



# Pacific Knowledge Systems

## RippleDown User Guide: Knowledge Builder

*The Knowledge Builder is the component of RippleDown that provides the user with the facilities for creating and maintaining Knowledge Bases. This document outlines how to use the multiple functionalities and features of the Knowledge Builder Application.*

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## Glossary

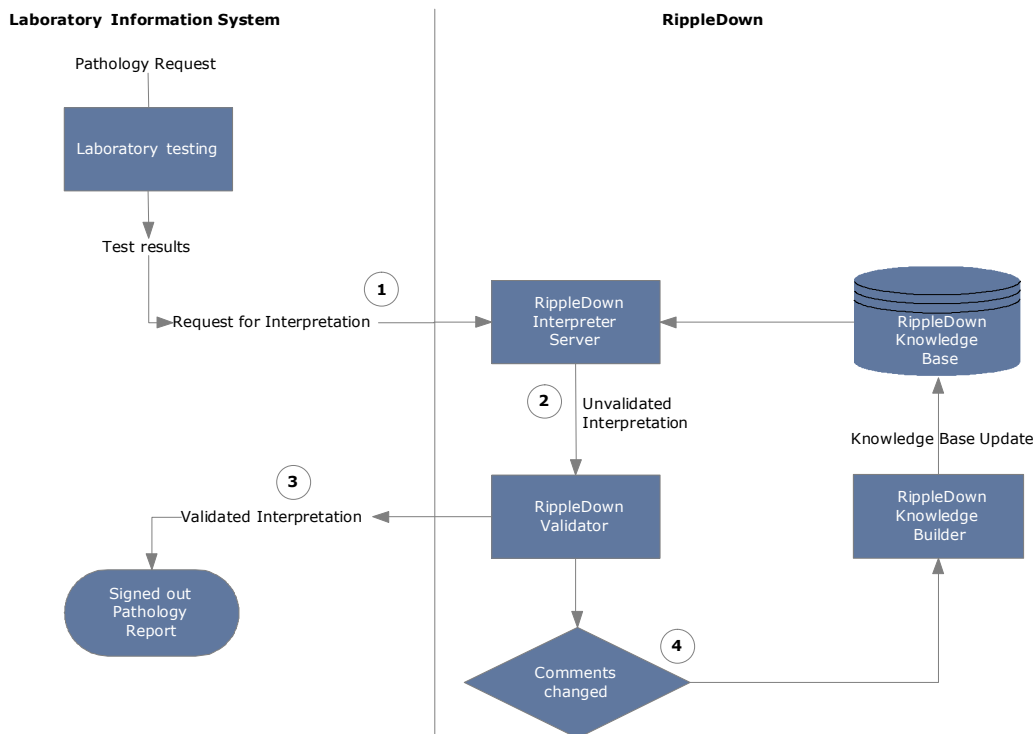
<b>Attribute</b>	Name representing each element or data item of a patient record <b>Primary attribute:</b> sent from the Online Information System <b>Derived attribute:</b> created from primary attributes as intermediate characteristic
<b>Auto-validation</b>	Release of cases from RippleDown without manual review. The degree and level of auto-validation can be set by rules in the Knowledge Base.
<b>Case</b>	Set of data for a patient that will be interpreted by a knowledge base
<b>Cornerstone</b>	A case against which a rule has been built. These are stored in the project as references for future rules
<b>Comments</b>	The output of the project and shown in the Validator screen.
<b>Condition</b>	A logical statement of either true or false used in creating rules e.g. glucose $\geq 5.5$ and can refer to current and or previous cases
<b>Episode</b>	The set of results for a patient at a particular time on a particular day
<b>Expert</b>	Medical staff member directing the objectives and outcomes of the project
<b>Feature</b>	Higher level characteristic of a case built using rules
<b>Knowledge Base</b>	This is the project or database containing the rules used for case interpretation for each clinical or operational domain
<b>Knowledge Builder</b>	Application used to create the rules and maintain the Clinical Knowledge Base.
<b>Objective</b>	Used for project documentation
<b>Project Explorer</b>	Documentation of the project showing the history of the knowledge base.
<b>Queues</b>	A list of cases pending review <b>Special purpose queue:</b> may be set up to hold a particular type of case <b>Copy queue:</b> created to allow independent review of cases
<b>Report</b>	The output of a RippleDown Knowledge Base i.e. the set of comments given for a case
<b>Rule</b>	A set of conditions to create an action, for example to add, delete or replace comments for a particular type of case
<b>Rule Wizard</b>	The set of steps to guide the rule building process.
<b>Validator</b>	Application used to review reports prior to release.

## Overview

### Workflow

The Knowledge Builder is the component of RippleDown that provides the user with the facilities for creating and maintaining the Knowledge Bases required for the various clinical domains.

