ASCEND Analytics®

Creating Custom Reports

Software versions:

ASCEND Analytics: 3.x, 4.x, 5.x, 6.x, 7.x

MS SQL Server / SSRS: 2012 - 2016

MS SSRS Report Builder: 3.0 (2012)

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Introduction

ASCEND Analytics is a query engine that leverages the power of structured data and ASCEND's unified cardiology schema to measure and report on productivity, outcomes, and best practices. It can be used as a stand-alone query tool or integrated with other analytic tools.

ASCEND Analytics (AA) supports cardiovascular administrative reporting, including ICAEL and ICAVL, as well as powerful ad hoc queries within and across modalities. Built on SQL Server 2012/2016 Reporting Services, ASCEND Analytics allows you to fine-tune existing reports and create new reports. AA's Clinical Schema Inspector (CSI) tool allows clinicians and analysts to work together to identify relevant data from structured clinical reports. Using the combination of ASCEND Analytics, CSI, and Microsoft Report Builder, you can build custom reports to fit your individualized reporting needs.

About this Guide

This advanced tutorial is intended for individuals who are familiar with ASCEND Analytics and the reporting application. It is also assumed that the user has some knowledge of SQL server, and can write basic SQL statements. Starting off with an overview of the process steps to create and modify new reports, this guide is designed to help you understand the flow of the report building process, and walk you through the steps to modify an existing report.

The second section of this guide explains the overall architecture of the ASCEND Analytics database and covers the specific exceptions/nuances of how the data is recorded and searched upon.

The goal of this advanced tutorial is to make you comfortable with building custom reports and to give you confidence when navigating through the various tools. This guide will not teach you how to write SQL code or use Microsoft Reporting Services tools, but it will provide you with the skills to build a custom report, and the confidence to look deeper into the advanced options and features of the database.

Definitions

This section provides definitions for some of the new terms you may encounter throughout this guide.

Case List Report

A case report displays the list of the individual cases, or studies, that match the criteria of the database query.

Dataset

Datasets contain information about the sets of data to display as a part of the report. The value of the Name attribute for the Dataset element must be unique within the report.

Data Source

The name of the server that contains the database.

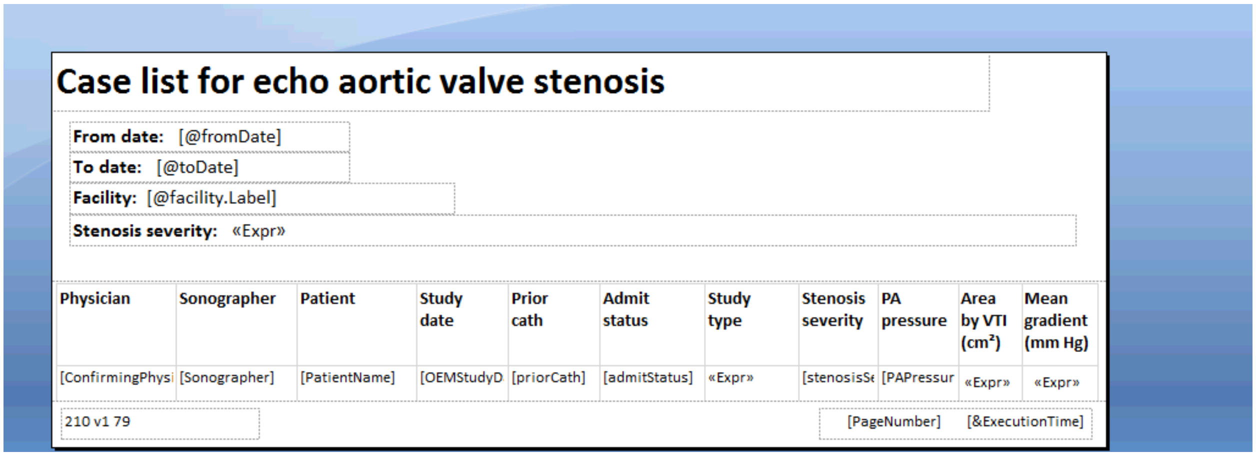
Expression

The **Expression** dialog box is used to write Microsoft Visual Basic expressions for report item properties. You can use expressions to set many properties, including color, font, and borders. At run time, the report processor evaluates expressions and substitutes the result for the value of the property.

When creating reports in SQL Server Report Builder, all data displayed in the report that was retrieved from the database is first evaluated by an expression to determine which values to display. Even the defined field values in a dataset are evaluated by a simple expression before being displayed in the report. Report Builder generates the expression syntax for these simple operations automatically. However, if your report requires a more complex conditional evaluation of values, you can create expressions to generate the data that you need to display in the report.

Field Values

In many cases in Report Builder, the value of the database field is exactly what you want to display in your report. For example, in the "Case List for Echo Aortic Valve Stenosis" report, a column labeled “Patient” displays the patient’s name.



Case list for echo aortic valve stenosis

From date: [@fromDate]

To date: [@toDate]

Facility: [@facility.Label]

Stenosis severity: «Expr»

Physician	Sonographer	Patient	Study date	Prior cath	Admit status	Study type	Stenosis severity	PA pressure	Area by VTI (cm²)	Mean gradient (mm Hg)
[ConfirmingPhysi	[Sonographer]	[PatientName]	[OEMStudyD	[priorCath]	[admitStatus]	«Expr»	[stenosisSe	[PAPressur	«Expr»	«Expr»

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PatientName is a field defined in the dataset named "Dset". Because the values stored in *PatientName* are the actual patient's name, you can add the dataset field *PatientName* directly to the report. In some cases, however, they are not the same and care should be taken to understand the difference.

GEV

GEV, or Global Enumerated Value, is a number associated with a specific value in the database. For example, in the table *studyData*, in the field *purpose*, you will find a GEV number of 21819 whenever the study has "screening" recorded. 21819 is a GEV number that always represents a screening procedure. This value may be found in several different tables.

Parameters

From Microsoft Developer Network*:

> "Report parameters enable you to control report data by filtering the data, connect related reports together, and vary the report presentation. To design a report that uses parameters effectively, you must understand how parameters and dataset queries are related, how to include parameters in expressions, and how to manage parameters independently from a report definition on the report server…"

*Source: Microsoft.com. SQL Server 2016. Retrieved from https://docs.microsoft.com/en-us/sql/reporting-services/report-design/report-parameters-report-builder-and-report-designer?view=sql-server-2016

Parameter values can be typed in by the user (such as numbers). They can also be selected from a set of hard coded values (like 'TTE', 'TEE', and 'Stress' study types), or selected from a list generated by a query (such as a list of facilities or physicians). When selecting a report, parameters have an impact on which report you choose.

Lastly, list parameters (drop downs) may be single-select or multi-select.

SSRS

The ASCEND Analytics user interface is based on the Microsoft application SSRS 2012/2016 (SQL Server Reporting Services) Report Manager.

Summary Report

This is a report that summarizes data for a set of studies and returns aggregate information such as counts or averages. A summary report compiles data; for example, it can show the number of studies for each physician.

Overview of the Process

This section walks you through the general steps required for custom report creation with ASCEND Analytics (AA). The ASCEND Analytics database contains all the data recorded in your structured reporting application.

Note: When a study is signed in your application, the recorded data is sent to the AA database.

The basic steps in building a custom report are:

1 Gather requirements (prerequisite before starting the process).

2 Select a starting report to work from.

- Open the ASCEND Analytics web application in Internet Explorer.
- In AA, click the Report Builder button (only available if you have sufficient privileges to edit a report).
- Microsoft SQL Server Report Builder opens.
- Locate and open the report that is most similar to what you want to edit.

3 Determine location of data (Use the CSI tool to identify which database fields and values to query.)

4 Write, implement, and test the report.

- Perform the necessary changes to create the new report in Report Builder, such as modifying the datasets and report body.
- Save the report to your personal folder.

5 Deploy the report.

- If the report is to be shared, the administrator needs to copy the new report to one of the common folders, so it can be accessed by all users.

Viewing the Standard Reports in ASCEND Analytics

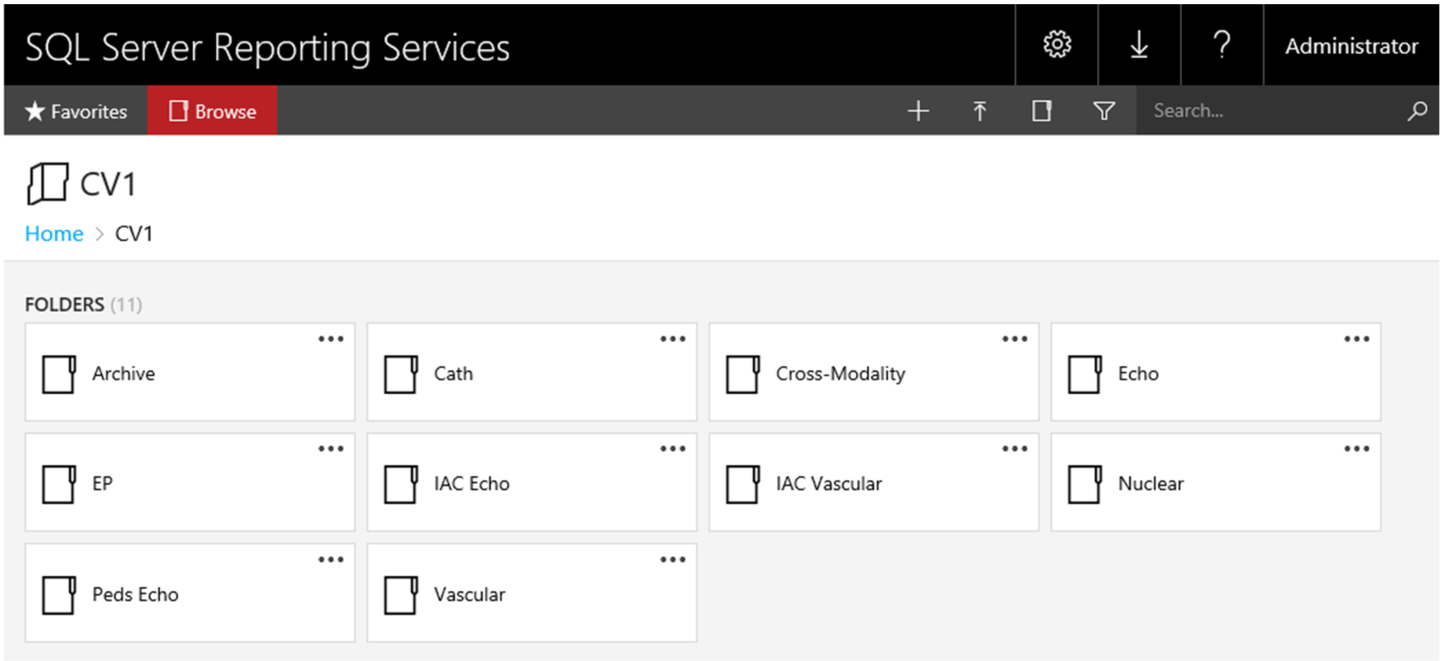
Before getting started, it may be helpful to review the reports in the ASCEND Analytics application. The ASCEND Analytics user interface is based on the Microsoft application SSRS 2012/2016 (SQL Server Reporting Services) Report Manager.

The main functions of the ASCEND Analytics application are to view/print/export reports, schedule reports for execution, and manage user access rights to the report content (the last function is available only to administrators).

To view the standard reports included with your system, follow these basic steps:

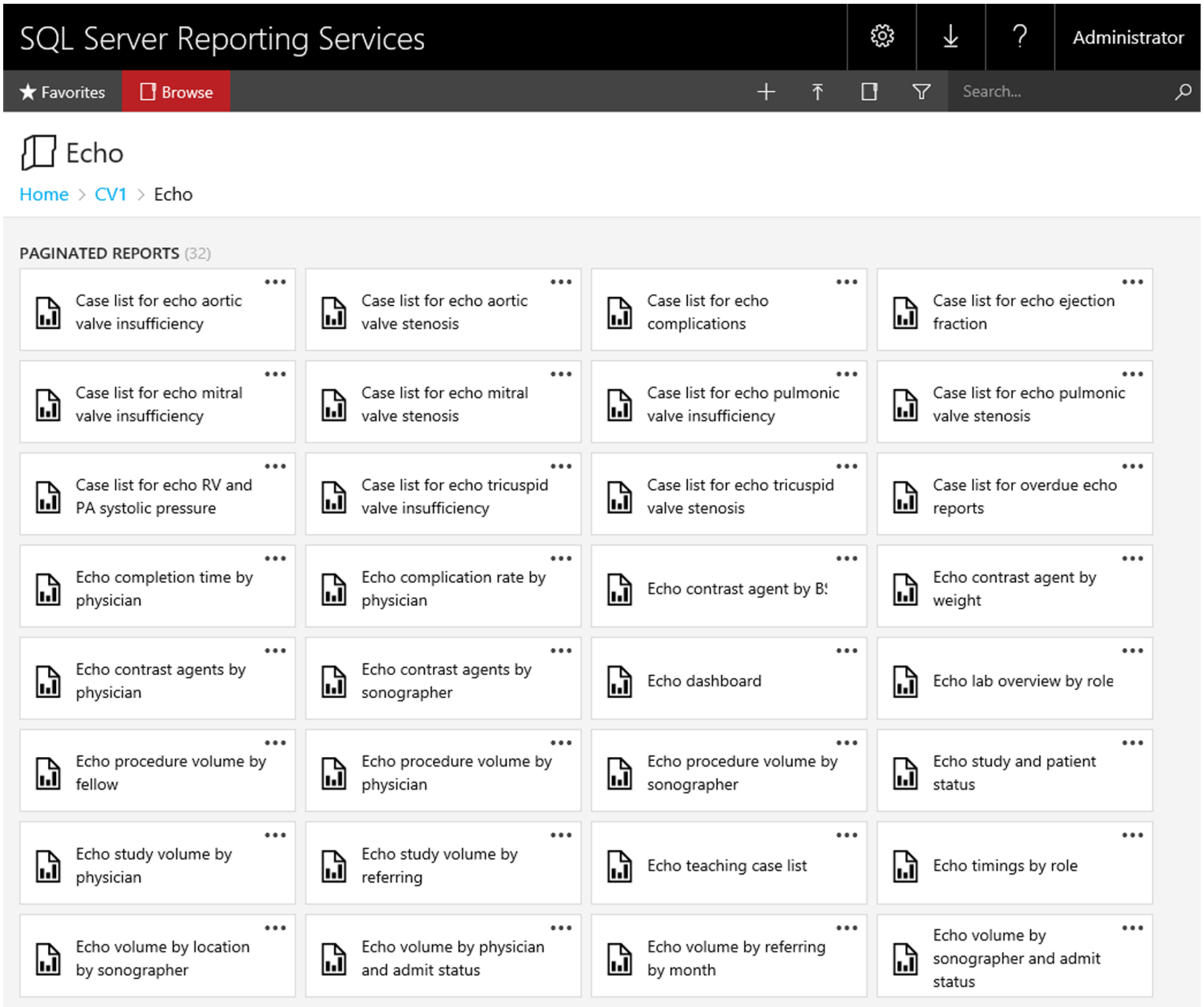
I To view a list of all the standard reports, open ASCEND Analytics in Internet Explorer.

2 In the Home folder, you will see the available reporting module folders. Select the *Echo* folder.



Note: The list of reports you see will vary from location to location.

3 Select *Case list for echo aortic valve stenosis* for the report.



Echo

Home > CV1 > Echo

PAGINATED REPORTS (32)

Case list for echo aortic valve insufficiency	Case list for echo aortic valve stenosis	Case list for echo complications	Case list for echo ejection fraction
Case list for echo mitral valve insufficiency	Case list for echo mitral valve stenosis	Case list for echo pulmonic valve insufficiency	Case list for echo pulmonic valve stenosis
Case list for echo RV and PA systolic pressure	Case list for echo tricuspid valve insufficiency	Case list for echo tricuspid valve stenosis	Case list for overdue echo reports
Echo completion time by physician	Echo complication rate by physician	Echo contrast agent by B!	Echo contrast agent by weight
Echo contrast agents by physician	Echo contrast agents by sonographer	Echo dashboard	Echo lab overview by role
Echo procedure volume by fellow	Echo procedure volume by physician	Echo procedure volume by sonographer	Echo study and patient status
Echo study volume by physician	Echo study volume by referring	Echo teaching case list	Echo timings by role
Echo volume by location by sonographer	Echo volume by physician and admit status	Echo volume by referring by month	Echo volume by sonographer and admit status

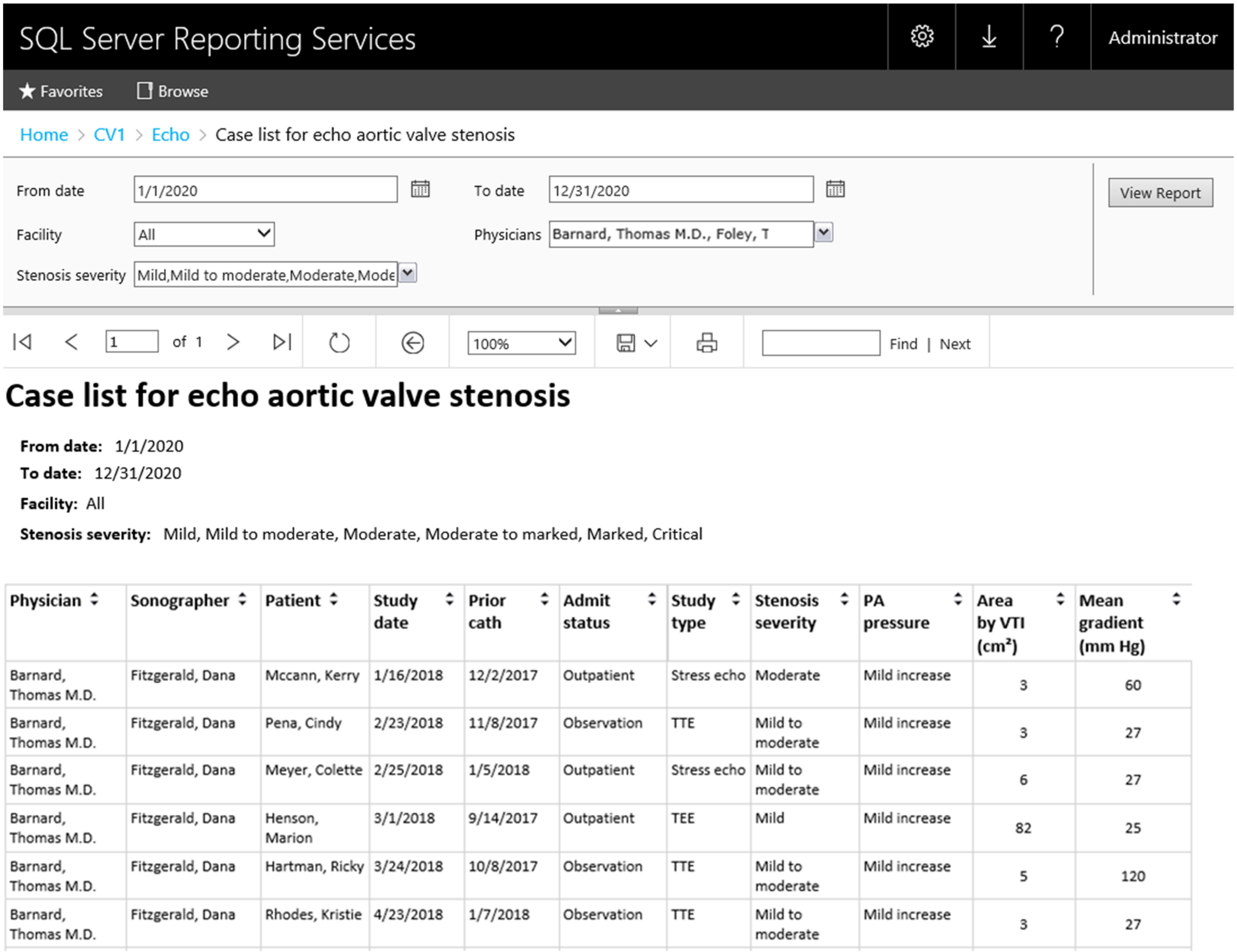
4 Enter a range of dates for the **From Date** and **To Date**.

