with no decimal points.
- Real: Numeric values with a decimal point.
- Text: Value can contain any alphanumeric characters.
- Text (categorical values specified by STS): Values displayed to the user are the text descriptions defined in the data specifications table. The values submitted to the Data Warehouse are the Harvest Codes defined in the data specifications.
- Text (categorical values specified by user): Values displayed to the user and submitted to the Data Warehouse come from a list maintained by the user (see item "e" under the "3. Data Entry" section of the "Software Specification" below).

I. DataSource – This field defines how the data is entered into the field. The options for this field are (note, in some cases, there is more than one option for data source, such as "User or Calculated"):
   ▪ User – The user enters the value, otherwise it is left missing (null).
   ▪ Automatic – The software automatically inserts a value for every record. This is usually assigned to administrative fields that must contain a value, such as the DataVrsn field.
   ▪ Calculated – The value is calculated by the software based on values in other fields (for example, the risk model fields).
   ▪ Lookup – The software automatically inserts a value after looking up the information kept in a table maintained by the user. For example, HospStat is filled in based on which HospName value is selected (see item "e" under the "3. Data Entry" section of the "Software Specification" below).
J. Definition – The official definition of the field.
K. LowValue – The lowest valid value that can be accepted for the specified field. This is used only in fields that accept numeric values.
L. HighValue – The highest valid value that can be accepted for the specified field. This is used only in fields that accept numeric values.
M. UsualRangeLow - The lowest value that is likely to be entered by the user. If the user enters a value that is below this number, but still greater than or equal to the value defined in LowValue, the value should be accepted, but the user should be given a message that the value they entered is unusually low and that they should verify the value.
N. UsualRangeHigh - The highest value that is likely to be entered by the user. If the user enters a value that is above this number, but still less than or equal to the value defined in HighValue, the value should be accepted, but the user should be given a message that the value they entered is unusually high and that they should verify the value.
O. ParentLongName – The "parent" field on which this field (the "child" field) is dependant. Software must be defined such that the parent field must contain a value that is specified in the ParentValue field before data can be entered into this field, otherwise the field is disabled or unavailable.
P. ParentShortName – The programmatic "ShortName" of the parent field.
Q. ParentValue – The list of values the parent field can have before this field can be available for data entry.
R. ACCField – This field indicates whether or not the definition and harvest coding of this field maps to a similar field in the American College of Cardiology (ACC) CathPCI Registry. The STS and the ACC are making an effort to synchronize the fields in their databases as much as possible in values and definitions. The distinction in this field compares the current STS definition with either the current ACC definition or definitions the ACC plans to use in their next release. This field will contain one of the following values with these meanings:
   ▪ "Not mapped" – There is no ACC field that is similar to this STS field in definition or coding.

- "Mapped – Definition only" – There is an ACC field that is similar to this STS field in definition, but not in coding. These two fields will have some difference (such as the time at which the value is collected) that precludes the data from being combined or stored in the database as one field.
- "Mapped – Definition and coding" – There is an ACC field that is similar to this STS field in definition and coding. These two fields can be combined and stored in the database as one field.

Table name: tblDataSpecificationsV2_73 _HarvestCodes

A. ShortName – The short programmatic name assigned to the field.
B. HarvestCode– The numerical code that is assigned to each choice in the valid data. These are the values that are used in the exported data file that is submitted to the Data Warehouse.
C. Description – The text description of the choice. This is the value the user sees while doing data entry.
D. DisplayOrder – The order in which the choices are displayed to the user for this field.
E. Definition – The official definition of the specified choice for this field. Note that not all choices will have a definition.

<u>Software specifications:</u>

It is not the intention of the STS to regulate the algorithms and methodologies the developers use to produce their software. However, there are specific features and functionalities that are needed in the software to allow data to be collected and submitted in a uniform format and to enable the warehouse to communicate with the members about individual records and data items. The purpose of this section is to describe those features and functions.

1. General features

    The certified software must have the following minimum features:

    a. Provide a user-friendly interface that can be used on a current personal computer operating system.
    b. Allow users to be able to view and select the actual data values for each field. If the data is coded internally, user should, by default, view the non-coded values.
    c. Ensure all date values are year 2000 compliant having a 4-digit year format.
    d. The STS database has a logical flat structure in which each record describes one surgical case. If a developer chooses, this can be implemented as a set of relational tables (e.g. demographics table, procedure table, etc.), but the software must be able to export the data in a flat file structure compatible with that of the STS. (See "Data Export for Harvest to the Data Warehouse", below).
    e. Software must accept and integrate data previously collected and maintained in other software products or data versions. (See "Data Import", below).
    f. The user's data must be accessible for *ad hoc* queries either through the software package or by common third party software (e.g. Microsoft Access, Crystal Reports, etc.) If the data is not directly accessible, then the software must provide the ability for the user to export the data in a standard file format which can be queried using common third party query software. (See "Data Export for Analysis by Users", below). When users are querying their data, grouping records that were created under multiple data version numbers must be invisible to the user. For example, if a user wants to analyze a risk factor in their data for a time period of two years, the fact that their data was recorded under two different version numbers during that period must not require any additional steps for the user to build the query. We strongly recommend ensuring this by keeping all data in one database regardless of the version number. This requirement is the result of feedback from many frustrated users.
    g. Users must be able to select specific records in their database via key fields including patient's name, medical record number, and the record identification field (RecordID).
    h. Software must include a utility that allows users to check the completeness of any or all of their data fields. This utility must allow the user to select which fields are included in the data check and have the option of including all fields or just specified fields. (See "Data quality and completeness checks" below)

i. Software must include a utility that allows on-demand updates for the following areas (see "On-demand updates" below):
   1. Valid values and harvest coding for the valve implant prosthesis fields (VS-Aortic Proc-Imp, VS-Mitral Proc-Imp, VS-Tricuspid Proc-Imp, VS-Pulmonic Proc-Imp)
   2. Valid values and harvest coding for the VAD device fields (VAD-Product Type, VAD-Product Type #2, VAD-Product Type #3, Starting with v2.73, this same list is also used for the field Previous VAD Device)

2. Record management

   Each record in the database describes one surgical case. On each record, there are four key fields used for record management:

   a. Participant identification number (ParticID): Each group of surgeons collecting and entering data into a database for submission to the STS is assigned a 5-digit ParticID by the STS. In most cases, all data being entered into a database will be for one participating group, in which case all records will have the same value in this field. In these situations, the developer can have the software enter the value into the record automatically for the user.

   In some situations however, more than one participating group will be entering their data into a single database. In these situations, the user should select the appropriate ParticID value from a drop down list (see "Categorical values specified by user" under the Data Source description in the "Explanation of Data Specification Terms", below).

   The developer should consult with the users to determine how many participants will be entering data into a single database and adjust the programs accordingly. In either case, a value for ParticID is required and the software should ensure one exists for every record.

   b. Record identification number (RecordID): The RecordID field contains a unique numeric value that identifies the record in the database. This is an arbitrary number and must not be a value that could identify the patient, such as Social Security Number, Medical Record Number, etc. Once attached to a specific record, the value can never be changed, nor can it be reused if the record is deleted. The data warehouse uses the RecordID field to communicate record-specific data quality issues to the participants. Because of this, users must be able to select cases from their database for review using this field and the field must be labeled "RecordID" on the data entry screen. See also the special considerations necessary for this field when importing data from another database in the "Data Import" section, below.