Once it is deployed on-line by the RippleDown Server, the primary purpose of each Knowledge Base is to generate an interpretation on receipt of a case from the Online Information System.



#### Workflow:

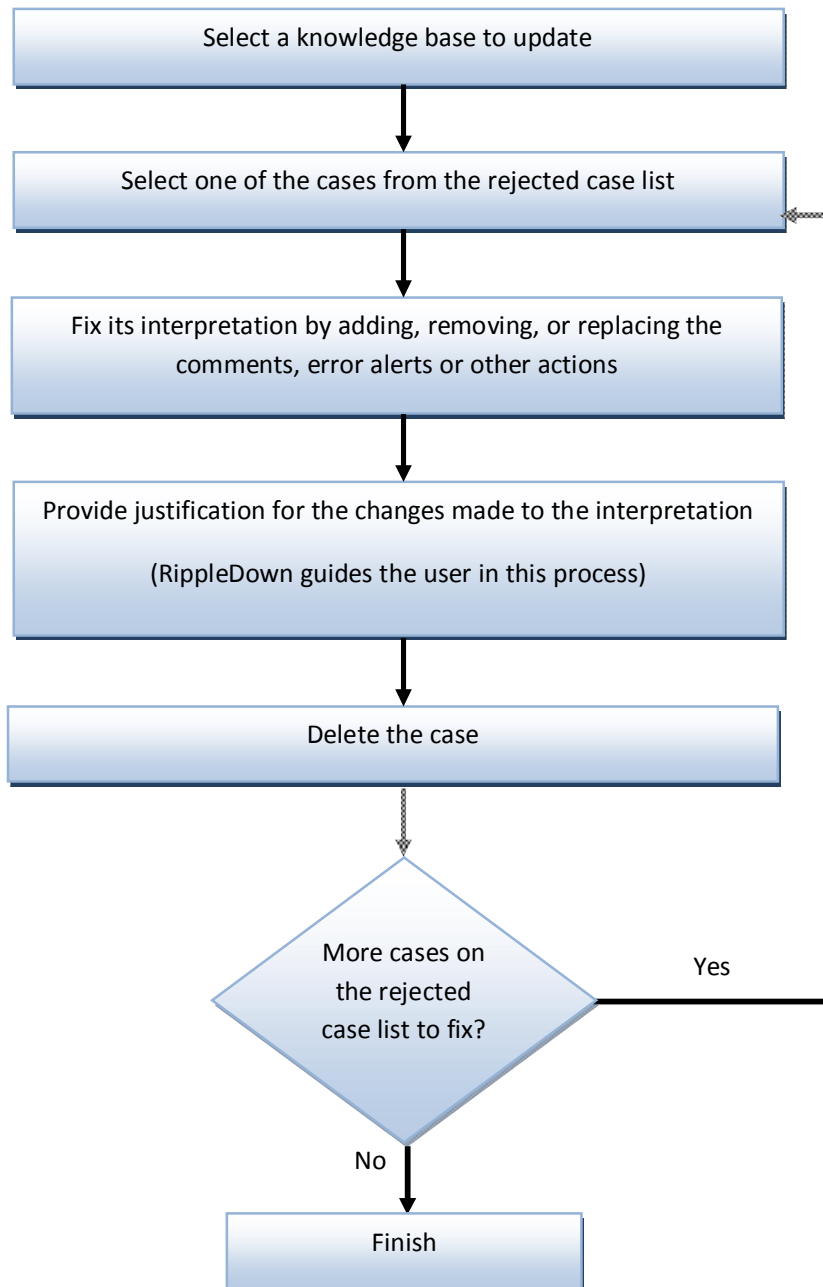
1. Laboratory case and result sent to RippleDown server.
2. Case is interpreted and comments added according to Knowledge Base rules.
3. Case authorised and the validated interpretation sent to the Online Information System.
4. If comments are changed in the Validator, the case is sent to the Knowledge Builder rejected list.  
Rules can be created to update the RippleDown Knowledge Base.

### Knowledge Base Organisation

RippleDown organises the rules into a structure using its RippleDown technology to maintain consistency of the Knowledge Base. The user of the Knowledge Builder can see all the conditions that were used to give that report.

## Knowledge Builder Tasks

Once the Knowledge Base is on-line the basic task for the Knowledge Builder is shown below:





## Projects

### What is a Project?

A project contains all the data (test results, episode and patient information, comments and rules) needed to make interpretive diagnostic conclusions for a pathology domain.

A project is also known as a knowledge base.

The purpose of a clinical knowledge base is to create an output in the form of an interpretive report, workflow comment, alert or combination of these. This output is displayed in the comments pane of Case View.

### Starting a New Project

To start a new project, 3 user types need to be involved.