5 Select a **Facility** or use the default value.

6 Select a **Physician** or use the default value.

7 Select the **Stenosis severity** or use the default value.

8 Click **View Report**, and after a few seconds, the report will appear on the screen.



Home > CV1 > Echo > Case list for echo aortic valve stenosis

From date: 1/1/2020
To date: 12/31/2020
Facility: All
Physicians: Barnard, Thomas M.D., Foley, T
Stenosis severity: Mild,Mild to moderate,Moderate,Mode

Page: 1 of 1
Zoom: 100%

Case list for echo aortic valve stenosis

From date: 1/1/2020
To date: 12/31/2020
Facility: All
Stenosis severity: Mild, Mild to moderate, Moderate, Moderate to marked, Marked, Critical

Physician	Sonographer	Patient	Study date	Prior cath	Admit status	Study type	Stenosis severity	PA pressure	Area by VTI (cm²)	Mean gradient (mm Hg)
Barnard, Thomas M.D.	Fitzgerald, Dana	Mccann, Kerry	1/16/2018	12/2/2017	Outpatient	Stress echo	Moderate	Mild increase	3	60
Barnard, Thomas M.D.	Fitzgerald, Dana	Pena, Cindy	2/23/2018	11/8/2017	Observation	TTE	Mild to moderate	Mild increase	3	27
Barnard, Thomas M.D.	Fitzgerald, Dana	Meyer, Colette	2/25/2018	1/5/2018	Outpatient	Stress echo	Mild to moderate	Mild increase	6	27
Barnard, Thomas M.D.	Fitzgerald, Dana	Henson, Marion	3/1/2018	9/14/2017	Outpatient	TEE	Mild	Mild increase	82	25
Barnard, Thomas M.D.	Fitzgerald, Dana	Hartman, Ricky	3/24/2018	10/8/2017	Observation	TTE	Mild to moderate	Mild increase	5	120
Barnard, Thomas M.D.	Fitzgerald, Dana	Rhodes, Kristie	4/23/2018	1/7/2018	Observation	TTE	Mild to moderate	Mild increase	3	27

If the standard reports do not include a report for the data you wish to query, it is necessary to edit and create a new report. The following sections of the guide give an overview of that process.

Step 1: Gather Requirements

If the standard ASCEND Analytics reports do not query the data you need to find, it is necessary to build a custom report. Before you start, review and decide what type of data you are searching for. Before you start building or modifying a AA report, the following questions should be answered:

- What type of problem are you trying to solve?
- What type of edit is being made?
    - Are you modifying an existing report and saving it as a new report? For example, adding a field, or modifying the report's logic to fulfill a different purpose.
    - Are you creating a completely new report? (Nothing similar exists in the standard reports).
- What should the new/modified report accomplish?
- What study findings need to be in this report, and how will they be used?

Explanation of the Sample Report Created throughout the Overview

Note: Sample explanations are in green italics throughout the tutorial.

The following sections of this overview will show you how to build a report called "Case list of heart rates for screening cases". This will be a very simple report to illustrate the tools used to edit and create a new report. (A Case List report returns one row of data for each study that meets the conditions of the search.) This report will display the recorded heart rates for all the Echo studies that were recorded as "screening" studies. This report will use two of the most common data types: numeric (heart rate) and enumeration (screening). You will use Clinical Schema Inspector (CSI) to locate this data in the ASCEND Analytics database. Steps 2 through 5 walk you through this process.

Step 2: Select an Existing Report as a Starting Point

There are a number of report settings, some of them very subtle, that are inherited when you start with an existing report. Selecting an existing report ensures that all the basic report configuration settings are correct (e.g. server, data sources, parameters, etc.). Plus, this also allows you to reuse common elements. For example, the Facility parameter and the associated query are likely to be the same in all of your reports. Starting a report from scratch does not capture these settings and can introduce bugs into the report.

Since creating a report from scratch would be very time consuming, it is also much more efficient to select a similar report and modify it. First you must identify the existing report that you will use as the starting point for this process.

When selecting an existing report as a starting point, select one that is similar to the one you wish to create – especially regarding these aspects:

- **Reporting module:** Select an existing report from the same reporting module as the new report (Echo, Cath, EP, etc.). If you are creating a cross-modality report, select an existing report from one of the target modules.
- **Parameters:** Select an existing report that has some or all of the same parameters as the new report, especially the query parameters such as physician lists.
- **Data items:** Select a report that displays or uses some of the same data items as the new report, such as findings, patient details, study details, practitioner details.
- **Type:** Select a report of the same type as the new report; either Case listing report or Summary report.

Note: If you do not have administrative privileges, it may be necessary for the Administrator to copy the report into your personal folder.

To Start with an Existing Report:

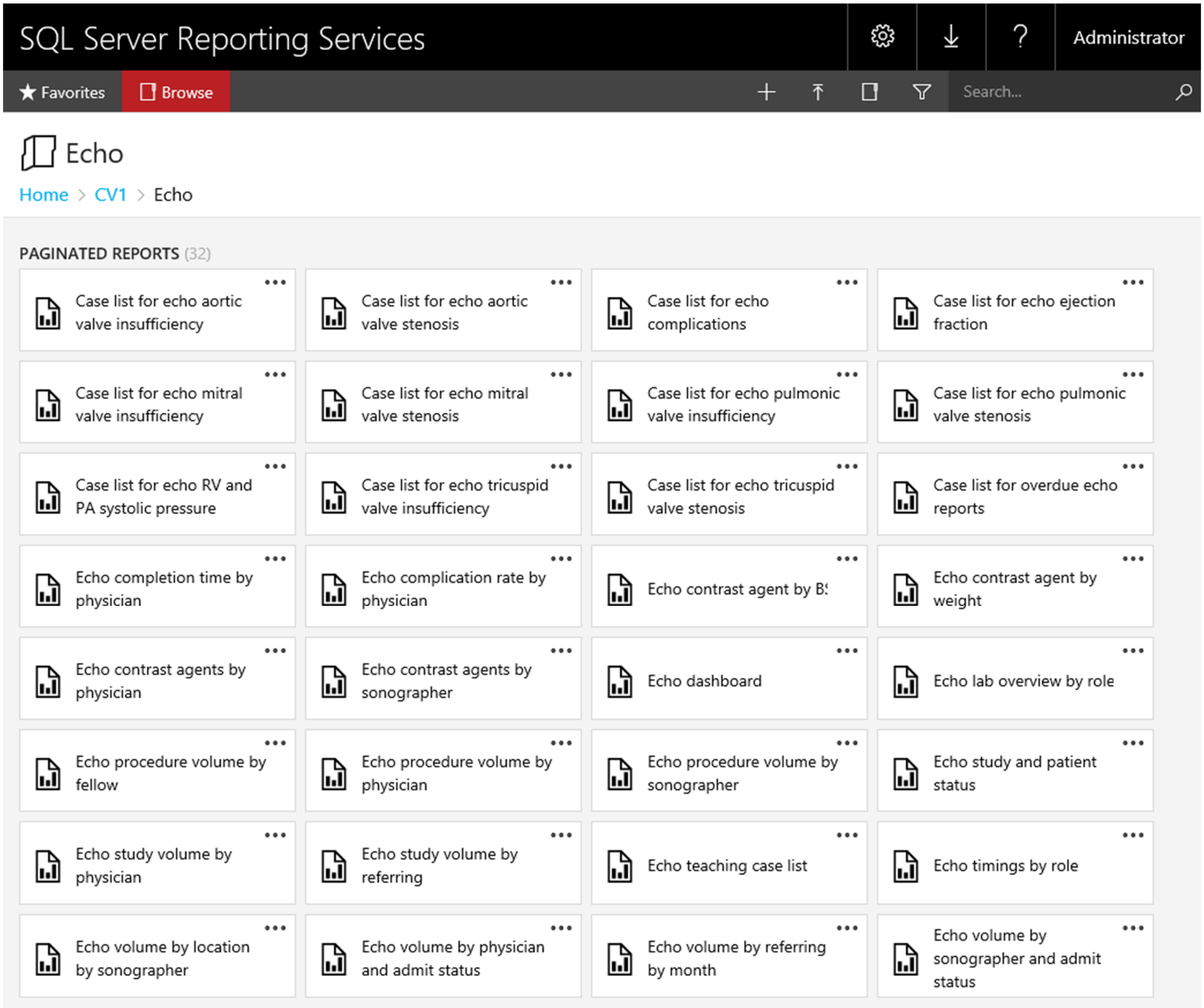
First you will locate a similar report called "Case list for echo aortic valve stenosis".

1 To locate one of the standard reports, open ASCEND Analytics in Internet Explorer.

2 Select the folder that is the closest match for the new report. Because the new report will display Echo studies, select the Echo folder.

3 Preview each of the reports in this folder and look for similarities to the new report. Because the new report is a case listing with a date range and facility parameters, select an existing report with those attributes.

Note: Most of the Echo case listing reports are a good starting point for this new report. For this tutorial, we will select “Case list for echo aortic valve stenosis”.



Echo

Home > CV1 > Echo

PAGINATED REPORTS (32)

Case list for echo aortic valve insufficiency

Case list for echo aortic valve stenosis

Case list for echo complications

Case list for echo ejection fraction

Case list for echo mitral valve insufficiency

Case list for echo mitral valve stenosis

Case list for echo pulmonic valve insufficiency

Case list for echo pulmonic valve stenosis

Case list for echo RV and PA systolic pressure

Case list for echo tricuspid valve insufficiency

Case list for echo tricuspid valve stenosis

Case list for overdue echo reports

Echo completion time by physician

Echo complication rate by physician

Echo contrast agent by B!

Echo contrast agent by weight

Echo contrast agents by physician

Echo contrast agents by sonographer

Echo dashboard

Echo lab overview by role

Echo procedure volume by fellow

Echo procedure volume by physician

Echo procedure volume by sonographer

Echo study and patient status

Echo study volume by physician

Echo study volume by referring

Echo teaching case list

Echo timings by role

Echo volume by location by sonographer

Echo volume by physician and admit status

Echo volume by referring by month

Echo volume by sonographer and admit status

Step 3: Determine the Location of the Data

The ASCEND Analytics database stores all clinical data collected by the physician reporting interface. In addition, a set of views has been created to display data items that were collected outside of the reporting interface, such as patient and practitioner information.

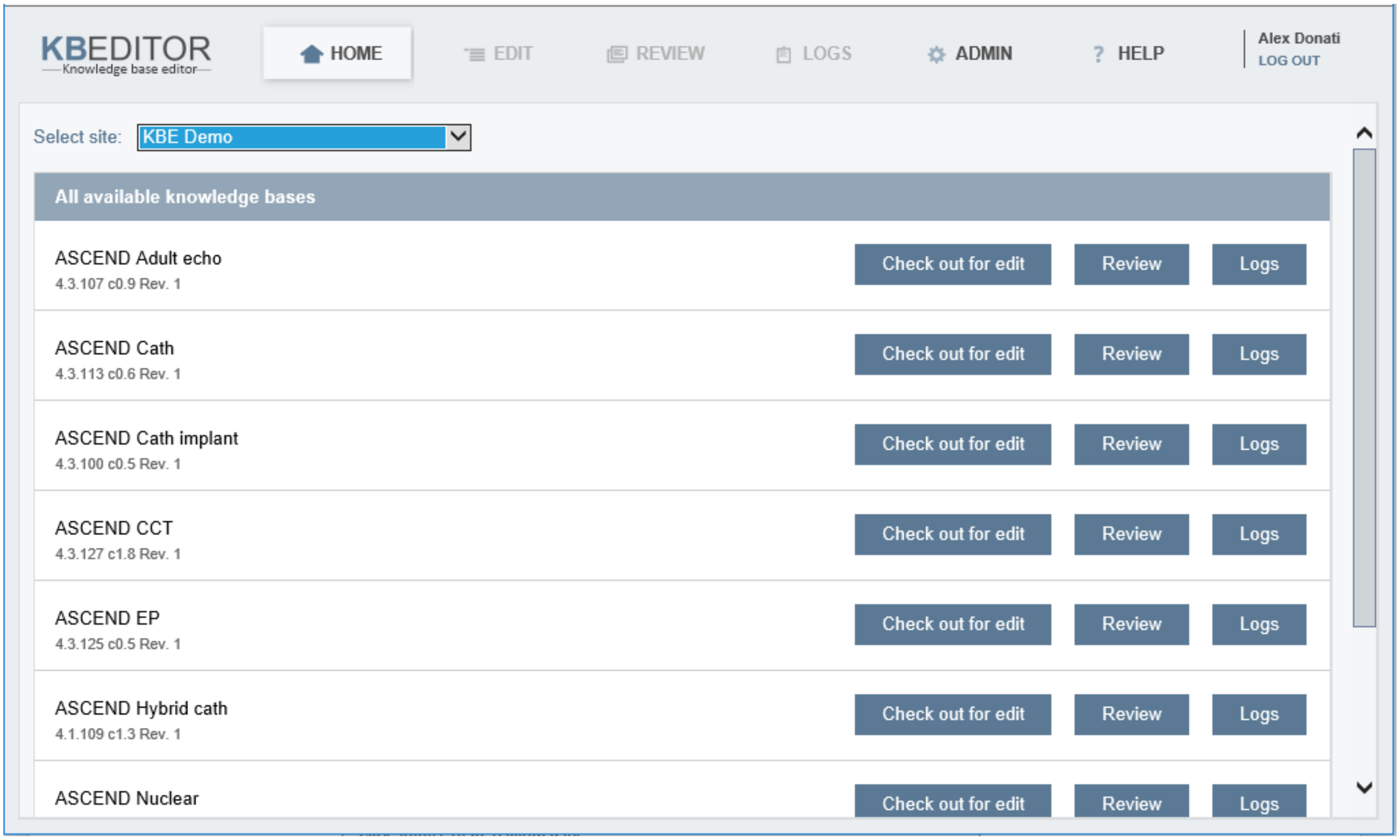
For all findings you wish to use in this report, use **Clinical Schema Inspector (CSI)** to find the appropriate tables, fields, and values where this data is stored in the AA database. CSI translates a finding you record in the reporting interface into a set of tables, fields, and values that describe how that data is stored in the AA database. The Clinical Schema Inspector functionality is provided to customers as part of the **KB Editor** application's Review panel.

Other data items not recorded through the reporting software are also available through AA views (e.g. patient name, study date, physician name, etc.).

Note: The CSI application is solely a documentation tool, and its use does not modify the AA database. The tool only shows where specific clinical reporting data would be stored in the ASCEND Analytics database – it does not record any data to the database.

To Determine the Location of Your Custom Report's Data

I Run KB Editor and locate the Knowledge base you are looking to query.