   Beginning with version 2.73 of the data specifications, the values generated by the software for the RecordID field must be a combination of a vendor specific

code followed by an alphanumeric value that makes the identifier unique. The vendor-specific code will consist of three characters and will be assigned to each vendor and Participant Generated Software site by the STS. The codes will be in a format similar to "V01". For example, the software will generate a RecordID value of V01000001 for the first record and V01000002 for the second record. The purpose of this feature is to allow sites to move their data from one version of a software package to another, or from one vendor package to another, and maintain the referential integrity of their data records.

Together, the ParticID and the RecordID will affect a composite key, which is unique to each record throughout the national STS database.

c. <u>Data Version Number (DataVrsn)</u>: The DataVrsn field contains the data specifications version number under which the record is created. The value is automatically entered into the record by the software at the time the record is created. The value then can never be changed, even if the software is upgraded to a newer version of the specifications.

Once a record is created and a data version has been assigned to it, that record will always follow the rules defined by that version of the data specifications. When a user selects a record for editing that has an older data version number, the software must follow the older data specification rules for editing that record. This includes controlling which fields are available to the user, which values are available for each field and the appropriate parent/child dependencies.

d. <u>Patient identification number (PatID)</u>: The PatID field contains a unique, arbitrary number to uniquely identify the patient in the database. If one patient has multiple admissions to the hospital, the records for each admission will contain the same PatID value. The number, once assigned to a patient, can not be edited or reused if the patient records are ever deleted. In order to avoid issues of patient confidentiality in transferring records, the PatID value should not be any known identifier such as Social Security Number or Medical Record Number. A PatID value is required on every record regardless of the structure of the software's database.

Beginning with version 2.73 of the data specifications, the values generated by the software for the PatID field must be a combination of a vendor specific code followed by an alphanumeric value that makes the identifier unique. The vendor-specific code will consist of three characters and will be assigned to each vendor and Participant Generated Software site by the STS. The codes will be in a format similar to "V01". For example, the software will generate a PatID value of V01000001 for the first patient record and V01000002 for the second patient record. The purpose of this feature is to allow sites to move their data from one version of a software package to another, or from one vendor package to another, and maintain the referential integrity of their data records.

3. Data entry

   The software must have the following features to control the data being entered by the users:

   a. For export of data to the warehouse, most data fields have a default value, usually null or blank, which indicates that the data is "Missing" (see data specifications). For data entry purposes the site and vendor may choose to institute internal codes for "Missing" values. As the site drives the need for this feature, the STS data specifications do not define standard codes for "Missing" values during data entry. If a site applies data entry "Missing" codes, the harvest process must include a step that maps the missing code to the STS specification for "Missing" values (null or blank). Note: zero must never be used to indicate missing data.

   b. The user should always be able to delete entered data, and return the field's value to the null or blank "Missing" value.

   c. For any field having specific values or a range of acceptable values defined, the software must restrict data entries to this set of values. For categorical variables this is expressed as a set of harvest codes and descriptions and the user must select from a pick list of these values. For numerical variables, this is expressed as a valid numeric range defined as a LowValue and HighValue, and the user must enter a value on or between the specified limits. If the user enters a value that is not one of the harvest codes or is outside of the defined range, the user must be given an error message that the value is invalid and the invalid value must not be stored in the database.

   d. Where a numeric variable has a UsualRangeLow and UsualRangeHigh specified, if the user attempts to enter a value that is outside of that range but still inside the LowValue/HighValue range, the software must warn the user that they are entering an unusual value and ask if the entry is correct. If the user confirms that the value is correct, then it should be accepted into the field.

   e. Some categorical text fields are designed to have data values controlled by the user. This applies primarily to a few site-specific fields such as hospital name and surgeon name. These fields are indicated in the Data Specifications by their Format specifying " Text (categorical values specified by User) ". The user should be able to maintain the pick list of valid data for these fields including the ability to add, change, or delete list elements. During data entry, the user should be able to enter only values that are in this pick list.

      The process of maintaining the list should be separate from the data entry process. In other words, users must purposely add a value to the list to make it available for selection during data entry. If a user enters a value that is not on

the list, it should be rejected and not automatically added to the list. The idea here is to avoid the possibility of users entering "free text" which causes unacceptable data quality issues at the warehouse.

It is important that the vendor support the site's ability to control these fields. Items in the user list should not have more than one choice for the same entity. For example, the hospital names "General Memorial Hospital" and "GMH" should not represent select choices for the same hospital.

f. Documentation including data definitions and help should be easily accessible to the user, preferably on-line.

4. Field dependencies

Field dependencies exist where one field (the "parent" field) controls whether or not one or more other fields (the "child" fields) can contain data. Child fields are indicated in the specifications by having their immediate parent field named in the "Parent Field" section of their specification. For example, "RF-Cerebrovascular Dis " is a parent field to its child " RF-Prior Stroke ". The following guidelines must be followed to handle dependent fields:

a. If the data value of a parent field indicates that no data should be in its dependent fields, then those dependent fields should be skipped or unavailable on the data entry screen. In the example above, only if "RF-Cerebrovascular Dis" = "Yes" should "RF-Prior Stroke" be available for data entry.
b. If a parent field contains a "No" value, vendors can choose one of two methods for handling the values in the associated child fields:

   1. set all child field values to Null, or
   2. set child field values to "No" as is appropriate.

Note that the STS highly recommends following the first method of setting all child fields to Null.

Vendors must keep in mind that the first method is required in the export file created for submission to the data warehouse. In other words, regardless of what is in the user's database, the export file must contain Nulls in child fields when the parent is No.

Also, vendors must notify the STS and the data warehouse if their software will insert No values into child fields when the parent is No. This will allow the warehouse to know that the data received by a site during a data harvest will not look exactly like what the user has in their database.

c. If a parent field is originally set to "Yes", then values can be entered into its child fields. If the record is subsequently edited by the user and the parent value is changed to "No", the values in the child fields must be automatically changed to Null or No depending on the method being used by the vendor as described above. This will avoid the possibility of conflicting information being left in the data record (for example "RF-Cerebrovascular Dis"is "No" but "RF-Prior Stroke" is "Yes").

d. Reporting on missing data values needs to be handled differently in dependent (child) fields, since its meaning depends upon the data value of the parent field. See "Data quality and completeness checks" below for a full description of how this should be handled.

5. Data quality and completeness checks

The software must provide the users with a utility for checking the accuracy and completeness of their data that includes the following features:

Data quality checks can be run during data entry and/or on demand for groups of records as specified by the user. This utility produces a data quality report indicating which records and fields failed the data checks. This report is used by the site data manager to review and potentially repair the data.

a. Certified software must contain a utility for checking and reporting on data completeness. This utility must include the following features:

   i)   The user must be able to identify in a list the fields that they want to have checked for completeness. The user should be able to select just one field, all fields, or any number of fields desired (by default, the utility should report on ALL fields). It is recommended that user should be able to save the selected list so as not to have to go through the selection process again the next time data quality is being checked.
   ii) The utility should report on individual records or groups of records (recommend grouping by surgery date range) as specified by the user.
   iii) The utility must take into consideration dependent fields when checking for completeness. For fields defined as "child" fields of a "parent" field, the child is considered missing only if the parent is answered "Yes" (or in a way that would allow the user to enter data into the child field) and the child field contains no data. Following this guideline will restrict reporting missing data to only those situations where data is clinically expected.