Select site: KBE Demo

All available knowledge bases

ASCEND Adult echo
4.3.107 c0.9 Rev. 1

ASCEND Cath
4.3.113 c0.6 Rev. 1

ASCEND Cath implant
4.3.100 c0.5 Rev. 1

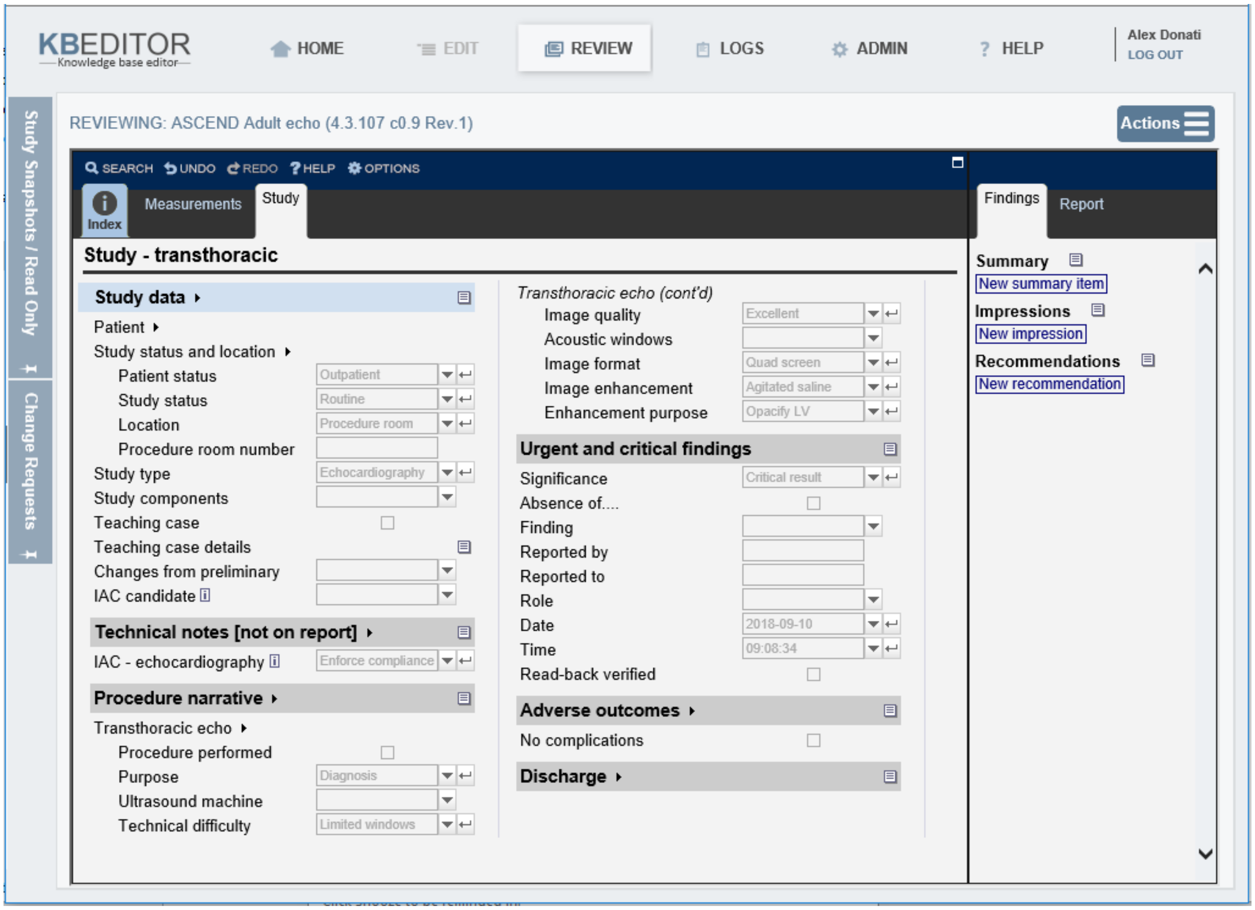
ASCEND CCT
4.3.127 c1.8 Rev. 1

ASCEND EP
4.3.125 c0.5 Rev. 1

ASCEND Hybrid cath
4.1.109 c1.3 Rev. 1

ASCEND Nuclear

2 Open the Knowledge base for Review: the KB Editor Review main screen appears.



REVIEWING: ASCEND Adult echo (4.3.107 c0.9 Rev.1)

Study - transthoracic

Study data

Patient

Study status and location

- Patient status: Outpatient
- Study status: Routine
- Location: Procedure room
- Procedure room number

Study type: Echocardiography

Study components

Teaching case □

Teaching case details

Changes from preliminary

IAC candidate

Technical notes [not on report]

IAC - echocardiography: Enforce compliance

Procedure narrative

Transthoracic echo

- Procedure performed □
- Purpose: Diagnosis
- Ultrasound machine
- Technical difficulty: Limited windows

Transthoracic echo (cont'd)

- Image quality: Excellent
- Acoustic windows
- Image format: Quad screen
- Image enhancement: Agitated saline
- Enhancement purpose: Opacify LV

Urgent and critical findings

Significance: Critical result

Absence of.... □

Finding

Reported by

Reported to

Role

Date: 2018-09-10

Time: 09:08:34

Read-back verified □

Adverse outcomes

No complications □

Discharge

Summary

New summary item

Impressions

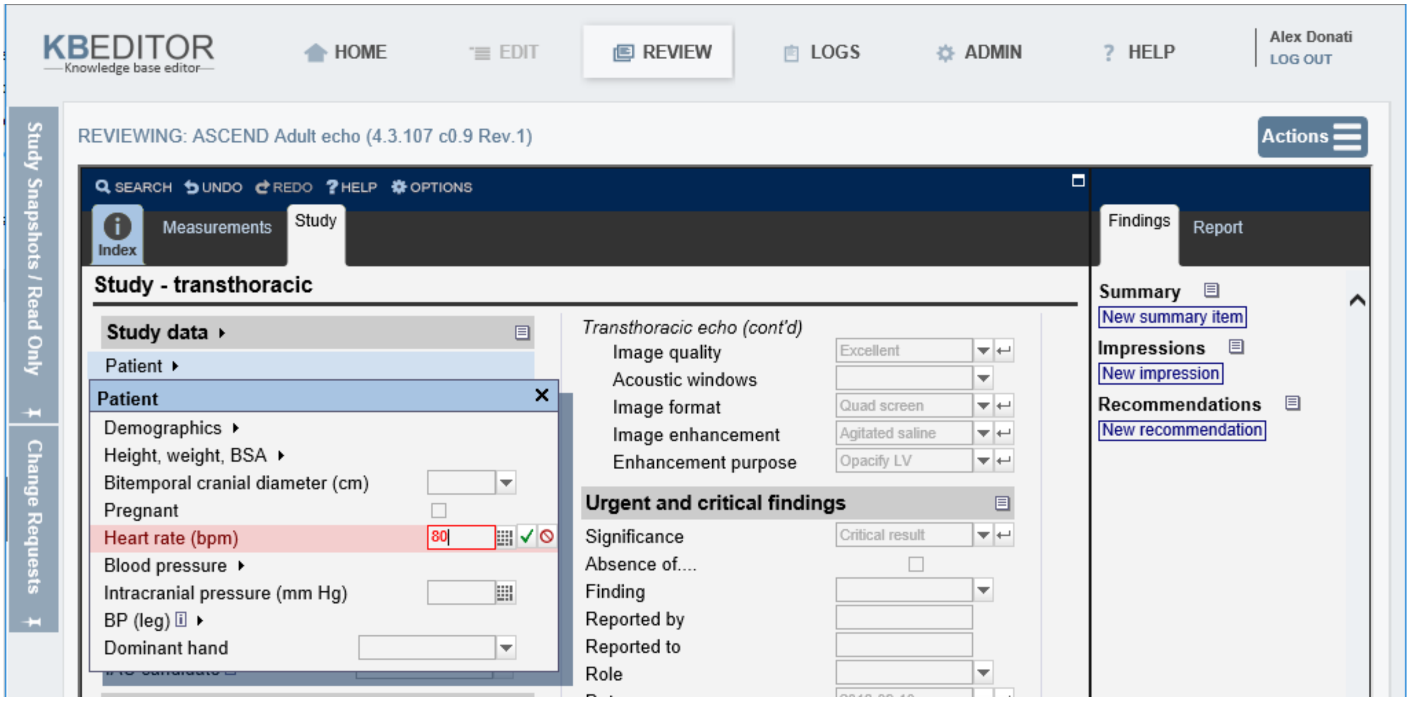
New impression

Recommendations

New recommendation

3 Start by entering a sample heart rate as you would in the reporting interface. Select **Study data > Patient > Heart rate**. Record a number (bpm) and click the green checkmark.

This report you are building needs to display the recorded heart rates for all the Echo studies that were recorded as "screening". By recording a heart rate finding, you can see where that value is located in the AA database.



REVIEWING: ASCEND Adult echo (4.3.107 c0.9 Rev.1)

Study - transthoracic

Study data

Patient

Patient
- Demographics
- Height, weight, BSA
- Bitemporal cranial diameter (cm)
- Pregnant □
- Heart rate (bpm): 80
- Blood pressure
- Intracranial pressure (mm Hg)
- BP (leg)
- Dominant hand

Transthoracic echo (cont'd)
- Image quality: Excellent
- Acoustic windows
- Image format: Quad screen
- Image enhancement: Agitated saline
- Enhancement purpose: Opacify LV

Urgent and critical findings
- Significance: Critical result
- Absence of.... □
- Finding
- Reported by
- Reported to
- Role

4 Select the **Database Results** option in the **Actions** menu.

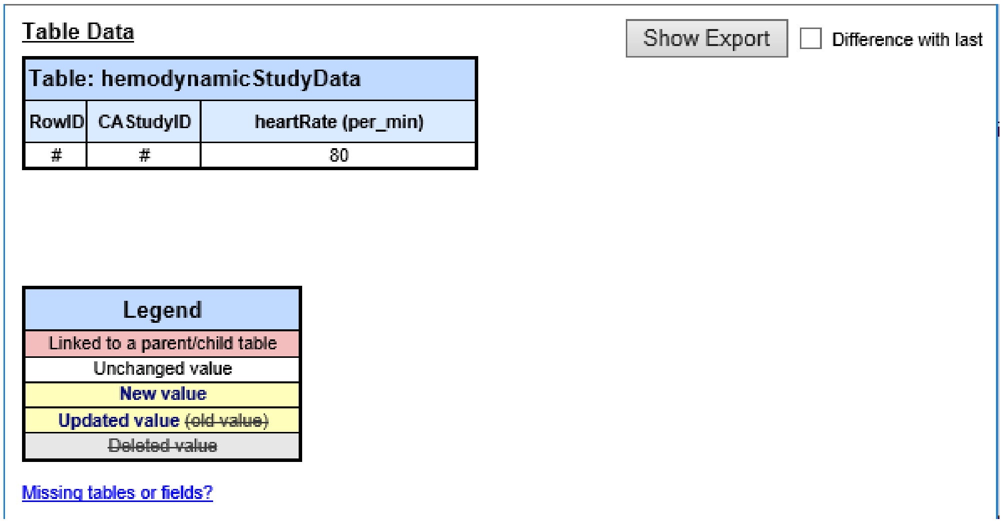


Table Data

Table: hemodynamicStudyData

RowID	CAStudyID	heartRate (per_min)
#	#	80

Legend
Linked to a parent/child table
Unchanged value
New value
Updated value ~~(old value)~~
~~Deleted value~~

Missing tables or fields?

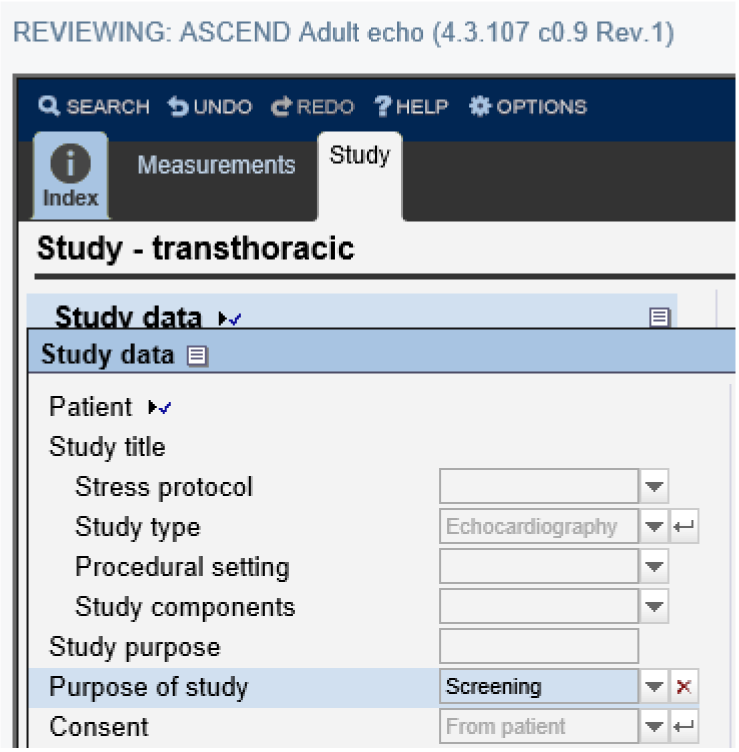
The **Database Results** are displayed in a new browser tab labeled **CSI Report**, and show the location of the recorded data in the AA database.

The heart rate finding is stored in:

- The **hemodynamicStudyData** table
- The **heartRate** field

5 Now, return to the **KB Editor** tab, and record a purpose for the study of “screening”. Select **Study data > Purpose of study > Screening**.

This report you are building needs to return results for all the Echo studies that were recorded as a "screening" study. By recording a purpose of "screening" in CSI, you can see where that value is located in the AA database.



REVIEWING: ASCEND Adult echo (4.3.107 c0.9 Rev.1)

Study - transthoracic

Study data

Study data

Patient

Study title

Stress protocol	
Study type	Echocardiography
Procedural setting	
Study components	
Study purpose	
Purpose of study	Screening
Consent	From patient

6 Next, select the **Database Results** Action again to see the location of this data in the AA database. Note that this will replace the contents of the CSI Report tab.

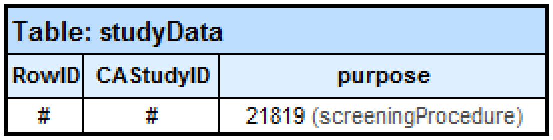


Table: studyData

RowID	CAStudyID	purpose
#	#	21819 (screeningProcedure)

The screening purpose is stored:

- In the **studyData** table
- In the **purpose** field
- With a value of **21819**

In the table **studyData**, in the field **purpose**, you will find a number (21819) whenever the study has “screening” recorded. 21819 is a GEV (Global Enumerated Value) number. For example, 21819 always represents a screening procedure. This value may be used in several different tables.

Important! In this case, the combination of the **table** name, the **field** name, and the **GEV** number, is your unique identification for the finding “screening”. You will use these values when writing your query in Report Builder.

Note: It is necessary to write down the table name, field name, and GEV number to use later when building your report. Alternatively, you can simply leave the CSI tab open and refer to it later.

7 Continue this process of recording findings, and noting the Database locations until you have located all the variables for your new report.

For the sample report you are building, heart rate and screening are the only necessary findings. For more information, see AA Database Structure*.*

Step 4: Write, Implement, and Test the Report

End-user report editing and custom report creation are performed using **SQL Server Report Builder 3.0 (or 2012)** – a Microsoft application designed for this purpose. Since the reports contain a SQL query to extract the relevant report data from the database, some knowledge of the SQL language is required to make edits to existing reports, and to create new reports. Limited edits to formatting and client-side functionality (such as modifying parameters) can be performed without SQL knowledge.

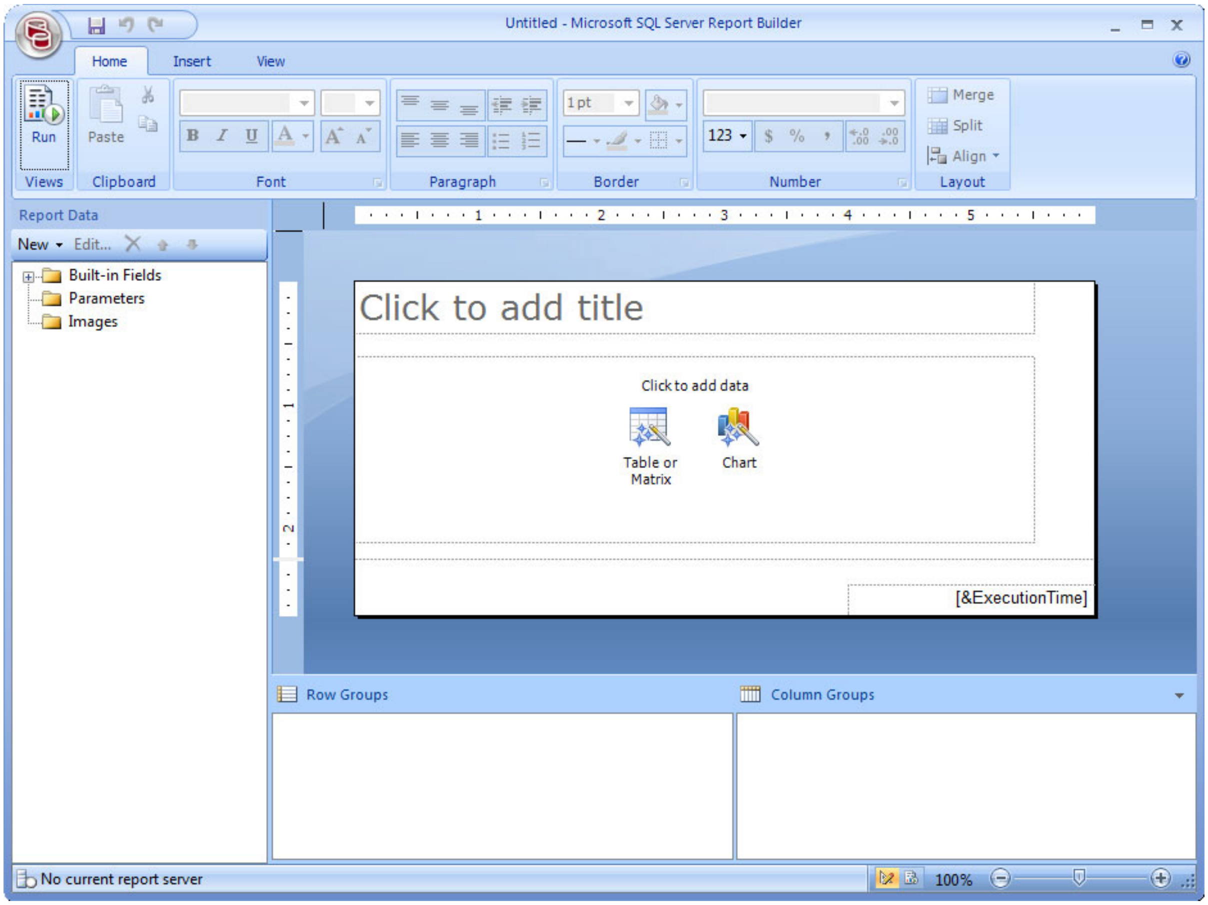
In Report Builder, parameters are used to specify the data to use in a report, connect related reports together, and vary report presentation. To design a report that uses parameters effectively, you must understand how parameters and dataset queries work together, how parameters and expressions work together, how parameters can be managed on the report server for a published report, and what questions a report is designed to answer. What you choose to parameterize can influence the report design and layout.

Query parameters are added to a dataset query by way of Report Builder's query designers or the Dataset Properties dialog box. After you create a query with parameters, Reporting Services automatically links query parameters to report parameters with the same name. New report parameters are added and modified by way of the Report Data pane.

Rename an Existing Report

1 Open Report Builder 2012.

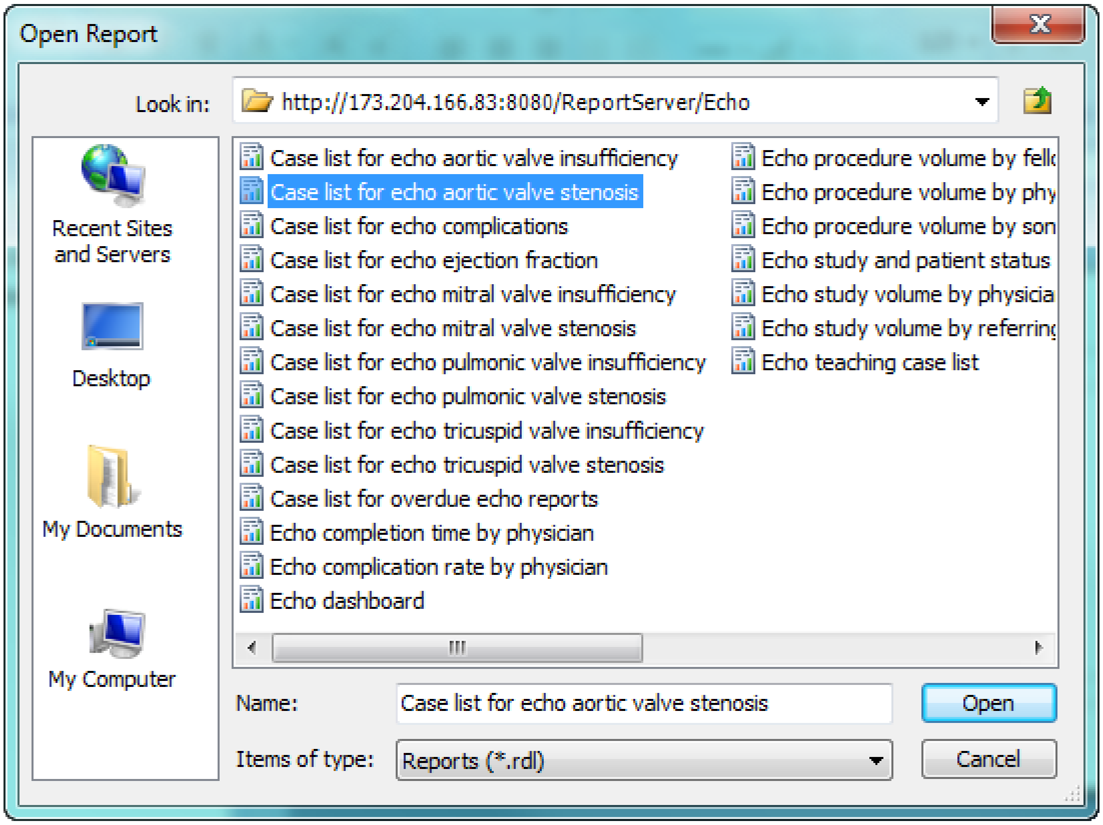
2 Microsoft SQL Server Report Builder opens.



3 Click the menu and select Open.

4 Navigate to the Echo folder and select *Case list for echo aortic valve stenosis.*

This report is the most similar one to the Case list report you will be building.



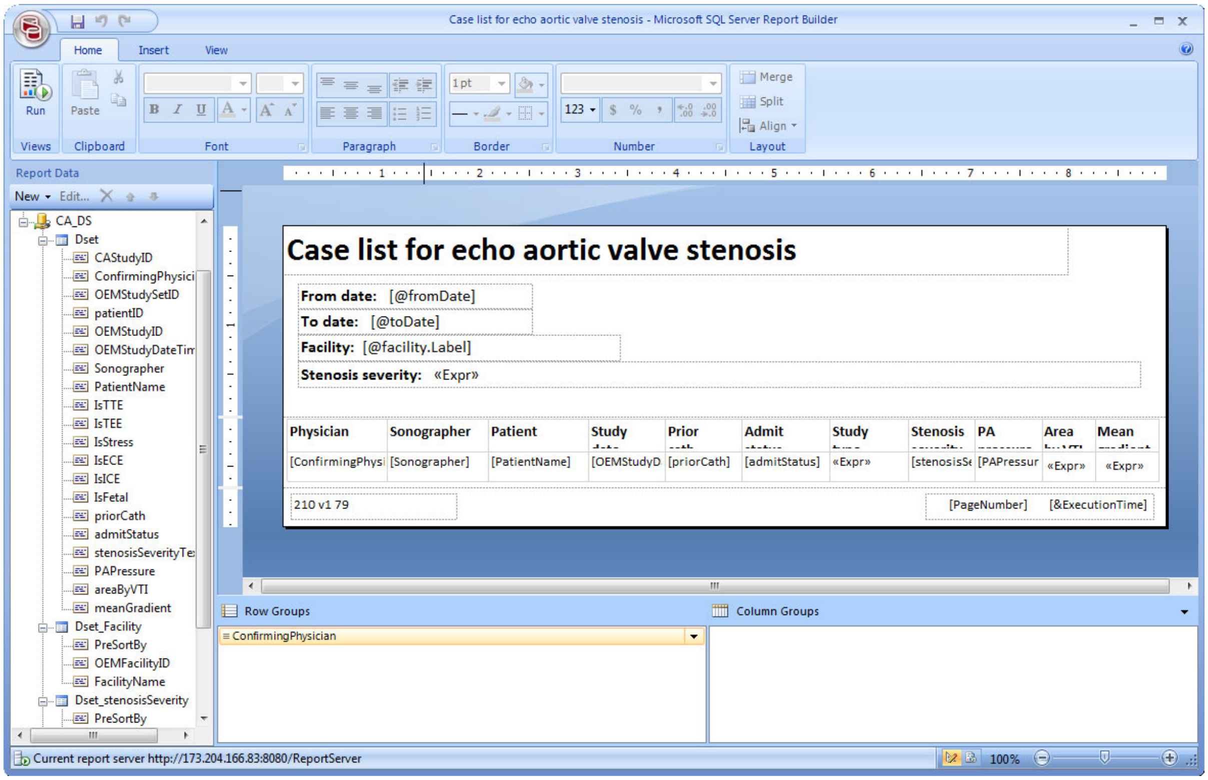
Look in: http://173.204.166.83:8080/ReportServer/Echo

- Case list for echo aortic valve insufficiency
- Case list for echo aortic valve stenosis
- Case list for echo complications
- Case list for echo ejection fraction
- Case list for echo mitral valve insufficiency
- Case list for echo mitral valve stenosis
- Case list for echo pulmonic valve insufficiency
- Case list for echo pulmonic valve stenosis
- Case list for echo tricuspid valve insufficiency
- Case list for echo tricuspid valve stenosis
- Case list for overdue echo reports
- Echo completion time by physician
- Echo complication rate by physician
- Echo dashboard
- Echo procedure volume by fell
- Echo procedure volume by phy
- Echo procedure volume by son
- Echo study and patient status
- Echo study volume by physicia
- Echo study volume by referrin
- Echo teaching case list

Name: Case list for echo aortic valve stenosis

Items of type: Reports (*.rdl)

4 The report opens on the screen.



Case list for echo aortic valve stenosis - Microsoft SQL Server Report Builder

Case list for echo aortic valve stenosis

From date: [@fromDate]

To date: [@toDate]

Facility: [@facility.Label]

Stenosis severity: «Expr»

Physician	Sonographer	Patient	Study	Prior	Admit	Study	Stenosis	PA	Area	Mean
[ConfirmingPhysi	[Sonographer]	[PatientName]	[OEMStudyD	[priorCath]	[admitStatus]	«Expr»	[stenosisSe	[PAPressur	«Expr»	«Expr»

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Current report server http://173.204.166.83:8080/ReportServer

To Save the Report on a Report Server[*]

I From the Report Builder button, select **Save As**.

2 Click **Recent Sites and Servers**.

3 Select or type the name of the report server where you have permission to save reports.

4 The message **Connecting to report server appears**. When the connection is complete, you see the contents of the report folder that the report server administrator specified as the default location for reports.

5 In **Name**, replace the default name with **Case list of heart rates for echo screening tests**.

6 Click **Save**.

7 The report is saved to the report server. The report server that you are connected to appears in the status bar at the bottom of the window.

*Source: Microsoft.com. (2017) Save Reports to a Report Server (Report Builder). SQL Server 2016. Retrieved from https://docs.microsoft.com/en-us/sql/reporting-services/report-builder/save-reports-to-a-report-server-report-builder?view=sql-server-2016

Report Builder Basics

From Microsoft Developer Network articles on Report Builder:

"The new report opens in design view. There are two views: design and preview. In design view, you create a report definition. You specify data in the Report Data pane and the report layout on the design surface. In preview, the report processor runs the report definition, combining report data and the report layout. The report is rendered on-demand as you view each page."

Using Report Builder, you can:

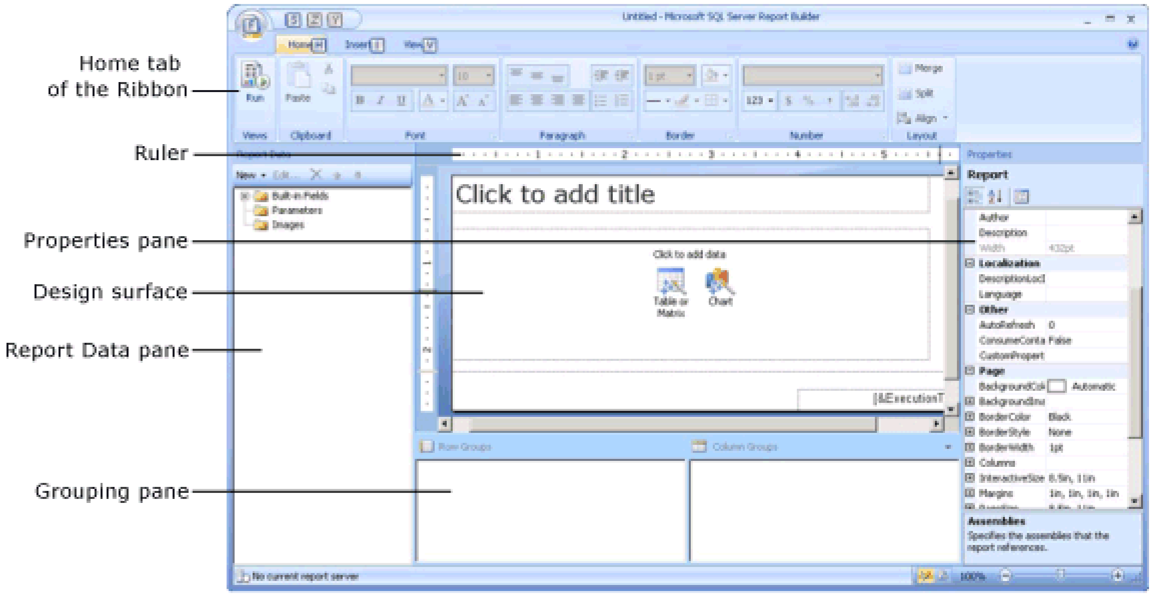
- Start designing the report by building the correct data set(s) for the data you are interested in using.
- Create reports with tables, matrices, charts, or free-form areas. Build your report by using the Table, Matrix, or Chart Wizard.

§ Prior to using Table Wizard, you must first create a dataset by writing the SQL code.

- Modify your data by filtering, grouping and sorting data, or by adding formulas or expressions.
- Change the appearance of your report by adding text boxes, images, or conditional formatting.
- Add interactive features, such as interactive sorting, drill-through reports, and toggling the visibility of report items.
- Run the report to preview your changes. Toggle between design view and preview.
- Save the report to your computer or to the report server, where you can manage it and share it with others. Once reports are created, RDL files can be rendered in a variety of formats including Excel, PDF, CSV, XML, TIFF (and other image formats), and HTML Web Archive.

* Source: Microsoft.com (2017). What is SQL Server Reporting Services (SSRS)?. SQL Server 2016. Retrieved from https://docs.microsoft.com/en-us/sql/reporting-services/create-deploy-and-manage-mobile-and-paginated-reports?view=sql-server-2016

The Report Builder interface is designed to help you easily organize your report resources and quickly build the reports you need. The design surface is at the center of the window, with the Ribbon above and the Report Data, Grouping, and Properties panes to the left, below, and right. The design surface is where you add and organize your report items. The Ribbon organizes traditional menu items into categories that you can easily find and use. The panes help you to select and organize your report resources, and change report item properties. For more information about each Report Builder window item, see the image below.



[*] Source: Microsoft.com. (2017) Report Design View (Report Builder). *SQL Server 2016*. Retrieved from https://docs.microsoft.com/en-us/sql/reporting-services/report-builder/report-design-view-report-builder?view=sql-server-2016

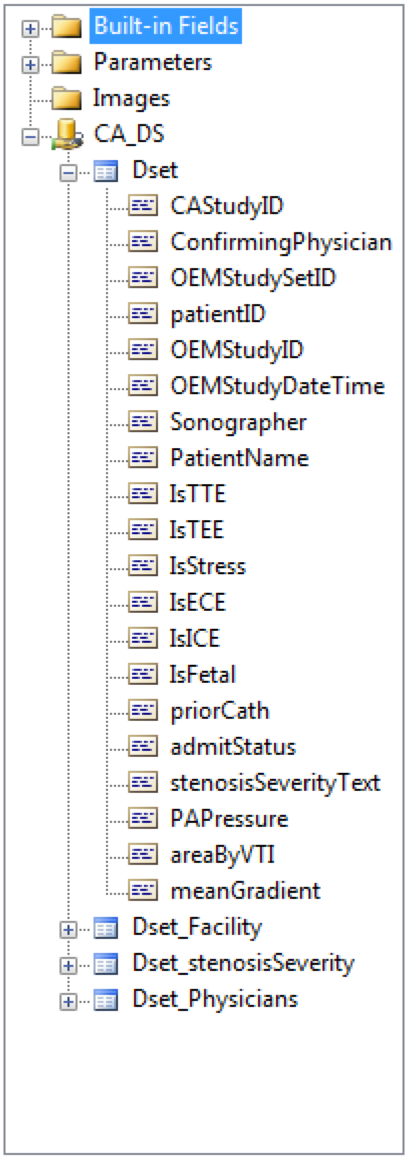
Datasets

Datasets contain information about the sets of data to display as a part of the report. The value of the **Name** attribute for the **Dataset** element must be unique within the report.

Each dataset consists of related data items selected from the AA database by a SQL query. The first task in Report Builder is to get your dataset working by creating your dataset query.

In Microsoft Report Builder, the data that you wish to display in your report is built using datasets and expressions. Datasets are groups of defined database fields along with their associated values. These groups of field values are generally related in some significant way, such that the grouping of the data makes logical sense and displays the relationships between the data values in a meaningful way within the context of the report.

For example, your data source may contain the following field names: “name”, “address”, “city”, “state”, and “zip code”. Each of these fields is related, such that the first value for “name” in the database (name1) is connected to the first value of “address” (address1), and so on. Because this data has a significant relationship, you may want to display this data in your report. By creating a dataset of these individual data points, you maintain their significant relationships to each other.



Parameters

Report parameters enable you to control report data by filtering the data, connect related reports together, and vary the report appearance. To design a report that uses parameters effectively, you must understand how parameters and dataset queries are related, how to include parameters in expressions, and how to manage parameters independently from a report definition on the report server .

Design Surface/Report Body

The Report Builder design surface is the main work area for designing your reports. To place report items such as data regions, sub-reports, text boxes, images, rectangles, and lines in your report, you add them from the Ribbon to the design surface. There, you can add groups, expressions, parameters, filters, actions, visibility, and formatting to your report items.

You can also change:

- The report body, header, and footer properties such as border and fill color by right-clicking the white area of the design surface, outside any report items, and clicking Report Body Properties
- The properties of the report itself, such as page setup, by right-clicking the blue area around the design surface and clicking Report Properties
- The properties of the report items by right-clicking them and clicking Properties

Modifying your Report in Report Builder

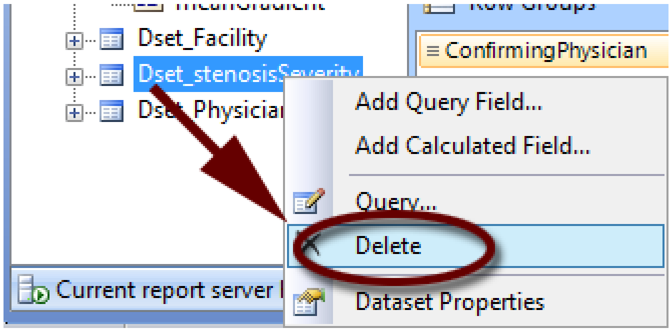
Modifying your Datasets

The dataset's SQL query returns the data you want to display in your report (in this example, the variable data: heart rate and screening).