6. Data Import

a. Software must be able to import data in standard file formats from third party applications. At a minimum, this must include delimited, ASCII text files. Other common formats (e.g. Excel or MS Access) are also recommended. This functionality is to only be used on a one-time basis. For example, this utility should only be used when a user first purchases a new certified software package and wants to import the data they had been collecting up to that time in a different package. Once the old data has been imported into the new package, all future data should be entered directly into the new package via the data entry screens and no additional data should be imported. Using the import feature to regularly import data so that it can be exported in the STS format for submission to the Data Warehouse is strictly against the STS policies.

b. Data that is imported will require controlled conversion to an acceptable STS data version. The conversion process must include reviewing the data for consistency with the STS data (i.e. mapping the categorical values in the imported data to the appropriate STS values). The site data manager and software vendor hold responsibility for the accuracy (both clinical definition and harvest format) of all imported data harvested to the warehouse. The software will assign to each imported record the STS data version number to which the data is converted. The data version to which the data is converted must be appropriate for the data of surgery for that record. The warehouse will handle data according to the STS data version number on each observation in a harvest file regardless of whether it was created in the software's data entry utility or imported from another source.

c. Special consideration is needed for the values in the RecordID field when importing data. This is especially true when importing data that was previously submitted to the data warehouse (i.e. data from another certified software package). RecordID values must never change once they are assigned to a record. The software developers and data managers must ensure that the values in the imported data do not change in the conversion process, and that they do not cause duplication of values with any existing records. Developers must also ensure that new records created after the data has been imported are not assigned RecordID values that already exist in the data. If data is to be imported that would cause a conflict in this manner, the software developer must contact the Data Warehouse to determine what steps need to be taken.

7. Record subsets and queries

Software must allow users to search for Individual records selected by RecordID or by patient identifiers including patient name, medical record #, and surgery date.

a. Software should allow groups of records to be selected (e.g., filter function) by multiple fields, which minimally include procedure type, surgeon, hospital, date of

surgery, date of admission, and date of discharge. This will also help sites find individual records when specific identifiers are not known.

    b. Users should be able to name, save, copy and modify record selection criteria.

    c. Users should also be able to construct more general queries including field selection, record selection, sorting, and summarizing. It is acceptable if this function is provided by a third party application (e.g. MS Access or Crystal Reports).

8. Reporting

Software should provide the users with reporting abilities that can do the following:

    a. View and print listing of records (either all records or a selected subset) with basic information such as, but not limited to, record number, patient name, SSN, procedure type, medical record number, date of birth, date of surgery, surgeon, and hospital.

Print full record detail on single or multiple selected records.

    b. View and print a data completeness report listing the records having missing fields and which fields are missing from each record.

    c. Build, save, copy, and modify more general reports with capability to select fields, record subsets, sorting, and summary statistics. (It is acceptable if this function is provided by a third party application, such as MS Access or Crystal Reports).

    d. Incorporate capabilities for graphing the data in reports, including trends over time (it is acceptable if this function is provided by a third party application).

    e. Data harvest procedure provides the site with a report documenting the following:
        1. whether or not the extract completed successfully
        2. number of records extracted
        3. time frame of the data extract (by date of surgery)
        4. date the data extraction was performed
        5. name of the person who performed the data extraction

9. Data export for analysis by users

The software must allow users to export their data for their own use in the following manner:

Software must be able to export data in standard file formats suitable for transfer into third party applications. This must include at a minimum delimited, ASCII text, and optionally other common formats such as Excel and Access. Developers should keep in mind that sites may need to export their data for reasons other than the STS data harvests.

    a. User should be able to choose whether an export includes all data or selected records and fields. Users must be able to select any field in their database including custom fields and other non-STS fields.

    b. If data is coded for internal storage (e.g. text string is stored as a number), the data must be able to be decoded when written to the export file so that actual values (e.g. full text strings) are contained in export file. The user can decide which format should be used for each export file.

    c. Export files must identify the data fields using field names (i.e., the STS ShortName or LongName) that are familiar to the users.

    d. User can build, save, copy, and modify named export configurations.

    e. User can control export file naming convention.

10. Data export for harvest to the data warehouse

As one of the key reasons for having certified software, the software must allow users to export their data for submission to the STS data warehouse following these exact guidelines:

The user must be able to specify the records to be exported for harvest by using range limits for the surgery date.

    a. The Data Harvest file exported must adhere to this specific format:
        1. File is an ASCII text file with vertical bar delimiters
        2. The first row is a "header" record containing the STS short field names in the same sequence as the data fields in subsequent rows
        3. Each subsequent row represents one data record describing one surgical case

    b. Only a single harvest file for each participant can be submitted to the warehouse for processing. Participants may submit repeatedly during a harvest, but each submission is only one file.

    c. The extracted file must contain data for only one participant ID (ParticID) value. If the site's database contains data for more than one participant, all of which is to be submitted to the warehouse, the software must extract the data for each ParticID into separate data files each with an appropriate file name (see below).

d. The harvest file must include all fields, and only those fields, defined in the data specifications with Core = "Yes" and Harvest = "Yes" or "Optional" for all STS data versions within the harvest file. In other words, a file containing v2.52.1 and v2.61 records would contain all fields where Core is "Yes" and Harvest is "Yes" or "Optional" for either version of the specifications (more information on submitting data from multiple data versions is given below). Fields with Core="No" or Harvest="No" and site-specific or custom fields must not be included in the export file.

e. Fields that are defined as Core = Yes and Harvest = Optional must be included in the data file. What is "optional" is whether or not the field contains data. By default, the software should include all data for optional fields. If the user specifies that an optional field should not be included, the data file will include the field but every record will contain a blank (null) in that field. This is necessary for the warehouse to be able to tell the difference between a field being left out by mistake and a site opting not to include that data.

f. The values in the harvest file must be the numerical "Harvest Coding" of the data values and not the full text strings.

g. A harvest report should be produced whenever a data harvest is performed (see "Reporting", above).

h. The software must create the exported data file using the file naming convention of XXXXXadt.dat where "XXXXX" is the 5-digit ParticID for the data contained in the file. The users should not specify the file naming convention. Files not using this naming convention can not be accepted by the automated process at the data warehouse and may be returned to the participant.

When records from more than one data version are being exported for an STS data harvest, the file must adhere to the following format:

The first record of the file must be the one and only "header" record containing the STS short field names in the same sequence as the data fields in subsequent rows.

i. Every data record in the file must contain the same fields which will consist of a superset of the Core, Harvested fields from all included data versions.

j. On each data record, the fields that are Core and Harvested for the data version specified in the DataVrsn field will contain data values as available and appropriate. The fields that are not Core or not Harvested for that data version will contain nulls (blanks). When the data is being processed by the warehouse, only the fields appropriate for the data version specified on the record will be included.

For an example of a data file containing more than one data version, consider a data file being submitted with records having data versions 2.52.1 and 2.61. The software will produce one data file with one header record that will identify all of the Core / Harvested fields for both versions, including "Patient Age" (Age), "RF-Renal fail" (RenFail), and "Hospital National Provider Identifier" (HospNPI). The Age field is Core to both 2.52.1 and 2.61. RenFail is Core for 2.52.1 but is not Core in 2.61. HospNPI didn't exist in 2.52.1 but is a Core field in 2.61. A data record in the extracted file that has a DataVrsn value of 2.52.1 should contain a value in Age and RenFail, but would contain a null in HospNPI. A data record that has a DataVrsn value of 2.61 should contain a value in Age and HospNPI, but would contain a null in RenFail.

11. Customization

It is up to the developer's discretion as to whether or not the users will have the ability to add customized fields to their software and database. If the user will have this ability, the following items must be considered:

In no case can the field names, short field names, or categorical data values specified by the STS be customized or modified by the users. (Please note however in the STS specifications that users can build the categorical data values for certain fields such as Hospital Name, see "Data entry", above.)

    a. Fields added by users must not be included in the data file exported for submission to the STS data warehouse.

    b. Developers should make clear to the potential users whether users can add custom fields themselves, or if they will require contracted work by the developer.

    c. It should be possible for users of customizable software to import custom fields that they might have created in a previous database or software package.

    d. Most importantly, developers who allow users to add customized fields must keep in mind that software upgrades will be necessary from time to time as new versions of the data specifications become available. These changes include adding new fields, discontinuing fields, and moving fields to a new location. It is the developer's responsibility to handle how a user's customization is incorporated when their software is being upgraded.

12. Combining collection of STS and non-STS database fields

Developers who design their software to collect data for more than just the STS Adult Cardiac database must not combine fields from other databases with the STS fields unless it is explicitly stated in the STS data specifications that the fields are the same in definition and coding. At the time this document was produced, the only other database

that has been designated as having fields in common with the STS Adult Cardiac database are the 2009 American College of Cardiology (ACC) CathPCI Registry v4.3.1. Within the STS data specifications, the field called "ACCField" contains the information that defines which STS fields can be combined with ACC fields (see "Data Specifications field descriptions" in the "Data Specifications" section above).

13. On-demand updates

Starting with v2.61, certified software was required to have the ability to load updated values to be used in two areas:

1. Valid values and harvest coding for the valve prosthesis fields (VS-Aortic Proc-Imp, VS-Mitral Proc-Imp, VS-Tricuspid Proc-Imp, VS-Pulmonic Proc-Imp)
2. Valid values and harvest coding for the VAD device fields (VAD-Product Type, VAD-Product Type #2, VAD-Product Type #3)

The Data Warehouse will provide data files that will contain the information needed for each area which will be in a bar-delimited ASCII text format. Each set of information will be assigned a version number by the Data Warehouse. Updated versions of these files will be made available annually.

Software should be designed to be able to load these updates so that they can be used by the users during the data entry process. This will allow newly available devices to be valid choices for the users without having to wait for a full specification and software upgrade.

It is important for the Data Warehouse to know what version of the on-demand files was in place when a user created a record or made subsequent updates to a record. When v2.61 was released, this was handled with a field on the data record for each area where the on-demand files applied: "Valve Implant List Version Number" (ValveVrsn) for the valve device fields and "VAD Product Type List Version Number" (VADListVrsn) for the VAD device fields. Since all of the on-demand files will always be updated at the same time, starting with v2.73, these two fields were dropped and one new field named "On-Demand Files Version Number" (OnDemandVrsn) was added in their place. For v2.73 records, this one field will be used to identify the version of all on-demand files in use for that record.

Unlike the DataVrsn field, the On-Demand version numbers can be updated after a record has been created. For example, when a record is first created and a valve prosthesis device is indicated, the OnDemandVrsn field will identify the version of the on-demand file in use at that time. If, at some time later, updated versions of the on-demand files are loaded into the system and then this record is edited by the user, the OnDemandVrsn value should be updated to indicate the newer version of the device list was available to the user.

Appendix A: Calculation of MELD scores:

Starting with version 2.73, software must be able to calculate the MELD score for each patient. The results from this calculation are entered by the software into the field RF-MELD Score (MELDScr). The value of this score is calculated using the values entered by the user into the three fields "RF-Total Bilirubin" (TotBlrbn), "RF-INR" (INR), and "RF-Last Creat Level" (CreatLst). The patient's dialysis status (RF-Renal Fail-Dialysis) is also considered in the calculation.

The calculation can be made by creating a "factor" for each of the three variables involved in the score. The value of the variable is used to determine the value of the factor. The factors are then used in a formula to determine the MELD score. The algorithm for determining the value of each factor is as follows:

If RF-Total Bilirubin is >0 and <=1 then bilirubin_factor = 1
otherwise, if RF-Total Bilirubin is >1, then bilirubin_factor = the specified RF-Total Bilirubin value.

If RF-INR is >0 and <=1 then inr_factor = 1
otherwise, if RF-INR is > 1, then inr_factor = the specified RF-INR value.

if RF-Renal Fail-Dialysis=Yes, then creatinine_factor = 4
otherwise, if RF-Last Creat Level is >0 and <=1 then creatinine_factor = 1
        otherwise, if RF-Last Creat Level is >1 and <=4, then creatinine_factor = the RF-Last Creat Level value
                otherwise, if RF-Last Creat Level is >4, then creatinine_factor = 4

After determining the three factors, the calculation is done using the formula:

MELDScr = (3.8 x Ln([bilirubin_factor])) + (11.2 x Ln([inr_factor])) + (9.6 x Ln([creatinine_factor])) + 6.4

Note that "Ln" refers to the mathematical "natural log" function.

No score should be calculated if any of the following conditions are true:
- RF-Total Bilirubin is missing
- RF-INR is missing
- Last Creat Level is missing and RF-Renal Fail-Dialysis = No or is missing

Most patients will have a score between 0 and 60, but some scores can be negative.

Appendix B: Field ShortName and SeqNo by DataVrsn.

The following table lists all fields that have been collected in the STS Adult CV Database since 1999. The sequence number (SeqNo) of each field for a given version of the specifications is specified under the version number. If no sequence number is specified, the field was not a Core field for that version of the specifications.

ShortName	2_35	2_41	2_52_1	2_61	2_73
VendorID	10	10	10	10	10
SoftVrsn	20	20	20	20	20
DataVrsn	30	30	30	30	30
OnDemandVrsn					31
ParticID	40	40	40	40	40
RecordID	50	50	50	50	50
CostLink		52	60	60	60
PatID	60	60	80	80	80
PatLName	80	80	100	100	90
PatFName	90	90	110	110	100
PatMName					120
DOB	110	110	130	130	130
Age	120	120	140	140	140
Gender	130	130	150	150	150
SSN	140	140	160	160	160
MedRecN	150	150	170	170	170
PatAddr					180
PatCity					190
PatRegion					200
PatZIP	190	190	180	180	210
PatCountry					220
PermAddr					230
PatPermAddr					240
PatPermCity					250
PatPermRegion					260
PatPermZIP					270
PatPermCountry					280
RaceCaucasian				191	290
RaceBlack				192	300
RaceAsian				193	310
RaceNativeAm				194	320
RacNativePacific				195	330
RaceOther				196	340
Ethnicity				199	350
RefCard	220	220	200	200	360