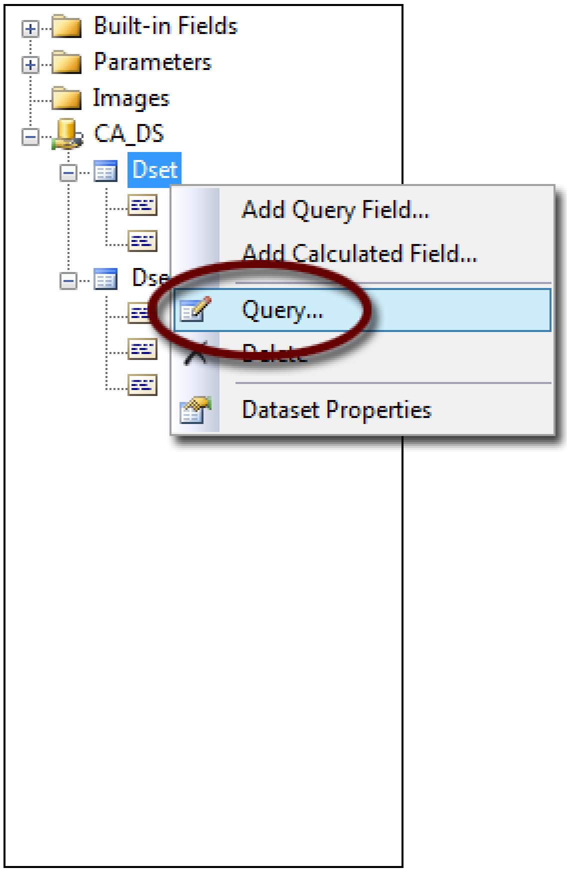
> *This report will display the recorded heart rates for all the Echo studies that were recorded as "screening". You will delete some of the other datasets, such as Physicians and Stenosis Severity, since we are not searching on that criteria. And since you are searching for the heart rates for all screenings, those two data items need to be added to the query.*

First, create your query. Once your dataset is working, you can use the dataset to create a new report body.

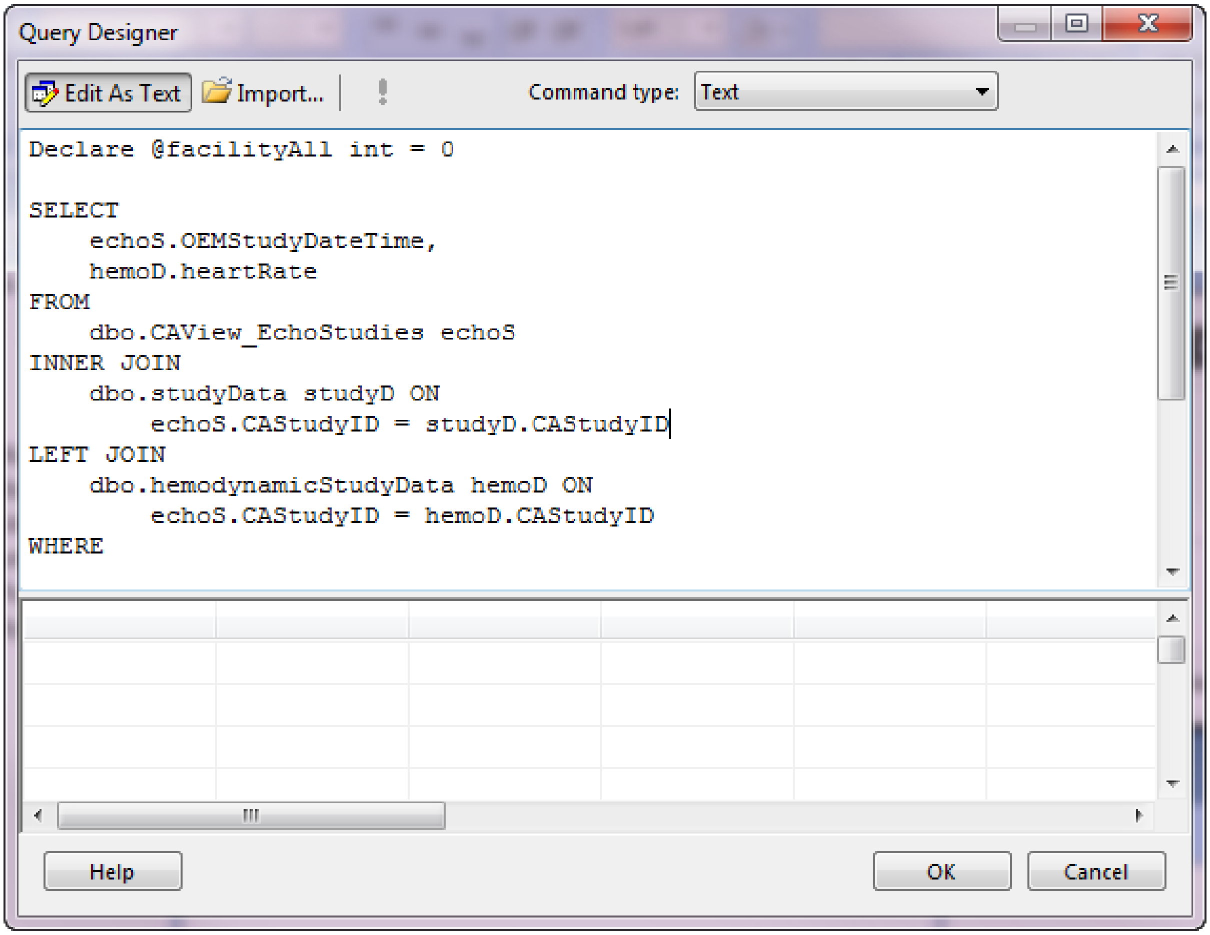
1 Remove the unnecessary datasets. For this tutorial, remove **Dset_stenosisSeverity** and **Dset_Physicians** since the new report does not need a stenosis filter or a physician filter. Right-click on each dataset name, and select **Delete**.



2 To open the Query for the main dataset (Dset), right-click on **Dset**, and select **Query**.



Query Designer opens and displays the current SQL code for the report with the new datasets.



Command type: Text

```
Declare @facilityAll int = 0

SELECT
    echoS.OEMStudyDateTime,
    hemoD.heartRate
FROM
    dbo.CAView_EchoStudies echoS
INNER JOIN
    dbo.studyData studyD ON
        echoS.CAStudyID = studyD.CAStudyID
LEFT JOIN
    dbo.hemodynamicStudyData hemoD ON
        echoS.CAStudyID = hemoD.CAStudyID
WHERE
```

3 Replace the SQL code with a query that returns the **study date** and **heart rate** for all studies with a **screening** finding recorded for purpose of **study**.

Note: The yellow highlighted areas are the unique identifiers that you located in CSI.

For example:

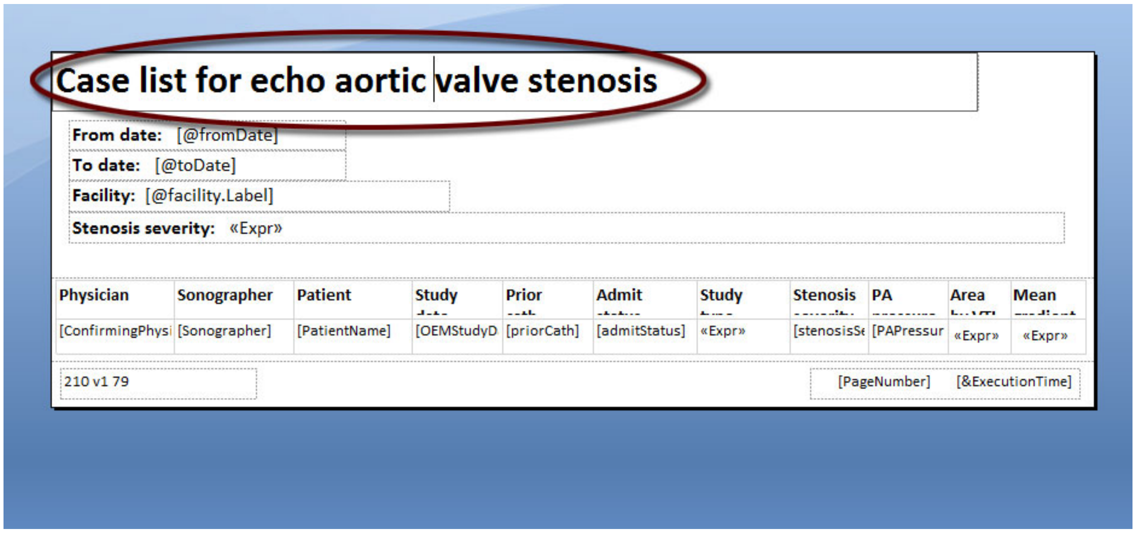
```
Declare @facilityAll int = 0

SELECT
  echoS.OEMStudyDateTime,
  hemoD.heartRate
FROM
  dbo.CAView_EchoStudies echoS
INNER JOIN
  dbo.studyData studyD ON
    echoS.CAStudyID = studyD.CAStudyID
LEFT JOIN
  dbo.hemodynamicStudyData hemoD ON
    echoS.CAStudyID = hemoD.CAStudyID
WHERE
  echoS.OEMStudyDateTime >= @fromDate
  AND
  echoS.OEMStudyDateTime <= @toDate
  AND
  (@facility = @facilityAll OR @facility = echoS.OEMFacilityID)
  AND
  studyD.purpose = 21819 -- screening
ORDER BY
  OEMStudyDateTime
```

4 Click **OK** to close the Query Designer.

To Change a Report Title

I On the design surface, click in the field of the current title of the report.



Case list for echo aortic valve stenosis

From date: [@fromDate]

To date: [@toDate]

Facility: [@facility.Label]

Stenosis severity: «Expr»

Physician	Sonographer	Patient	Study	Prior	Admit	Study	Stenosis	PA	Area	Mean
[ConfirmingPhysi	[Sonographer]	[PatientName]	[OEMStudyD	[priorCath]	[admitStatus]	«Expr»	[stenosisSe	[PAPressur	«Expr»	«Expr»

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[PageNumber] [&ExecutionTime]

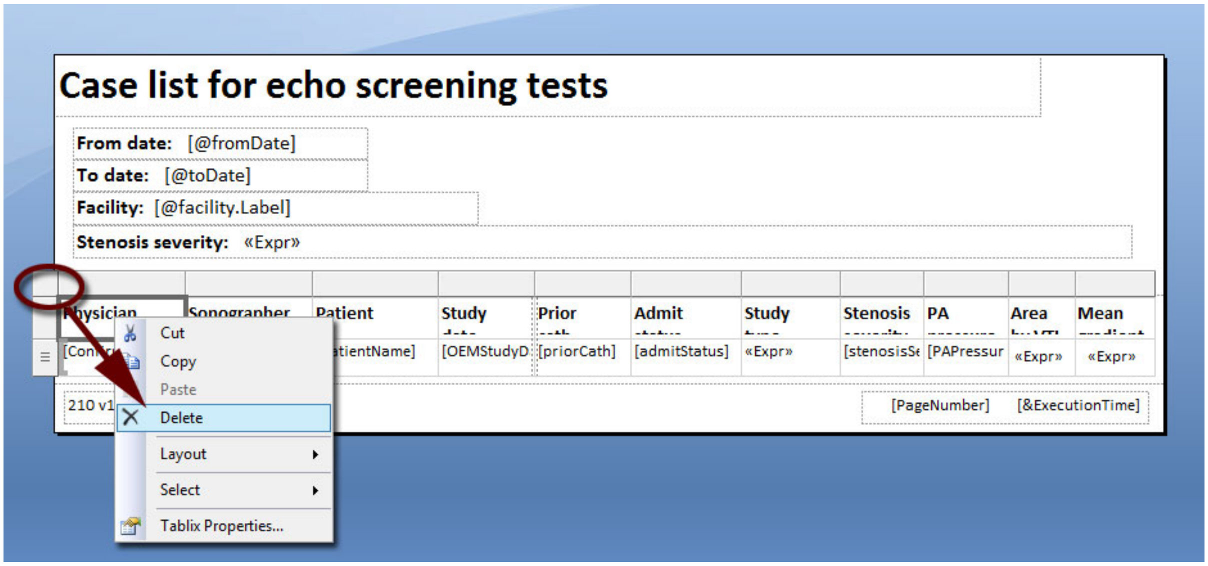
2 Type **Case list of heart rates for echo screening tests** and then click outside the text box.

3 This title appears at the top of the report.

Modifying Your Report Body

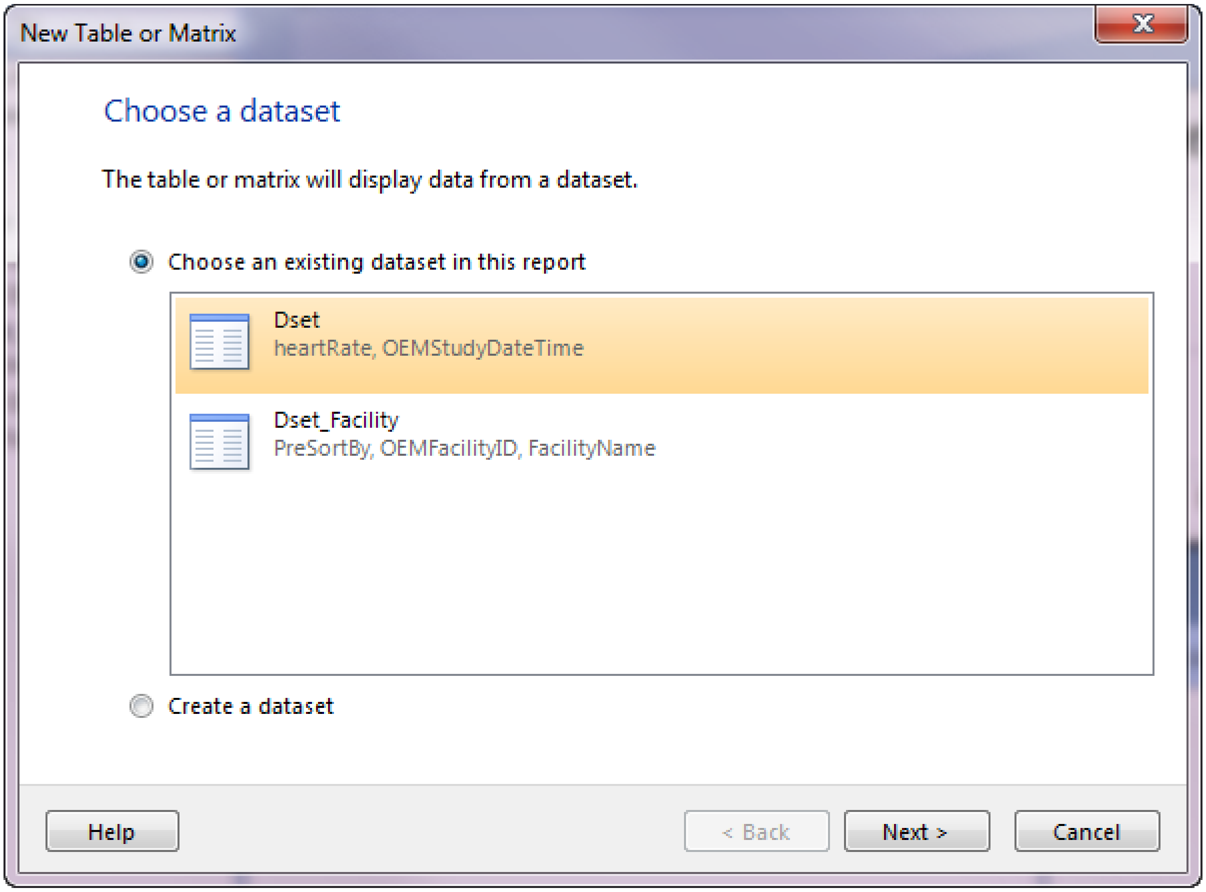
Modify the report body as specified below.

1 Delete the existing body table by right-clicking on the corner of the table, and select **Delete**.



2 Add a new table and populate it with **OEMStudyDateTime** and **HeartRate** from the main dataset. Start by selecting the **Insert** tab, and choose Table > Table Wizard.

3 Select the **Dset** existing dataset for this report, and click **Next**.



New Table or Matrix

Choose a dataset

The table or matrix will display data from a dataset.

● Choose an existing dataset in this report

Dset
heartRate, OEMStudyDateTime

Dset_Facility
PreSortBy, OEMFacilityID, FacilityName

○ Create a dataset

4 Use the **Arrange fields** page to choose values to display, and to group data in rows, columns, or both. You can use keyboard shortcuts to move and delete items. To add an item to the report body, click on the item and drag the dataset fields to the Column groups.

Available Fields

This box lists the available fields that you can display as values or add to row or column groups.

To move a field from Available Fields to Column groups, Row groups, or Values, drag the field to the appropriate box.

You can also use the ENTER key to add a field. Numeric fields will be added to Values. Non-numeric fields will be added to Row groups.

Column Groups

Lists the fields that are in column groups.

Row Groups

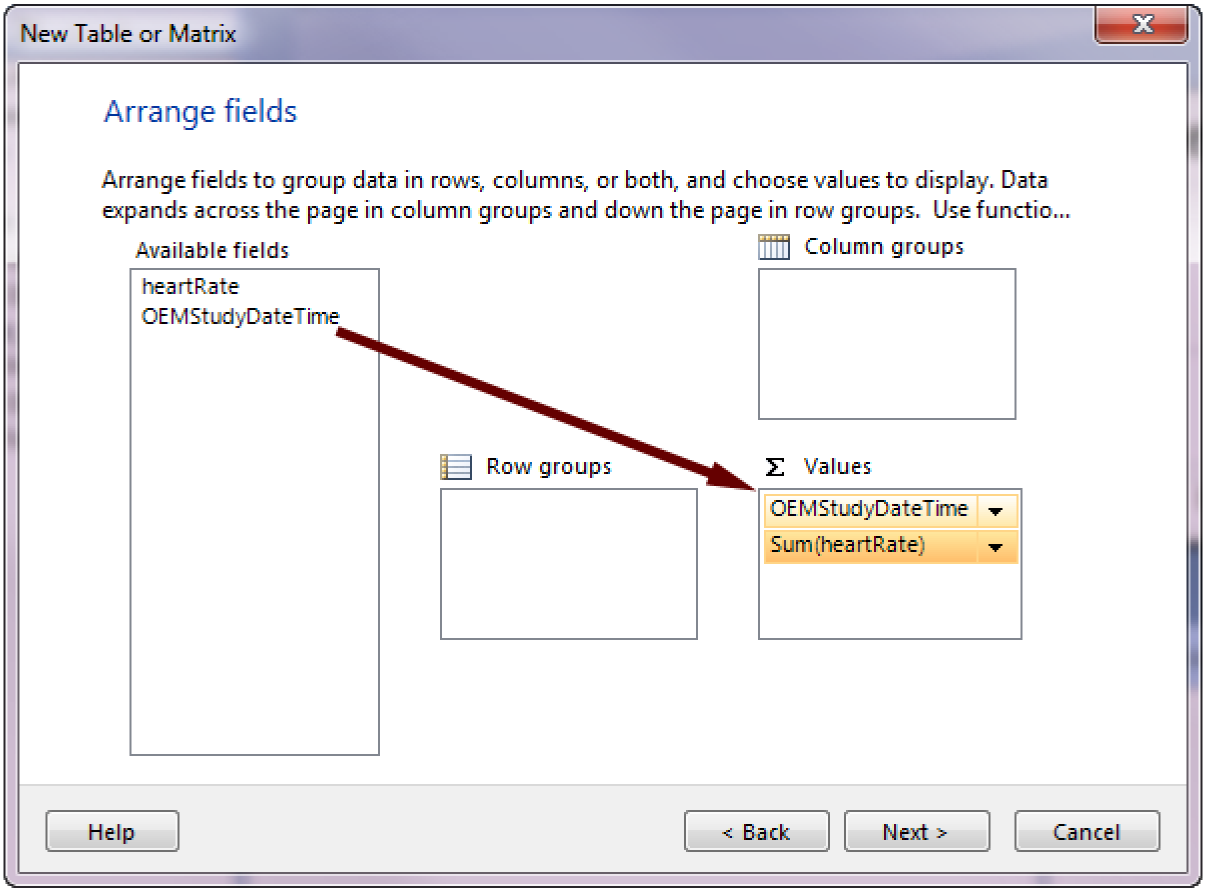
Lists the fields that are in row groups.