ShortName	2_35	2_41	2_52_1	2_61	2_73
RefPhys	250	250	210	210	370
HospName	280	280	220	220	380
HospZIP	282	282	230	230	390
HospStat	284	284	240	240	400
HospNPI				241	410
PayorGov				247	420
PayorGovMcare				248	430
HICNumber				171	440
PayorGovMcareFFS					450
PayorGovMcaid				249	460
PayorGovMil				250	470
PayorGovState				251	480
PayorGovIHS				252	490
PayorGovCor					500
PayorCom				254	510
PayorHMO				255	520
PayorNonUS				256	530
PayorNS				257	540
ArrivalDt					550
ArrivalTm					560
AdmitDt	320	320	260	260	570
AdmitSrc					580
OthHosCS					590
SurgDt	330	330	270	270	610
DischDt	340	340	280	280	620
WeightKg	400	400	350	350	630
HeightCm	420	420	360	360	640
CigSmoker				385	650
CigSmokerCurr					660
OthTobUse					661
FHCAD	470	470	390	390	670
Hct				391	680
WBC				392	690
Platelets					700
INR					710
HITAnti					711
TotBlrbn					720
TotAlbumin					730
A1cLvl				412	740
CreatLst	550	525	430	430	750
Diabetes	480	480	400	400	780
DiabCtrl	490	490	410	410	790
Dyslip				421	800

ShortName	2_35	2_41	2_52_1	2_61	2_73
Dialysis	560	560	450	450	810
MELDScr					815
Hypertn	570	570	460	460	820
InfEndo	610	610	490	490	830
InfEndTy	620	620	500	500	840
InfEndCult					850
ChrLungD	660	660	510	510	860
PFT					880
FEV1					890
DLCO					892
DLCOPred					893
ABG					900
PO2					910
PCO2					920
HmO2					930
BDTx					940
SlpApn					950
LiverDis					960
ImmSupp	670	670	520	520	970
PVD	680	680	530	530	980
UnrespStat					1000
Syncope					1001
CVD	690	690	540	540	1010
CVA	590	590	470	552	1020
CVAWhen	600	600	480	553	1030
CVDTIA				555	1050
CVDCarSten					1070
CVDStenRt					1071
CVDStenLft					1072
CVDPCarSurg				557	1080
IVDrugAb					1130
Alcohol					1131
Pneumonia					1140
MediastRad					1150
Cancer					1160
FiveMWalkTest					1161
FiveMWalk1					1170
FiveMWalk2					1180
FiveMWalk3					1190
PrCVInt	710	710	570	570	1200
PrCAB	760	760	600	600	1215
PrValve	770	770	610	610	1216
PrevProcAVReplace					1220

ShortName	2_35	2_41	2_52_1	2_61	2_73
PrevProcAVRepair					1230
PrevProcMVReplace					1240
PrevProcMVRepair					1250
PrevProcTVReplace					1260
PrevProcTVRepair					1270
PrevProcPV					1280
PrevProcAVBall					1285
PrevProcMVBall					1290
PrevProcTCVRep					1300
PrevProcPercVRepair					1310
IndReop					1340
NonStVDys					1350
PrValDtKnown					1410
PrValveDate					1420
PrValveMonths					1430
PrOthCar	940	940	620	620	1440
POArr					1445
PrOthCongen				621	1450
PrOCAICD			630	630	1460
PrOCPace			640	640	1470
POCPCI			660	660	1480
POCPCIWhen					1481
POCPCIndSurg					1490
POCPCISt				661	1500
POCPCIStTy				663	1510
POCPCIIn			670	670	1520
POCO				671	1530
PrevMI				751	1540
MIWhen	1360	1360	760	760	1550
AnginalClass					1570
CHF	1370	1370	770	770	1580
ClassNYH	1540	1540	870	775	1585
PriorHF					1590
CardPres				791	1610
CarShock	1420	1420	810	810	1620
Resusc	1440	1440	830	830	1630
ArrhythWhen					1650
ArrhyVtach				851	1660
ArrhyVtachHrtBlk					1670
ArrhyVtachSicSinSyn					1680
ArrhyTHB				852	1690
ArrhyAfib				853	1700
ArrhyAfibTy					1701

ShortName	2_35	2_41	2_52_1	2_61	2_73
MedBeta	1650	1650	890	890	1710
MedACEI48					1730
MedNitIV	1690	1690	910	910	1740
MedACoag	1720	1720	930	930	1750
MedACMN			940	940	1760
MedAArrhy					1770
MedCoum			950	950	1780
MedInotr	1740	1740	970	970	1790
MedSter	1750	1750	980	980	1800
MedASA	1760	1760	990	990	1820
MedLipid			1000	1000	1830
MedLipMN			1010	1010	1840
MedADP5Days				1021	1850
MedADPIDis				1022	1860
MedAplt5Days				1023	1870
MedGP			1030	1030	1880
MedGPMN			1040	1040	1890
MedThrom					1900
CarCathPer					1910
CarCathDt					1920
NumDisV	1820	1820	1050	1050	1930
LMainDis	1830	1830	1060	1060	1940
ProxLAD					1941
HDEFD		1858	1070	1070	1950
HDEF	1860	1860	1080	1080	1960
HDEFMeth	1870	1870	1090	1090	1970
LVSD					1980
LVEDD					1990
PASYSMeas					2020
PASYS					2030
VDAort					2040
VDAoEt					2090
VDEndAB					2110
VDCongenT					2120
VDPrimAo					2130
VDLVOutOb					2140
VDAortTumor					2150
VDStenA	2010	2010	1120	1120	2152
VDAoVA					2153
VDGradA		2015	1130	1130	2154
VDInsufA	2050	2050	1170	1170	2155
VDMit					2160
VDMitET					2170

ShortName	2_35	2_41	2_52_1	2_61	2_73
VDMitDegLoc					2180
VDMitAnDegDis					2190
VDMitIsTy					2210
VDMitPMR					2220
VDMitTumor					2221
VDMitFC					2230
VDStenM	2020	2020	1140	1140	2240
VDMVA					2250
VDGradM					2260
VDInsufM	2060	2060	1180	1180	2270
VDTr					2280
VDTrEt					2290
VDStenT	2030	2030	1150	1150	2300
VDInsufT	2070	2070	1190	1190	2320
VDPulm					2321
VDStenP	2040	2040	1160	1160	2330
VDInsufP	2080	2080	1200	1200	2340
Surgeon	2230	2230	1210	1210	2350
SurgNPI				1221	2360
TIN				1222	2370
Incidenc			560	1230	2380
Status	2300	2300	1240	1240	2390
UrgntRsn	2310	2310	1250	1250	2400
EmergRsn	2320	2320	1260	1260	2410
PCancCase					2415
PCancCaseDt					2416
PCancCaseTmg					2417
PCancCaseRsn					2418
PCancCaseCAB					2419
PCancCaseVal					2420
PCancCaseMech					2421
PCancCaseOC					2422
PCancCaseONC					2423
CCancCase					2424
CCancCaseTmg					2425
CCancCaseRsn					2426
CCancCaseCAB					2427
CCancCaseVal					2428
CCancCaseMech					2429
CCancCaseOC					2430
CCancCaseONC					2431
OPApp					2435
Robotic			1270	1270	2436

ShortName	2_35	2_41	2_52_1	2_61	2_73
OpCAB	2340	2340	1280	1280	2437
OpValve			1290	1290	2440
ValExp					2450
ValExpPos					2451
ValExpTyp					2460
ValExpMan					2461
ValExpDev					2462
ValExp2					2463
ValExpPos2					2464
ValExpTyp2					2465
ValExpMan2					2466
ValExpDev2					2467
VADProc					2480
OpOCard	2510	2510	1310	1310	2490
OpONCard	2520	2520	1320	1320	2500
UnplProc					2501
UnplCABG					2502
UnplAV					2503
UnplMV					2504
UnplAo					2505
UnplVAD					2506
UnplOth					2507
CPT1Code1				1321	2510
CPT1Code2				1322	2520
CPT1Code3				1323	2530
CPT1Code4				1324	2540
CPT1Code5				1325	2550
CPT1Code6				1326	2560
CPT1Code7				1327	2570
CPT1Code8				1328	2580
CPT1Code9				1329	2590
CPT1Code10				1330	2600
OREntryDT				1335	2610
ORExitDT				1336	2620
IntubateDT				1337	2670
ExtubateDT				1338	2680
SIStartDT				1341	2690
SIStopDT				1342	2700
AbxSelect				1345	2710
AbxTiming				1346	2720
AbxDisc				1347	2730
CPBUtil				1350	1350	2740
CPBCmb				1360	1360	2750

ShortName	2_35	2_41	2_52_1	2_61	2_73
CPBCmbR			1370	1370	2760
PerfusTm	4360	4360	1380	1380	2770
LwstTemp					2780
LwstHct					2790
CanArtStAort					2851
CanArtStFem					2852
CanArtStAx					2853
CanArtStOth					2854
CanVenStFem					2856
CanVenStJug					2857
CanVenStRtA					2858
CanVenStLfA					2859
CanVenStPulm					2861
CanVenStBi					2862
CanVenStOth					2863
CircArr				1381	2865
DHCATm				1382	2866
CPerfUtil					2867
CPerfTime					2868
CPerfTyp					2869
AortOccl	3880	3880	1400	1400	2870
XClampTm	4350	4350	1410	1410	2880
CplegiaDeliv					2900
CplegiaType					2901
CerOxUsed					2930
PreRSO2Lft				1422	2940
PreRSO2Rt				1423	2950
CumulSatLft				1424	2960
CumulSatRt				1425	2970
COFirstInd				1426	2980
SCRSO2Lft				1427	2990
SCRSO2Rt				1428	3000
ConCalc					3005
AsmtAscAA					3010
AsmtAoDx					3020
AsmtAPln					3030
IBldProd			1460	1460	3040
IBldProdRef				1461	3050
IBdRBCU			1470	1470	3060
IBdFFPU			1480	1480	3070
IBdCryoU			1490	1490	3080
IBdPlatU			1500	1500	3090
IBdFactorVII					3091

ShortName	2_35	2_41	2_52_1	2_61	2_73
IMedEACA				1511	3120
IMedTran				1513	3140
InOpTEE					3157
PRepAR					3158
PRepMR					3159
PRepTR					3161
CABHybrPCI					3165
HybrStat					3170
HybrProc					3180
DistArt	2570	2570	1520	1520	3190
DistVein	2580	2580	1530	1530	3200
DistVeinHTech				1531	3205
SaphHrvstT				1532	3206
SaphPrepT					3207
IMAArtUs	2590	2590	1560	1560	3210
NoIMARsn					3220
NumIMADA	2660	2660	1580	1580	3230
IMATechn	4070	4070	1570	1570	3240
NumRadArtUs					3260
NumRadDA	2680	2680	1600	1600	3270
RadHTech				1601	3280
RadHrvstT				1602	3285
RadPrepT					3286
NumOArtD			1620	1620	3300
CABDisLoc01					3355
CABPctSten01					3356
CABPrevCon01					3357
CABProximalSite01					3360
CABProxTech01					3370
CABConduit01					3380
CABDistSite01					3390
CABDistTech01					3400
CABDistPos01					3410
CABEndArt01					3420
CABHyPCI01					3430
CAB02					3440
CABDisLoc02					3445
CABPctSten02					3446
CABPrevCon02					3447
CABProximalSite02					3450
CABProxTech02					3460
CABConduit02					3470
CABDistSite02					3480

ShortName	2_35	2_41	2_52_1	2_61	2_73
CABDistTech02					3490
CABDistPos02					3500
CABEndArt02					3510
CABHyPCl02					3520
CAB03					3530
CABDisLoc03					3535
CABPctSten03					3536
CABPrevCon03					3537
CABProximalSite03					3540
CABProxTech03					3550
CABConduit03					3560
CABDistSite03					3570
CABDistTech03					3580
CABDistPos03					3590
CABEndArt03					3600
CABHyPCl03					3610
CAB04					3620
CABDisLoc04					3625
CABPctSten04					3626
CABPrevCon04					3627
CABProximalSite04					3630
CABProxTech04					3640
CABConduit04					3650
CABDistSite04					3660
CABDistTech04					3670
CABDistPos04					3680
CABEndArt04					3690
CABHyPCl04					3700
CAB05					3710
CABDisLoc05					3715
CABPctSten05					3716
CABPrevCon05					3717
CABProximalSite05					3720
CABProxTech05					3730
CABConduit05					3740
CABDistSite05					3750
CABDistTech05					3760
CABDistPos05					3770
CABEndArt05					3780
CABHyPCl05					3790
CAB06					3800
CABDisLoc06					3805
CABPctSten06					3806

ShortName	2_35	2_41	2_52_1	2_61	2_73
CABPrevCon06					3807
CABProximalSite06					3810
CABProxTech06					3820
CABConduit06					3830
CABDistSite06					3840
CABDistTech06					3850
CABDistPos06					3860
CABEndArt06					3870
CABHyPCI06					3880
CAB07					3890
CABDisLoc07					3895
CABPctSten07					3896
CABPrevCon07					3897
CABProximalSite07					3900
CABProxTech07					3910
CABConduit07					3920
CABDistSite07					3930
CABDistTech07					3940
CABDistPos07					3950
CABEndArt07					3960
CABHyPCI07					3970
CAB08					3980
CABDisLoc08					3985
CABPctSten08					3986
CABPrevCon08					3987
CABProximalSite08					3990
CABProxTech08					4000
CABConduit08					4010
CABDistSite08					4020
CABDistTech08					4030
CABDistPos08					4040
CABEndArt08					4050
CABHyPCI08					4060
CAB09					4070
CABDisLoc09					4075
CABPctSten09					4076
CABPrevCon09					4077
CABProximalSite09					4080
CABProxTech09					4090
CABConduit09					4100
CABDistSite09					4110
CABDistTech09					4120
CABDistPos09					4130

ShortName	2_35	2_41	2_52_1	2_61	2_73
CABEndArt09					4140
CABHyPCI09					4150
CAB10					4160
CABDisLoc10					4165
CABPctSten10					4166
CABPrevCon10					4167
CABProximalSite10					4170
CABProxTech10					4180
CABConduit10					4190
CABDistSite10					4200
CABDistTech10					4210
CABDistPos10					4220
CABEndArt10					4230
CABHyPCI10					4240
VSAV					4270
VSAVPr					4280
VSAVRComA					4282
VSAVRRingA					4283
VSAVRLPlic					4284
VSAVRLResect					4285
VSAVRPTFE					4286
VSAVRLPPatch					4287
VSAVRComRS					4288
VSAVRDeb					4289
VSAVRRaphe					4290
VSTCV					4295
VSTCVR					4300
AnlrEnl			1670	1670	4310
ResectSubA					4311
VSAoIm	3250	3250	1690	1690	4330
VSAoImSz	3260	3260	1700	1700	4340
VSMV					4351
VSMVPr					4352
VSMitRAnnulo					4361
VSMitRLeafRes					4362
VSLeafResTyp					4380
VSLeafRepLoc					4390
VSMitRSlidP					4391
VSMitRADecalc					4393
VSMitRPTFE					4394
VSNeoChNum					4400
VSMitRChord					4401
VSMitRLeafERP					4402