Values

Lists the fields that display as values.

5 Drag the identified fields from the Available Fields box into the Values box. The system automatically adds a 'SUM' formula for the HeartRate field. Notice it shows Sum(HeartRate) in the Values box.

This is the default Report Builder behavior when adding numeric data to a table column. Since this is a Case listing report, all heart rate values need to be shown individually, without aggregating (e.g. adding) them. Therefore, we need to remove the SUM formula from this field.

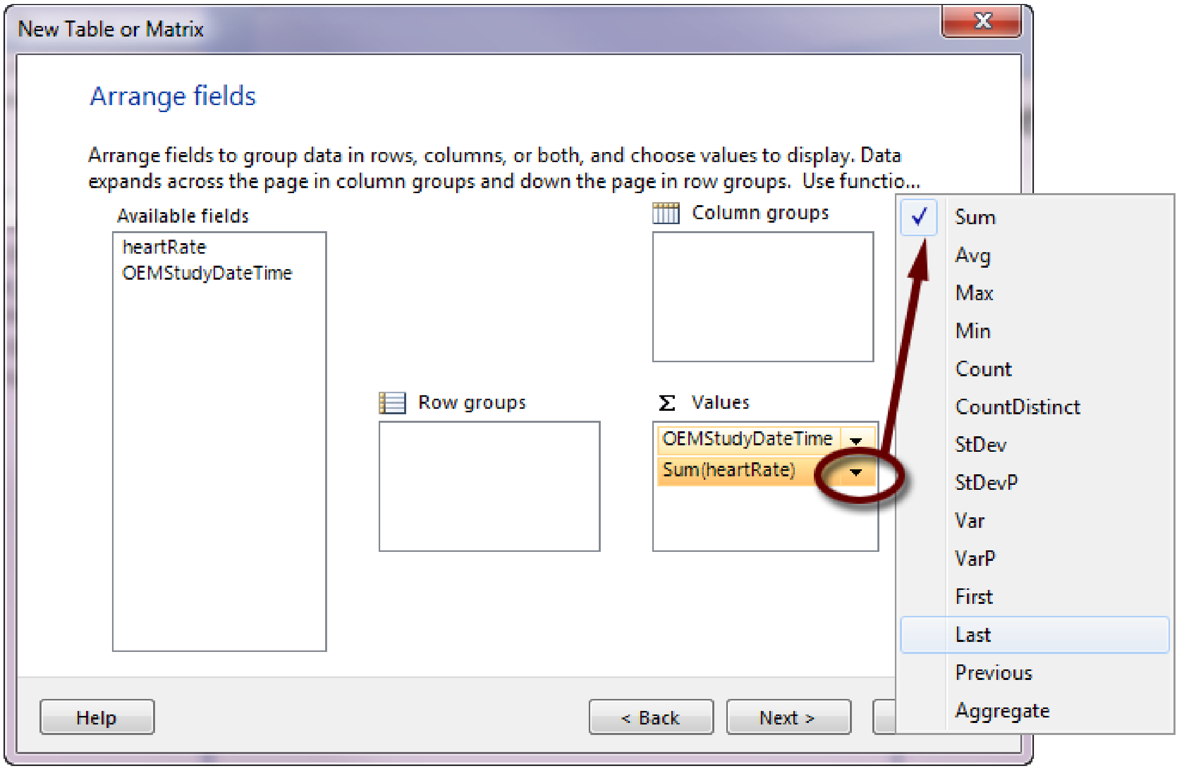


New Table or Matrix

Arrange fields

Arrange fields to group data in rows, columns, or both, and choose values to display. Data expands across the page in column groups and down the page in row groups. Use functio...

6 Click on the arrow next to Sum(heartRate), and a popup menu appears.

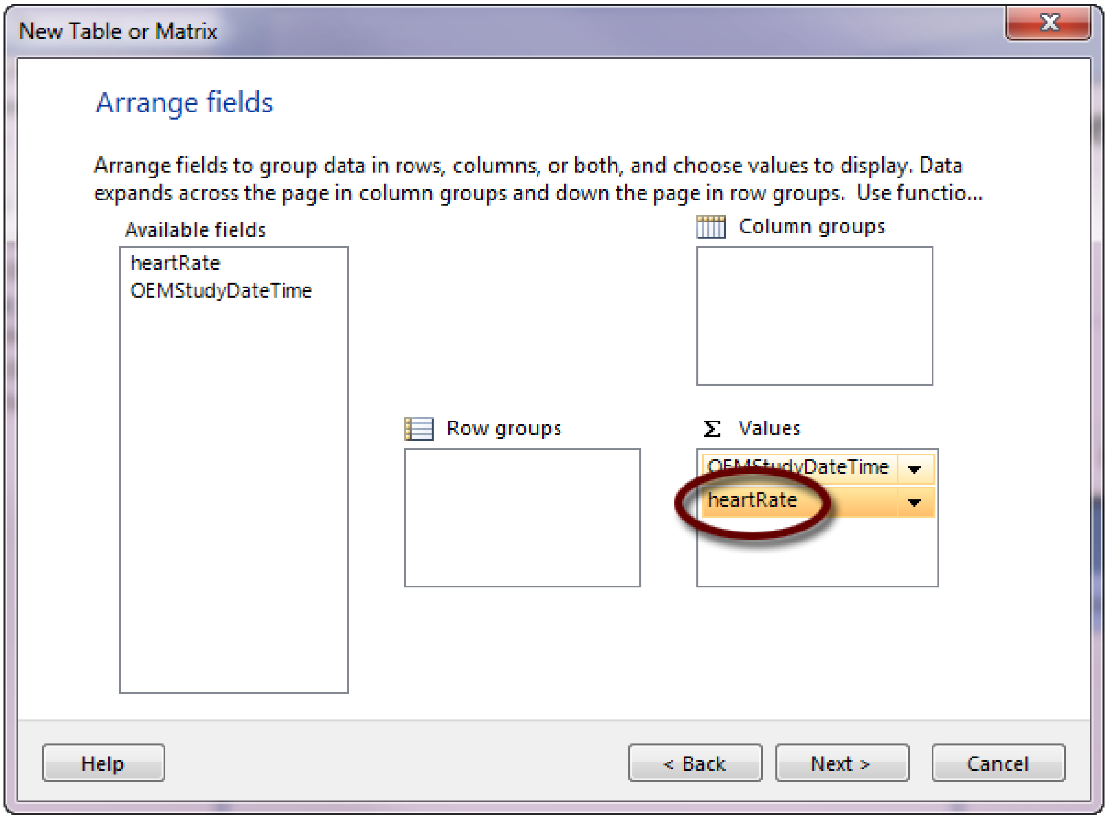


New Table or Matrix

Arrange fields

Arrange fields to group data in rows, columns, or both, and choose values to display. Data expands across the page in column groups and down the page in row groups. Use functio...

7 Uncheck the Sum row. Now you will see "heartRate" in the Values instead of "Sum(heartRate)".



New Table or Matrix

Arrange fields

Arrange fields to group data in rows, columns, or both, and choose values to display. Data expands across the page in column groups and down the page in row groups. Use functio...

8 Click **Next** to continue.

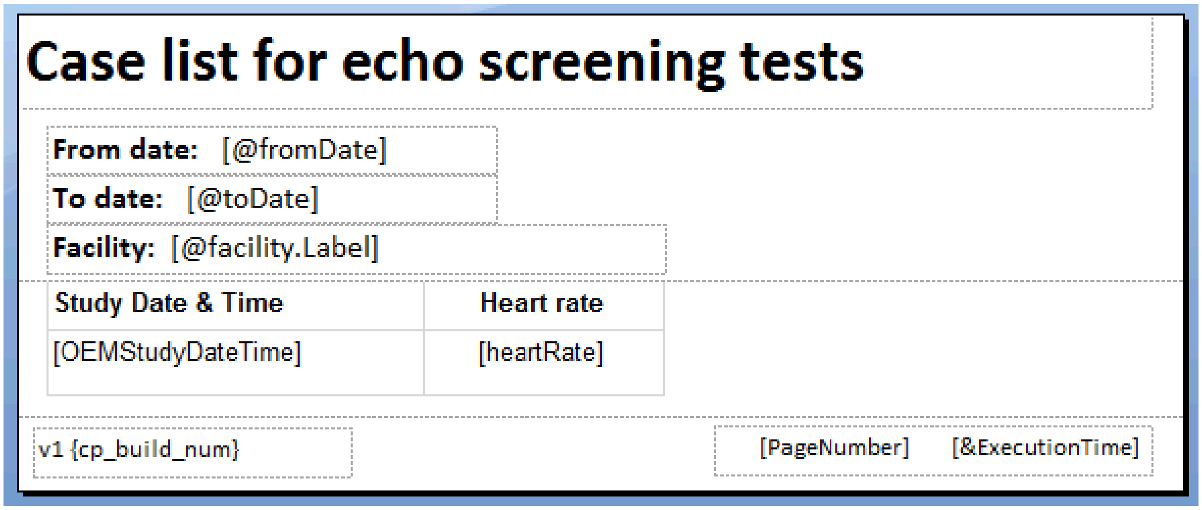
9 Next, choose the layout for this table. In this report, you are not using any subtotals or totals, so click **Next** to continue.

10 Now choose a style (color scheme, fonts, etc.) for your table, and click **Finish**.

NOTE: If unsure which style to select, choose the Generic style.

The new table appears on the report body.

NOTE: It may be necessary to adjust the text in the two column headings. For example, the first column may need to be changed from **OEMStudyDateTime** to **Study date/ time.**



Case list for echo screening tests

From date: [@fromDate]

To date: [@toDate]

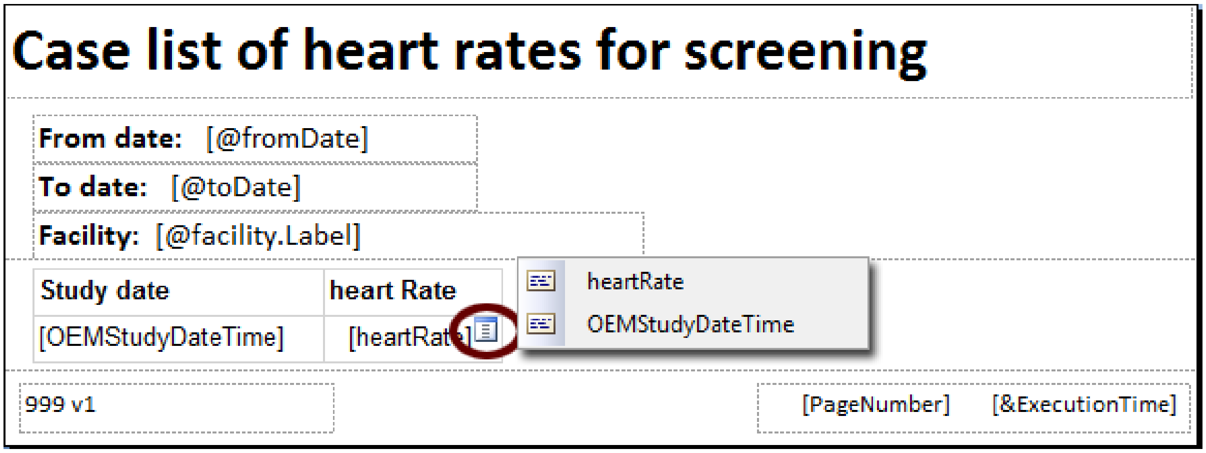
Facility: [@facility.Label]

Study Date & Time	Heart rate
[OEMStudyDateTime]	[heartRate]

v1 {cp_build_num}

[PageNumber] [&ExecutionTime]

11 If you hover the mouse over the corner of a dataset cell in the table, an icon appears. Click the icon to open a list of all of the fields in the dataset. This is another method of selecting fields from the dataset.



Case list of heart rates for screening

From date: [@fromDate]

To date: [@toDate]

Facility: [@facility.Label]

Study date	heart Rate
[OEMStudyDateTime]	[heartRate]

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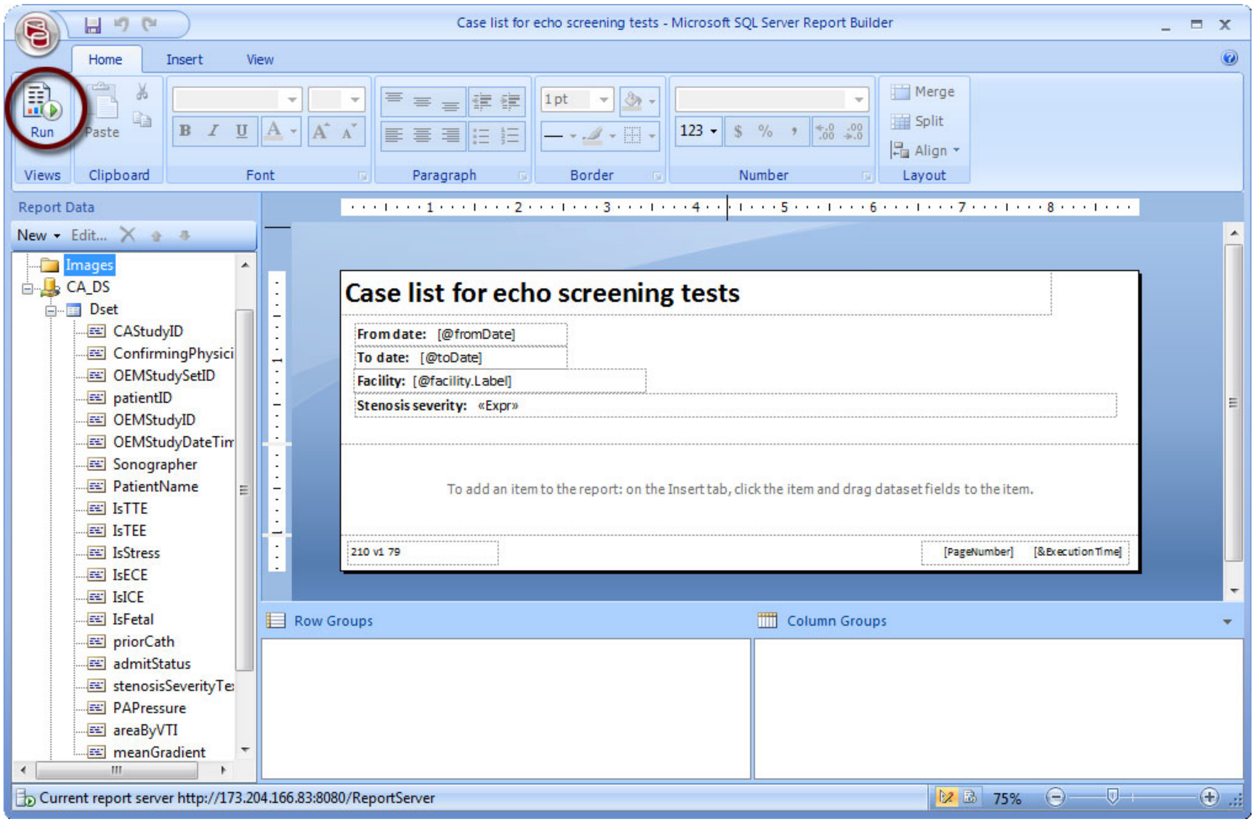
[PageNumber] [&ExecutionTime]

Next, preview the report.

To preview a report, simply click **Run**. Enter a start and end date and click the **View report** button.



Case list for echo screening tests - Microsoft SQL Server Report Builder

Case list for echo screening tests

From date: [@fromDate]

To date: [@toDate]

Facility: [@facility.Label]

Stenosis severity: «Expr»

To add an item to the report: on the Insert tab, click the item and drag dataset fields to the item.