ShortName	2_35	2_41	2_52_1	2_61	2_73
VSMitREdge					4403
VSMitRMitComm					4404
MitralIntent				1641	4410
VSMiIm	3310	3310	1750	1750	4430
VSMiImSz	3320	3320	1760	1760	4440
VSChorPres					4450
OpTricus	2370	2370	1650	1650	4500
OpTricusAnTy					4510
VSTrIm	3370	3370	1810	1810	4540
VSTrImSz	3380	3380	1820	1820	4550
OpPulm	2380	2380	1660	1660	4560
VSPulm	3430	3430	1870	1870	4580
VSPulmSz	3440	3440	1880	1880	4590
IABP	4480	4480	1430	1430	4610
IABPWhen	4490	4490	1440	1440	4620
IABPInd	4500	4500	1450	1450	4630
IABPRemDt					4640
CathBasAssist					4660
CathBasAssistDev					4670
CathBasAssistWhen					4690
CathBasAssistInd					4700
CathBasAssistRemDt					4710
ECMO					4730
ECMOWhen					4740
ECMOInd					4750
PrevVAD			1920	1920	4760
PrevVADF				1921	4770
PrevVADD					4771
PrevVADIn					4772
PrevVADTy					4773
PrevVADDevice					4774
VADInd			1930	1930	4790
VImpTy			2030	2030	4850
VProdTy			2040	2040	4880
VImpDt			2050	2050	4890
VExp			2060	2060	4900
VExpDt			2070	2070	4910
VExpRsn			2080	2080	4920
VTxDt			2100	2100	4930
VImp2				2129	4940
VImpTy2			2130	2130	4950
VProdTy2			2140	2140	4980
VImpDt2			2150	2150	4990

ShortName	2_35	2_41	2_52_1	2_61	2_73
VExp2			2160	2160	5000
VExpDt2			2170	2170	5010
VExpRsn2			2180	2180	5020
VTxDt2			2200	2200	5030
VImp3				2209	5040
VImpTy3			2210	2210	5050
VProdTy3			2220	2220	5080
VImpDt3			2230	2230	5090
VExp3			2240	2240	5100
VExpDt3			2250	2250	5110
VExpRsn3			2260	2260	5120
VTxDt3			2280	2280	5130
PVCmpBld			2290	2290	5140
PVCmpESt			2300	2300	5150
PVCmpDCI			2310	2310	5160
PVCmpPPI			2320	2320	5170
PVCmpEnd			2330	2330	5180
PVCmpMal			2340	2340	5190
PVCmpHem					5191
PVCmpBO				2341	5200
VADDiscS			2350	2350	5210
OCarLVA	4150	4150	2360	2360	5220
OCarVSD	4160	4160	2370	2370	5230
OCarASD	4170	4170	2380	2380	5240
OCarASDTy					5241
OCarSVR		4185	2400	2400	5290
OCarCong	4190	4190	2410	2410	5300
OCarCongDiag1					5310
OCarCongDiag2					5320
OCarCongDiag3					5330
OCarCongProc1					5340
OCarCongProc2					5350
OCarCongProc3					5360
OCarLasr	4200	4200	2420	2420	5370
OCarTrma	4210	4210	2430	2430	5380
OCarCrTx	4220	4220	2440	2440	5390
OCarACD			2450	2450	5400
OCarACDLI					5410
OCarACDLE					5430
OCarAFibSur					5450
OCarAFibSurLoc					5451
OCarAFibSurLAA					5452
OCarAFibMethRad					5455

ShortName	2_35	2_41	2_52_1	2_61	2_73
OCarAFibMethUltra					5456
OCarAFibMethCryo					5457
OCarAFibMethMicro					5458
OCarAFibMethLas					5459
OCarAFibMethCAS					5460
OCarAFibAProc					5465
OCAoProcType					5471
ONCAoRt					5473
ONCAoGraft					5474
ONCAsc			2520	2520	5480
ONCArch			2530	2530	5490
ONCArchRepExt					5491
ONCDesc			2540	2540	5500
ONCThAbd			2550	2550	5510
ONCThAbdGraft					5511
ONCThAbdInterVes					5512
ONCThAbdLumCSF					5513
ONCThAbdExtent					5514
AoDisAc					5516
AoDisTyp					5517
AoTrTyp					5518
EndoProc					5520
EndoProcDeb					5521
OCTumor					5530
OCPulThromDis					5540
OCarOthr	4250	4250	2560	2560	5550
ONCCarEn	4320	4320	2570	2570	5560
ONCOVasc	4330	4330	2580	2580	5570
ONCOThor	4340	4340	2590	2590	5580
ONCOther			2600	2600	5590
PostCreat				2605	5610
BldProd	4630	4630	2610	2610	5620
BdRBCU			2620	2620	5630
BdFFPU			2630	2630	5640
BdCryoU			2640	2640	5650
BdPlatU			2650	2650	5660
ExtubOR			2660	2660	5670
ReIntub		4678	2680	2680	5680
VentHrsA		4679	2690	2690	5690
ICUVisit			300	300	5700
ICUInHrs		354	310	310	5710
ICUReadm		355	320	320	5720
ICUAdHrs		356	330	330	5730

ShortName	2_35	2_41	2_52_1	2_61	2_73
POpTTEch					5744
POpTTAR					5745
POpTTMR					5746
POpTTTR					5747
POpEFD					5748
POpEF					5749
POpEnzDrawn					5750
POpPkCKMB					5751
POpPkTrI					5752
POpPkTrT					5753
POpEKG					5754
POpImagStdy					5755
Complics	4760	4760	2710	2710	5759
COpReBld	4840	4840	2720	2720	5760
COpReBldTim					5770
COpReVlv	4850	4850	2730	2730	5780
COpReGft	4860	4860	2740	2740	5790
COpReOth	4870	4870	2750	2750	5800
COpReNon	4880	4880	2760	2760	5810
COpPlndDelay					5811
CSternal					5830
CSternalDehis					5840
SurSInf					5841
CSternalSupInf					5850
CIStDeep	4920	4920	2780	2780	5860
CSternalMedia					5870
CSternalMediaDtDiag					5880
CSternalMediaSPOpen					5890
CSternalMediaSPWVac					5900
CSternalMediaSPMuscle					5910
CSternalMediaSPOmental					5920
CIThor	4930	4930	2790	2790	5930
CILeg	4940	4940	2800	2800	5940
WndIntOpen					5960
WndIntWVac					5970
CSepsis					6010
CSepsisPBC					6020
CNStrokP	5000	5000	2830	2830	6030
CNStrokTTIA				2841	6040
CNComaEnceph					6070
CNParal				2851	6110
CNParalTy				2852	6120
CPVntLng	5050	5050	2860	2860	6130