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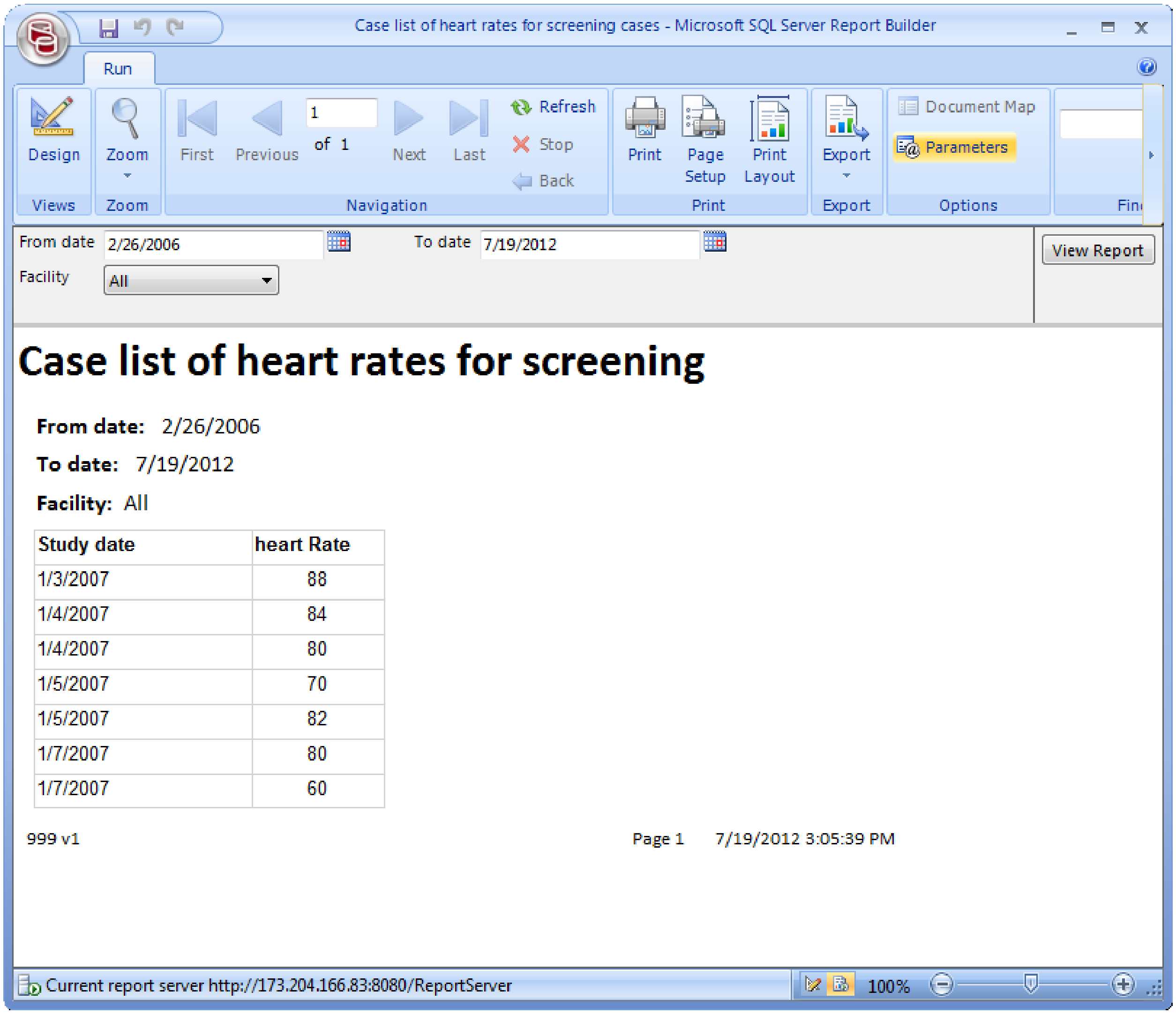
[PageNumber] [&ExecutionTime]

Current report server http://173.204.166.83:8080/ReportServer

The report is generated on the report server and the resulting report is displayed on screen. Each page of the report includes a page footer listing the report name, the time the report was generated, and the page number.



From date 2/26/2006

To date 7/19/2012

Facility All

Case list of heart rates for screening

From date: 2/26/2006

To date: 7/19/2012

Facility: All

Study date	heart Rate
1/3/2007	88
1/4/2007	84
1/4/2007	80
1/5/2007	70
1/5/2007	82
1/7/2007	80
1/7/2007	60

999 v1 Page 1 7/19/2012 3:05:39 PM

Current report server http://173.204.166.83:8080/ReportServer

Online Resources for Report Builder

There are many online resources to learn more about Microsoft Report Builder. Here are a few links to get you started:

Microsoft documentation

https://docs.microsoft.com/en-us/sql/reporting-services/reports/reporting-services-reports-ssrs?view=sql-server-2016

Microsoft Tutorials for Report Builder

https://docs.microsoft.com/en-us/sql/reporting-services/reporting-services-tutorials-ssrs?view=sql-server-2016

Step 5: Deploy the Report

Deployment to the report server is simple since you started with an existing report and used **Save as** in Report Builder. The new report is already on the server.

Note: If you do not have administrative privileges, it may be necessary for the Administrator to copy the report from your personal folder into the shared (public) folder. The only valid Save location may be the My reports folder. If this is the case, a user with higher privileges can move the report to the general area so it is available to all users.

When you **Save** the query, the dataset fields update accordingly.

- Select the button and choose **Save**.

Next, test the deployed report.

1. Open **ASCEND Analytics** in Internet Explorer.
2. Open the folder where you saved the new report (depending on your user privileges, this may be the Echo folder or the My Reports folder).
3. Open the new report: "Case list of heart rates for echo screening tests".
4. Enter a start and end date, and click the **View Report** button.
5. Verify that the report works as expected.

AA Database Overview

The recommended approach when creating ASCEND Analytics queries and reports is to use the database views provided with ASCEND Analytics, and to join any data tables that contain the necessary data.

Tables

Lookup and Admin Tables

These tables are static (pre-populated on install) and contain lookup values for various features. These tables include:

- All tables that start with "CALookup..."
- CAModules table
- gevData table
- CAVersionLog table (which is updated with each new software version or patch)

CAStudies Table

This is the root table for AA data. It stores one row for each confirmed study in the ASCEND Analytics database. The included fields are:

- CAStudyID: This is a unique ID for each study. Every other table that stores findings (data tables below) has a foreign key relationship to this field.
- OEMStudyID: This is an external ID to link the AA study with additional data in the OEM database.
- ModuleID: This is a foreign key to the table CAModules. It stores the reporting module (e.g. Echo, Cath) that was used to record each study in Report Wizard.

Data Tables

These are used to store all the findings recorded with Report Wizard. All tables in the ASCEND Analytics database are Data tables, except for the ones listed above.

- All data tables have a field named CAStudyID, which is a foreign key relationship to CAStudies.CAStudyID.
- Certain data tables have foreign key relationships to one another. In these cases, the child table has a foreign key relationship field to each of its possible parent tables (at the most, one key field is recorded for any given row).

Views

A view consists of a stored query accessible as a virtual table in a relational database.

- Views are created to provide access to subsets of the available data.
- Some views list all confirmed studies for one reporting module (e.g. all Echo studies, all Cath studies.) Many such views also display key findings for the studies, such as the study type.
- Some views list unconfirmed studies, which are not stored in the AA database. These views reference tables in related databases outside of ASCEND Analytics.
- Some views list other study/patient/practitioner details not stored in the AA database. These views reference tables in related databases outside of ASCEND Analytics.
- For details on each view, see section 4.3 of the ASCEND Analytics User Manual.

Data Mapping Patterns

The ASCEND Analytics database structure is designed for optimal data storage and retrieval. Because of this, there is a data mapping step that transforms the findings recorded with Report Wizard (which are optimized for data entry and expressiveness) into the format supported by the ASCEND Analytics database. Due to this transformation, you may not be able to trivially locate the database value of every findings recorded in Report Wizard. The purpose of the CSI tool is to show report and query writers the results of this data mapping step for all Report Wizard findings. For each Report Wizard finding or set of related findings, this transformation step may exhibit one or more data mapping patterns. Below are some common data mapping patterns, with examples of each and tips on how to handle such patterns in your reports.

Item in Report Wizard maps to GEV in ASCEND Analytics

Statement findings in Report Wizard are stored in the ASCEND Analytics database using one or more enumerated lookup values called GEVs.

> *Let's look at the sample report we built in Steps 1-5. This report displays the recorded heart rates for all the Echo studies that were recorded as "screening"– in other words, where the purpose of the study was a screening. This report uses two of the most common data types: numeric (heart rate) and enumeration (screening). We used Clinical Schema Inspector (CSI) to locate this data in the ASCEND Analytics database. By recording a purpose of "screening" in CSI, you can see where that value is located in the AA database.*

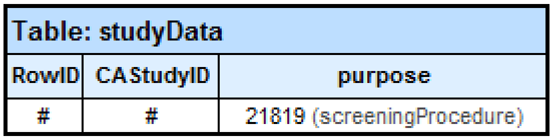


Table: studyData		
RowID	CAStudyID	purpose
#	#	21819 (screeningProcedure)

The screening purpose is stored:

- In the **studyData** table
- In the **purpose** field
- With a value of **21819**

*In the table **studyData**, in the field **purpose**, you will find a number (21819) whenever the study has "screening" recorded. 21819 is a GEV (Global Enumerated Value) number. For example, 21819 always represents a screening procedure. This value may be used in several different tables.*

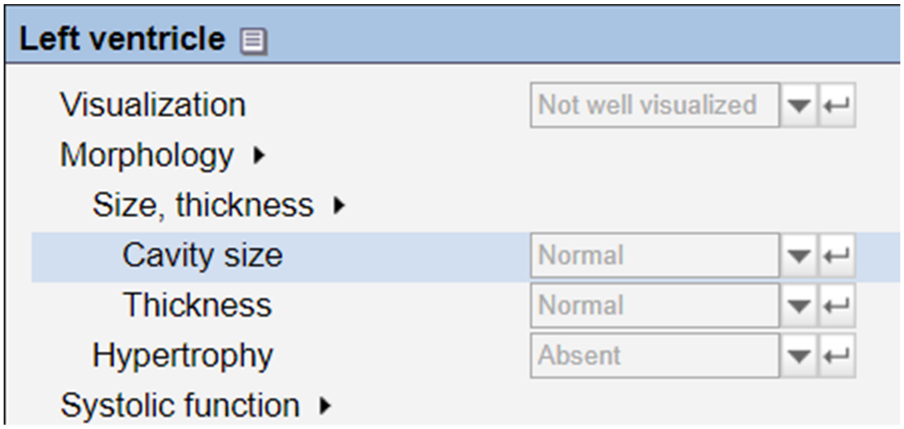
The gevData table in the AA database contains all the GEV lookup values (gevData.GEV field), and a text string for each value (gevData.displayName field). When displaying GEV values in a AA reports, the 'displayName' text strings should be used.

Below is an example of a query that returns the displayName string for a field storing GEV values (using the studyData.purpose field):

```
SELECT
  gevD.displayName AS Purpose
FROM
  dbo.CAView_EchoStudies echoS
LEFT JOIN
  dbo.studyData studyD ON
    echoS.CAStudyID = studyD.CAStudyID
LEFT JOIN
  dbo.gevData gevD ON
    studyD.purpose = gevD.GEV
```

Single Item in Report Wizard Maps to Multiple Fields in ASCEND Analytics Database

It is common in the ASCEND Analytics database for data that appears as a single value in Report Wizard to map to multiple data fields in ASCEND Analytics. For example, in the Echo reporting module in Report Wizard, you can select the Left Ventricle Cavity Size from a small list of values. (Index tab > Findings > Left ventricle > Morphology > Size, thickness > Cavity size.)



Left ventricle

Visualization	Not well visualized
Morphology ▸	
Size, thickness ▸	
Cavity size	Normal
Thickness	Normal
Hypertrophy	Absent
Systolic function ▸	

When you view the same data in CSI, you will see that ASCEND Analytics stores this information using **two** database fields: the **size** and **chamberID** fields in the **chamberData** table.

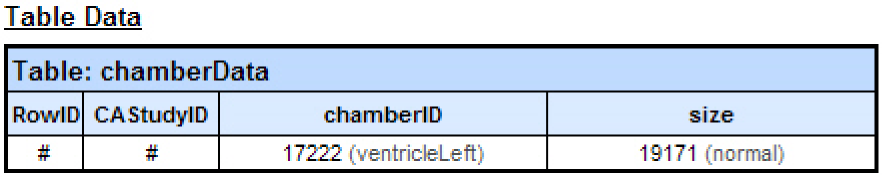


Table Data

Table: chamberData

RowID	CAStudyID	chamberID	size
#	#	17222 (ventricleLeft)	19171 (normal)

Please note that although you may be working with more than one data field to report on a particular data point (in this case, Left Ventricle Cavity Size), not all values in the mapped data fields may change when you change a particular value. In the above example, the values required to define “Left Ventricle Cavity Size = Normal” are **chamberID** = *17222 (ventricleLeft)* and **size** = *19171 (normal).* Similarly, recording Left Ventricle Cavity Size = "Below Normal" yields the following data in ASCEND Analytics.

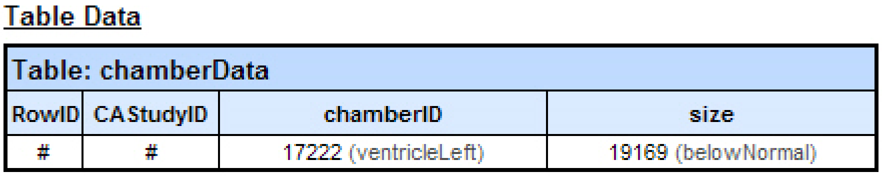


Table Data

Table: chamberData

RowID	CAStudyID	chamberID	size
#	#	17222 (ventricleLeft)	19169 (belowNormal)

Finally, recording Right Ventricle Cavity Size = "Below Normal", changes the **chamberID** value, but the **size** value remains the same.

Note: This is an example of the most common data mapping pattern in ASCEND Analytics – most data in the AA tables is post-coordinated – meaning that its components are stored in separate fields.

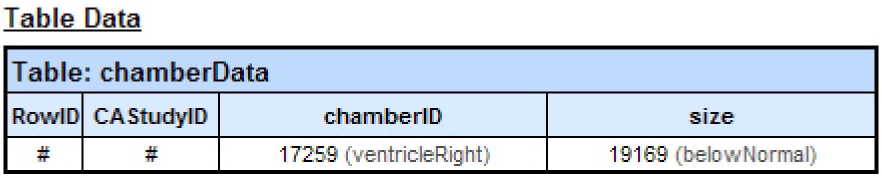


Table Data

Table: chamberData			
RowID	CAStudyID	chamberID	size
#	#	17259 (ventricleRight)	19169 (belowNormal)

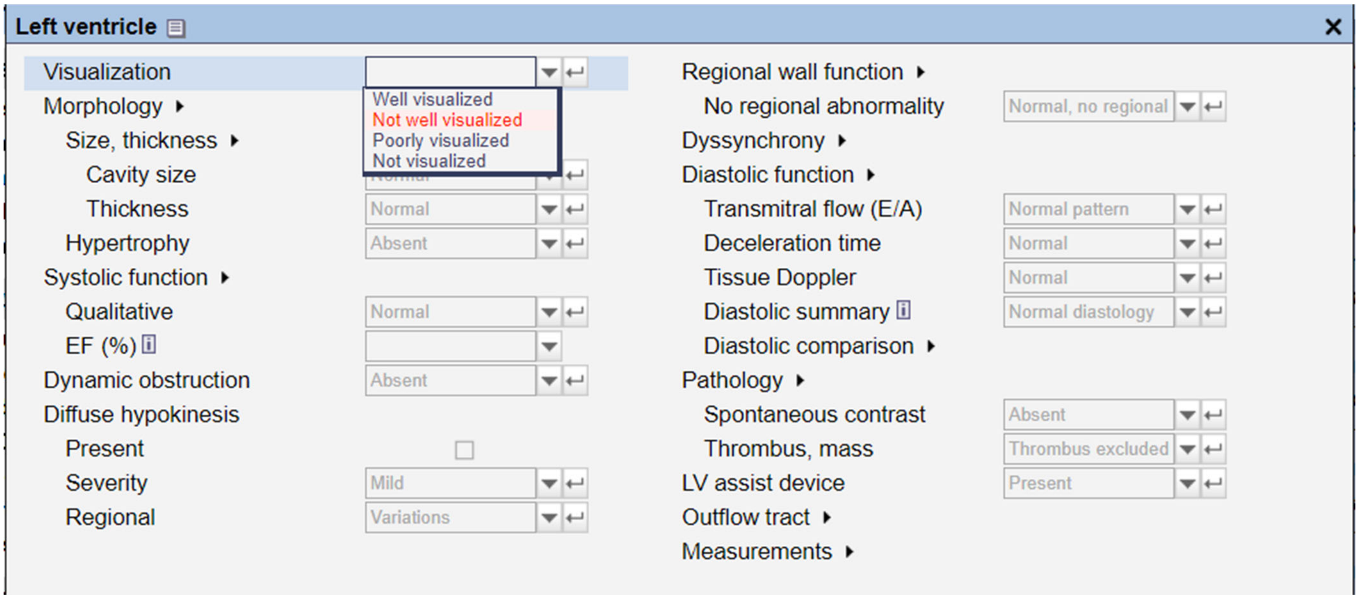
The following query selects any value recorded in the 'size' field of the chamberData table, but only for Echo studies and only for rows where the chamberID is VentricleLeft (17222).

```
SELECT chamberD.size

FROM CAView_EchoStudies echoS

LEFT JOIN chamberData chamberD on echoS.CAStudyID = chamberD.CAStudyID

WHERE chamberD.chamberID = 17222
```

Heterogeneous Mapping of List Values

Items listed in the same pick list in Report Wizard may map to different fields (or even different tables) in the AA database.

For example, "Left Ventricle Visualization" contains four defined values: Well Visualized, Not Well Visualized, Poorly Visualized, and Not Visualized. (Index tab > Findings > Left ventricle > Visualization.)



Left ventricle

Visualization	Well visualized Not well visualized Poorly visualized Not visualized
Morphology ▸	
Size, thickness ▸	
Cavity size	Normal
Thickness	Normal
Hypertrophy	Absent
Systolic function ▸	
Qualitative	Normal
EF (%)	
Dynamic obstruction	Absent
Diffuse hypokinesis	
Present	□
Severity	Mild
Regional	Variations
Regional wall function ▸	
No regional abnormality	Normal, no regional
Dyssynchrony ▸	
Diastolic function ▸	
Transmitral flow (E/A)	Normal pattern
Deceleration time	Normal
Tissue Doppler	Normal
Diastolic summary	Normal diastology
Diastolic comparison ▸	
Pathology ▸	
Spontaneous contrast	Absent
Thrombus, mass	Thrombus excluded
LV assist device	Present
Outflow tract ▸	
Measurements ▸	

The finding "Not Well Visualized", is mapped to the **chamberData** table as follows:

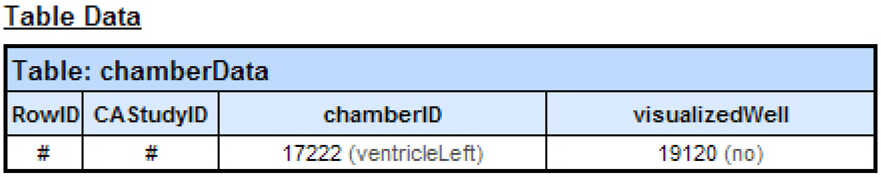


Table Data

Table: chamberData

RowID	CAStudyID	chamberID	visualizedWell
#	#	17222 (ventricleLeft)	19120 (no)

The finding "Poorly Visualized" qualifies the visualizedWell='no' (19120) field using an additional field visualizationComments='poorlyVisualized' (18765).

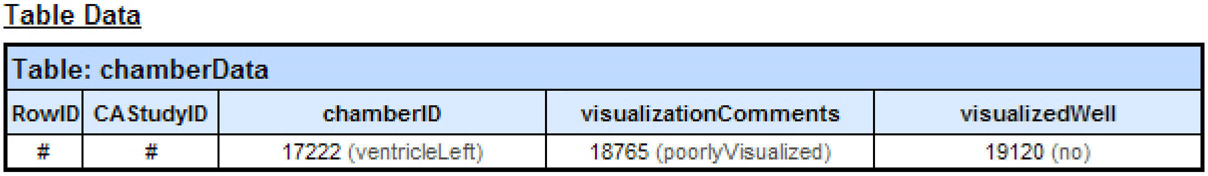


Table Data

Table: chamberData

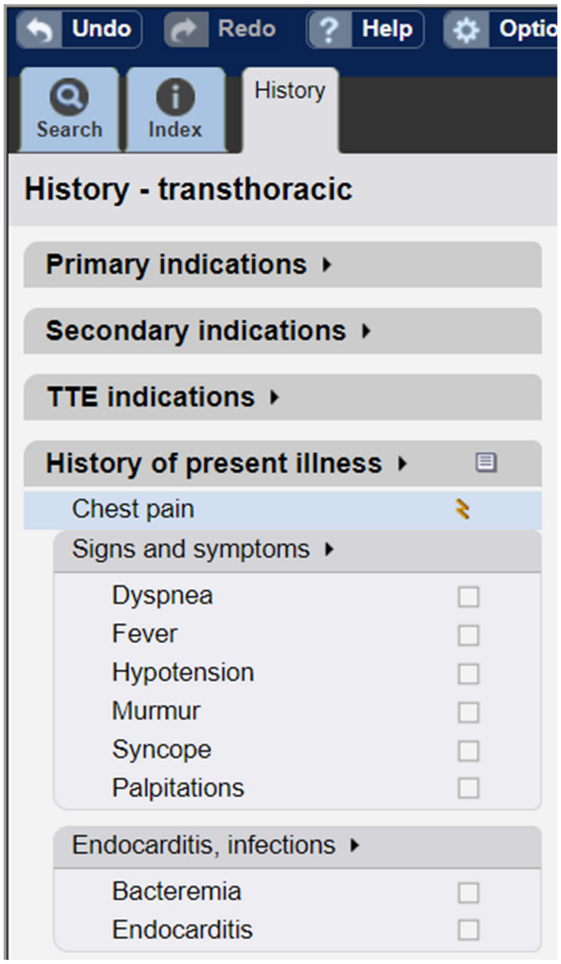
RowID	CAStudyID	chamberID	visualizationComments	visualizedWell
#	#	17222 (ventricleLeft)	18765 (poorlyVisualized)	19120 (no)

In this example, the **chamberID** and **visualizedWell** fields are defined with values as in the example above, and a third field, **visualizationComments**, appears as well. Because the **visualizedWell** field has two possible values (yes or no) and Left Ventricle Visualization has four possible values (Well Visualized, Not Well Visualized, Poorly Visualized, or Not Visualized), the **visualizationComments** field is required to further qualify the value.

Composite Data

Most concepts will export as a post-coordinated set of data items in the ASCEND Analytics database. For example, the TTE History tab contains an entry for Chest Pain, which is a single item in the list of indications.

When this finding is exported, three fields are used to define the Chest Pain value: the **context**, **location**, and **syndromeID** fields in the **syndromesData** table.



History - transthoracic

Primary indications ▸

Secondary indications ▸

TTE indications ▸

History of present illness ▸

Chest pain

Signs and symptoms ▸

Dyspnea □
Fever □
Hypotension □
Murmur □
Syncope □
Palpitations □

Endocarditis, infections ▸

Bacteremia □
Endocarditis □

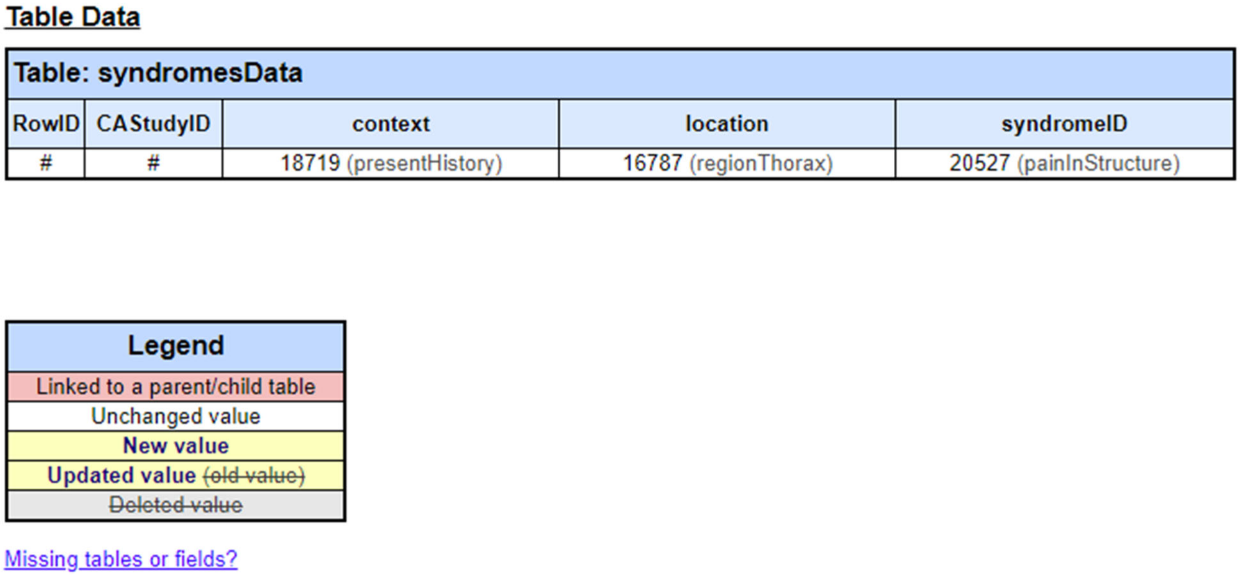


Table Data

Table: syndromesData				
RowID	CAStudyID	context	location	syndromeID
#	#	18719 (presentHistory)	16787 (regionThorax)	20527 (painInStructure)

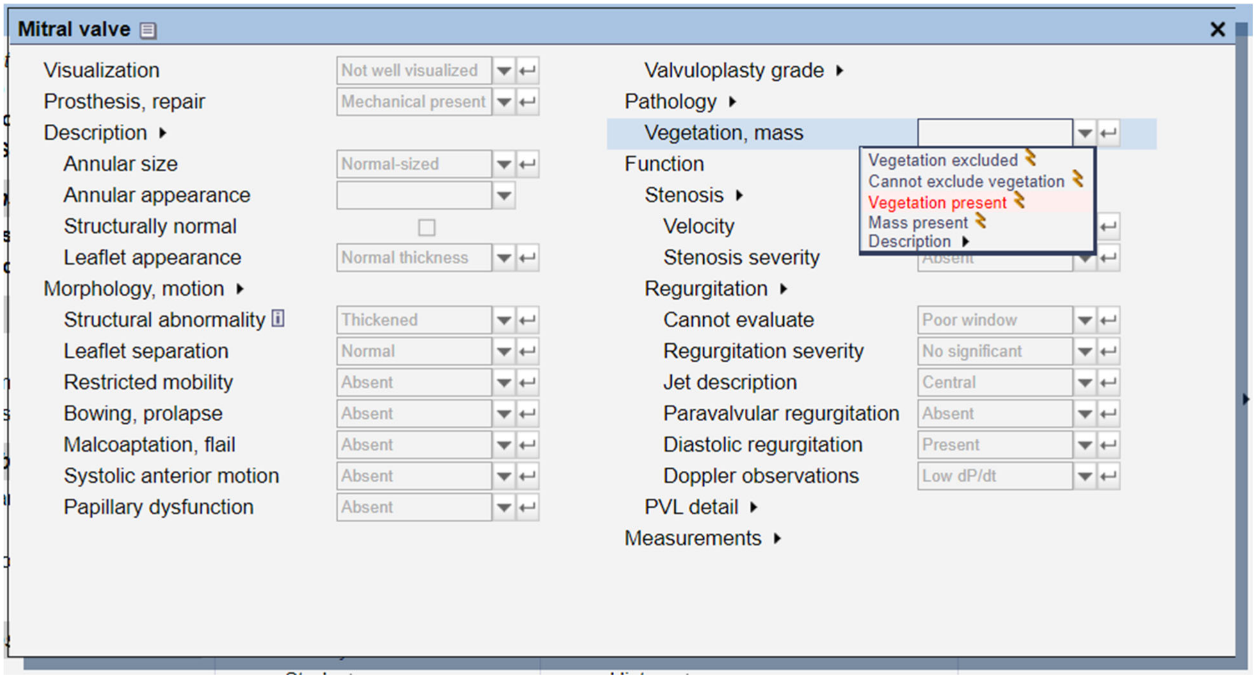
Legend
Linked to a parent/child table
Unchanged value
New value
Updated value ~~(old value)~~
~~Deleted value~~

Missing tables or fields?

Nested Data

Certain Report Wizard data items will be mapped to fields in more than one ASCEND Analytics data table. In most cases, a parent-child relationship will exist between the two tables.

For example, to indicate that a vegetation is present in the Mitral Valve, a single item is recorded in Report Wizard. (Index tab > Findings > Mitral valve > Pathology > Vegetation, mass.)



Visualization	Not well visualized	Valvuloplasty grade ▸	
Prosthesis, repair	Mechanical present	Pathology ▸	
Description ▸		Vegetation, mass	
Annular size	Normal-sized	Function	
Annular appearance		Stenosis ▸	
Structurally normal	☐	Velocity	
Leaflet appearance	Normal thickness	Stenosis severity	Absent
Morphology, motion ▸		Regurgitation ▸	
Structural abnormality	Thickened	Cannot evaluate	Poor window
Leaflet separation	Normal	Regurgitation severity	No significant
Restricted mobility	Absent	Jet description	Central
Bowing, prolapse	Absent	Paravalvular regurgitation	Absent
Malcoaptation, flail	Absent	Diastolic regurgitation	Present
Systolic anterior motion	Absent	Doppler observations	Low dP/dt
Papillary dysfunction	Absent	PVL detail ▸	
		Measurements ▸	

Upon export to the ASCEND Analytics database, however, you will see that two tables are required to record this data: **valveData** and **pathologyData**.

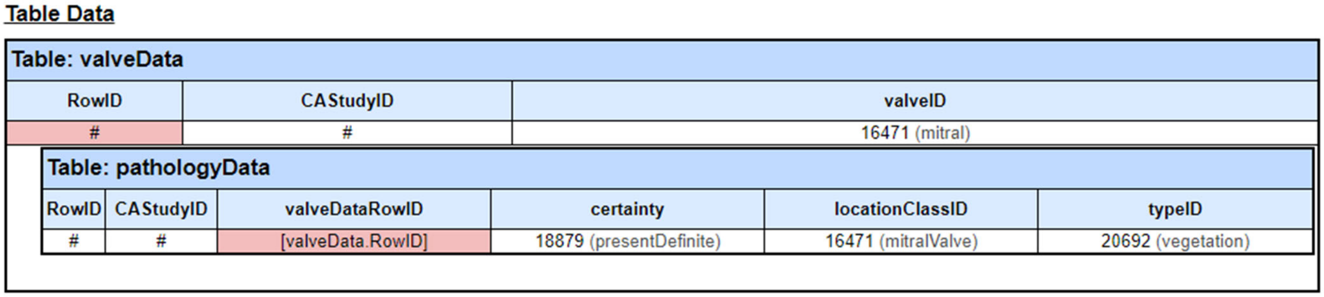


Table Data

Table: valveData

RowID	CAStudyID	valveID
#	#	16471 (mitral)

Table: pathologyData

RowID	CAStudyID	valveDataRowID	certainty	locationClassID	typeID
#	#	[valveData.RowID]	18879 (presentDefinite)	16471 (mitralValve)	20692 (vegetation)

The **valveData** table identifies the mitral valve in the **valveID** field, and links to the **pathologyData** child table via the **RowID** column. The **pathologyData** table contains the remainder of data for this finding.

In cases of parent/child tables, CSI also provides the table link information that describes the relationship between the two tables.

- The pink highlighted fields in the parent and child tables provide the parent-child link for those tables. These are always linked by a foreign key relationship in the database.
- The SQL statement provides an example showing how to link the two tables.

In this example, the following statement is used to define the relationship between the **pathologyData** table and the **valveData** table:

```
valveData LEFT JOIN pathologyData ON valveData.RowID = pathologyData.valveDataRowID
```

As you define your report queries, CSI provides the proper table linkages for each related table.

Example of nested data

Example: Echo | Mitral valve | Pathology | Vegetation, mass | Mass present

This exports as a parent table with information about the Mitral valve, and a child table with info about the pathology (mass) – there is a parent-child link between the two tables

Example of data coded to export in multiple places

***Example*: Echo | Left ventricle | Regurgitation pick list**

This is the same nesting as mass (above), but with one difference – the Regurgitation finding is present in both the **valveData** AND the **pathologyData** tables. The user can query either, depending on their needs. The data is duplicated specifically to make it easier to query for different purposes.

Example of measurements (use all fields in query)

Example: Left ventricle | Measurements | M-mode | IVS, ED (mm)

Measurements are shown as a single item in Report Wizard, but they often export as a post-coordinated set of values that itemize the various descriptors that define precisely what was measured (and how) in addition to the measurement’s value and units. The above example exports seven different fields in the **measurementData** table, plus the **chamberID** field in the parent **chamberData** table.

Miscellaneous Information

Existing Datasets

The first dataset in every report is the one providing the data displayed in the report. A few reports have a second dataset that calculates totals, and Dashboard reports have one dataset for each chart control. The name of the first dataset is usually "Dset" or "Dset_" followed by a number.

The other datasets provide values for any parameters that are dynamically generated, such as the list of physicians. There are three main varieties of these datasets:

- **Single-select list** – the dataset generates a dynamic list for a single-select parameter. One of the list values is always 'All'. The other values are dependent on the date range entered by the user – to ensure that the associated parameter displays only values relevant to the report's date range. The dataset **Dset_Facility** from the report **Case list for echo aortic valve stenosis** is an example of this dataset.

Note: All reports have a Dset_Facility dataset, because all reports have a Facility parameter.

- **Multi-select list** – the dataset generates a dynamic list for a multi-select parameter. This set does not contain an entry for 'All'. All values are dependent on the date range entered by the user – to ensure that the associated parameter displays only values relevant to the report's date range. The dataset **Dset_Physicians** from the report **Case list for echo aortic valve stenosis** is an example of this dataset.

- **Static list** – the dataset always generates the same list every time, and does not depend on any other parameters. The dataset **Dset_stenosisSeverity** from the report **Case list for echo aortic valve stenosis** is an example of this dataset. This type of dataset is rare – since the same end result can be accomplished without using a dataset by simply adding the list items as 'Available values' to the corresponding parameter.

Expressions*

When your report requires more a complex conditional evaluation of values, you can create expressions to generate the data that you need to display in the report.

Complex expressions include more than one simple reference, and are usually conditional in nature, meaning that the values displayed in the report depend upon certain conditions being satisfied. These expressions appear in Report Builder as <<Expr>>, and do require some programming knowledge (generally Visual Basic) to create or edit.

> * Source: Microsoft.com. (2017) Expression Dialog Box. *SQL Server 2014*. Retrieved from https://docs.microsoft.com/en-us/sql/reporting-services/expression-dialog-box?view=sql-server-2014

Common Expressions in AA Reports

Expressions in ASCEND Analytics can be used to:

- Concatenate values from multiple dataset fields

  Example: "Study type" cell from the report "Case list for echo aortic valve stenosis" has an expression that concatenates several study type strings, separated by carriage returns.

- Calculate values

  Example: the report "Echo completion time by physician" has several expressions in its main table whose purpose is to calculate different percentages, by dividing the appropriate number by the total and formatting as a percentage. In the bottom row of this report, the field logic also ensures that no 'divide by zero' errors occur by checking that the percentage denominator is not zero.

- Display alternate text for null, empty, or zero values

  Example: the "Area by LVOT" cell from the report "Case list for echo aortic valve stenosis" has an expression that displays "—" if the measurement value is 0.

- Treat "To date" parameter value as inclusive

Date parameter values in SSRS are treated as midnight (0:00:00 AM) of the date. However, in the case of a date range, the user’s expectation is for the date range to be inclusive. For example, entering a range of 1-1-2012 to 12-31-2012 should return studies recorded on any day in the year 2012. By default, this would not happen: the “To date” parameter would be treated as midnight of 12-31-2012, and therefore the results would exclude all studies recorded on 12-31-2012 after midnight.

This issue is fixed by using an expression in the Dataset parameters. NOT in the parameters themselves, but in the parameter references inside each Dataset.

Example: open the Dataset properties for the “Dset” dataset and click on the Parameters item in the dialog: the @toDate parameter shows “<<Expr>>” in the parameter value field. Click the “fx” button next to it to see the expression: it adds 23 hours, 59 minutes, and 59 seconds to the value, thereby allowing studies recorded on the last day of the date range to be included.

This expression MUST be present for every dataset that uses date ranges, in order to ensure that the “To date” parameter value is treated consistently.