ShortName	2_35	2_41	2_52_1	2_61	2_73
CPPneum	5100	5100	2880	2880	6150
CVTE					6160
PulmEmb					6170
DVT					6180
CPlEff					6190
CRenFail	5120	5120	2890	2890	6200
CRenDial		5130	2900	2900	6210
DialDur					6220
CUltraFil					6230
CVaIlFem	5230	5230	2910	2910	6240
CVaLbIsc	5240	5240	2920	2920	6250
CRhythmDis					6270
COtArrst	5270	5270	2940	2940	6280
COtCoag	5280	5280	2950	2950	6290
COtTamp	5290	5290	2960	2960	6300
COtGI	5300	5300	2970	2970	6310
COtMSF	5310	5310	2980	2980	6320
COtAFib	5320	5320	2990	2990	6330
CVaAoDis	5220	5220	3000	3000	6340
RecLarynNrvInj					6341
PhrenNrvInj					6342
COtOther			3010	3010	6350
Mortalty		5337	3020	3020	6360
MtDCStat	5340	5340	3030	3030	6370
Mt30Stat	5350	5350	3040	3040	6380
Mt30StatMeth					6381
MtOpD	5400	5355	3050	3050	6390
MtDate	5360	5360	3060	3060	6400
MtLocatn	5370	5370	3070	3070	6410
MtCause	5380	5380	3080	3080	6420
DCADP			3090	3090	6430
DCAArhy			3100	3100	6440
DCASA		5331	3120	3120	6460
DCACE		5332	3130	3130	6470
DCBeta		5333	3140	3140	6480
DCLipid		5334	3150	3150	6490
DCLipMT			3160	3160	6500
DCCoum			3180	3180	6510
DCDirThromIn					6511
DisLoctn		5336	3190	3190	6520
CardRef			3200	3200	6530
SmokCoun			3210	3210	6540
Readm30	5500	5500	3220	3220	6550

ShortName	2_35	2_41	2_52_1	2_61	2_73
ReadmRsn	5510	5510	3230	3230	6560
ReadmPro			3240	3240	6570
PredMort	2530	5610	3250	3250	6590
PredDeep		5620	3260	3260	6600
PredReop		5630	3270	3270	6610
PredStro		5640	3280	3280	6620
PredVent		5650	3290	3290	6630
PredRenF		5660	3300	3300	6640
PredMM		5670	3310	3310	6650
Pred6D		5680	3320	3320	6660
Pred14D		5690	3330	3330	6670
STSCustNum1				3400	6680
STSCustNum2				3410	6690
STSCustNum3				3420	6700
STSCustNum4				3430	6710
STSCustNum5				3440	6720
STSCustTxt1				3450	6730
STSCustTxt2				3460	6740
STSCustTxt3				3470	6750
STSCustTxt4				3480	6760
STSCustTxt5				3490	6770
AnasDev			1550	1550	
AnasDevU			1540	1540	
Angina	1380	1380	780		
AngType	1390	1390	790		
AngUnstT	1400	1400			
Arrhyth	1450	1450	840	840	
ArrhyTyp	1460	1460	850		
CABUnpln	2550	2550			
CanAortAtr				1393	
CanAortFem				1391	
CanFemAtr				1394	
CanFemFem				1392	
Cannulat	3760	3760	1390		
CanOther				1395	
CarShTyp	1430	1430	820		
CIArm				2801	
CISeptic	4960	4960	2810	2810	
CIUTI	4970	4970			
ClassCCS	1530	1530			
CNComa	5030	5030	2850	2850	

ShortName	2_35	2_41	2_52_1	2_61	2_73
CNStrokT	5010	5010	2840		
CNStrokTRIND				2842	
CnvIndic	3520	3520			
CnvStdIn	3510	3510			
ConvCPB		3479			
COpPerMI	4890	4890	2770	2770	
CorShunt	3930	3930			
COtHtBlk	5260	5260	2930	2930	
CPBUsed	3750	3478			
Cplegia	4380	4380	1420	1420	
CPPulEmb	5070	5070	2870	2870	
CVDComa				551	
CVDNInvas				556	
CVDRIND				554	
CVDType	700	700	550		
DCAArMN			3110	3110	
DCAntPlt		5335			
FlowPtcy	4080	4080			
HDPAD		1915	1100	1100	
HDPAMean	1940	1940	1110	1110	
HPVCI			1980	1980	
HPVCVP			1960	1960	
HPVPCWP			1950	1950	
HPVPVO2			2020		
HPVPVO2M			2010		
HPVPVR			1970		
HPVRVEF			1990	1990	
HPVRVMth			2000		
Hyprchol	510	510	420		
IMedAprot				1509	
IMedAprotD				1510	
IMedDesmo				1512	
IndMnInv	3480	3480			
IntPVAD			1940	1940	
IschTCFX	3970				
IschTLAD	3950				
IschTRCA	3960				
LVADInf			2110	2032	

ShortName	2_35	2_41	2_52_1	2_61	2_73
LVADinf2				2131	
LVADInf3				2211	
MedACEI		1670	900	900	
MedADPI			1020		
MedAPlt		1710			
MedDig	1640	1640			
MedDiur	1730	1730			
MI	1340	1340	750		
NumGEPDA	2700	2700	1610	1610	
NumIncis	3500	3500			
OCarACDL			2460	2460	
OCarAFES			2480		
OCarAFib			2470	2470	
OCarAICD	4240	4240			
OCarBati	4180	4180	2390	2390	
OCarPace	4230	4230			
ONCAoAn	4260	4260	2510	2510	
OpAortic	2350	2350	1630	1630	
OpMinInv	2500				
OpMitral	2360	2360	1640	1640	
PatMInit	100	100	120	120	
Payor	290	290	250		
POCPaceT			650		
PrCBNum	740	740			
PrCNNum	750	750			
PredCoefVrsn				3249	
PrimInc	3490	3490			
PrNSBall	1280	1280			
PrNSStnt	1230	1230			
PrPTCA	1160	1160			
PrPTIntv	1190	1190			
Race	210	210	190		
RadArtUs	2670	2670	1590	1590	
RecComp	70	70	90		
RenFail	530	530	440		
RVADInf			2120	2033	
RVADinf2				2132	
RVADInf3				2212	

ShortName	2_35	2_41	2_52_1	2_61	2_73
SameDay	350	350			
SIStartT		4347	1330		
SIStopT		4348	1340		
SmokCurr	450	450	380		
Smoker	440	440	370		
StntIntv		1235			
STSTLink		54	70	70	
SurgGrp	2235	2235			
SurgID			1220		
SutrTech	4040	4040			
ThrIntvl	1260	1260			
Thrmblys	1240	1240			
TotHrICU		357	340	340	
VAD	4550	4550	1300	1300	
VADListVrsn				1922	
ValveVrsn				1881	
VCardTx			2090		
VCardTx2			2190		
VCardTx3			2270		
VentHrs	4680	4680	2700		
VentHrsI		4676	2670		
VSAoEx	3280	3280			
VSAoExSz	3290	3290			
VSAoExTy	3270	3270			
VSAoImTy	3240	3240	1680	1680	
VslStblz	4050	4050			
VSMiEx	3340	3340			
VSMiExSz	3350	3350			
VSMiExTy	3330	3330			
VSMiImTy	3300	3300	1740	1740	
VSPuEx	3460	3460			
VSPuExSz	3470	3470			
VSPuExTy	3450	3450			
VSPuImTy	3420	3420	1860	1860	
VSTrEx	3400	3400			
VSTrExSz	3410	3410			
VSTrExTy	3390	3390			

ShortName	2_35	2_41	2_52_1	2_61	2_73
VSTrlmTy	3360	3360	1800	1800	