The **RippleDown Administrator** to configure the Online Information System to:

- send cases to RippleDown consisting of current and historical patient data
- receive reports, alerts etc. from RippleDown
- to create the project in RippleDown
- to ensure the users have access to the project

The **project expert** to determine which data elements are needed in the project. These should include:

- Patient demographics
- Episode details
- Test codes and results
- History files

The **rule builder** to create the Knowledge Base project in RippleDown.

### Planning

Before building your project it is imperative to plan the main objectives, the attributes required from the Online Information System and the outputs expected from the knowledge base. Also required are an appropriate number of report sections to make the validating process as easy as possible.

## Project Components

### Objectives

Objectives are used for project documentation. These can be created during rule building, but for new projects it might be useful to create them first. Go to [Edit | Objectives...](#)

### Report Sections

Report sections need to be created before comments are written. These sections may be used to group together similar comment types. Go to [Edit | Report Sections...](#) to build your sections.

### Queues

A default queue is automatically created for each project. Rules can be built to create special purpose review queues for particular cases or conditions. Go to [Edit | Queues...](#) to build your queues.

### Attributes

A case in RippleDown consists of a set of **attributes**, and for each attribute a sequence of samples which are the values for those attributes for current and historical samples. There are several different types of attributes:

**Primary attributes** represent the "raw" data sent to RippleDown by the Online Information System.

**Derived attributes** can be created from the primary attributes to capture examples of key concepts e.g. a risk ratio

These attributes can be built in the Attribute Editor located in [Edit | Attributes....](#) Examples are:

- **lists** refer to a primary attribute and indicate when the attribute is an element contained in a defined list, for example of a group of doctor codes.
- **double lists** refer to two primary attributes, and match samples from one list depending on the value in the other list, for example to determine whether a doctor code is valid for particular wards.
- **numeric range attributes** – refer to a primary attribute and are used to flag values falling within a defined range.
- **deltas** refer to a primary attribute and use a table to flag cases for which there has been a significantly abnormal result or a significant change in values since the last episode.
- **text attributes** are used for careful matching of samples for a primary attribute, such as clinical notes, against lists of known keywords, taking into account lists of exceptions.
- **merged attributes** combine two or more attributes received from the Online Information System, possibly using different units, into a single attribute
- **calculated values** are derived from combinations of other attributes using the condition functions.

- **group attributes** refer to a set of related primary attributes.
- **episode attributes** are used to make complex assertions about individual episodes in a case.

**Features and Derived Features:** Features are higher level concepts that are created by rules to make further rule building easier. Derived features are similar to features but these can be constructed using existing features.

Features are used when there may be many definitions of a concept e.g. to identify a diabetic patient

## RippleDown Rules

A rule consists of one or more logical expression(s) or condition(s), which, if true for the case means that an output such as a report comment, an alert, or a workflow instruction is generated from the project.

The rule wizard is used in RippleDown Knowledge Builder to guide the user through the rule building steps.

### Rule Wizard

The rule wizard appears each time a rule is started and is used to guide the process step-by-step.

This facility allows the user to define a rule and document the reason for adding the rule and define the condition/s under which the rule will be applied. A reference case, called a Cornerstone, is stored for each rule in the knowledge base. All subsequent rules are checked against these cornerstones to maintain integrity of the knowledge base.

The user is able to undo the last rule that was added. This action may be repeated, if required, for all rules in the Knowledge Base.

Any changes made to the Knowledge Base, will take effect immediately and for subsequent interpretations made by the RippleDown Server.

### Conditions

The user is able to create conditions using near-natural language syntax. Conditions may refer to:

- The current episode or previous episodes
- A specified time period or date
- Trends in a test value
- Comparisons between values
- Previous or current reference ranges
- Textual values in clinical notes or other field

The full condition syntax is provided in the RippleDown Help utility.

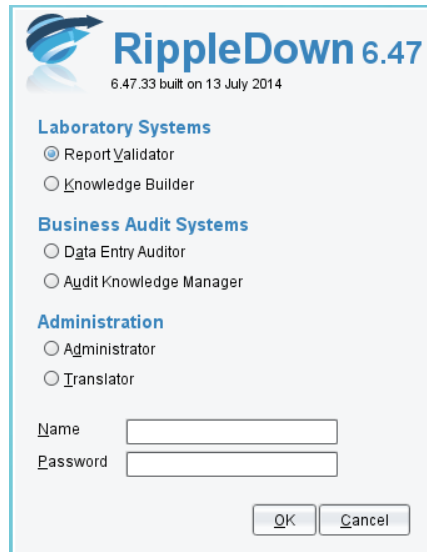
ALL conditions in an expression must be met before a rule is 'true' (or has passed).

## Logging In

Three modules of RippleDown are available from the login screen. The Laboratory Systems module is required for the clinical applications of Validator and Knowledge Builder.

To login to the Knowledge Builder:

1. Open the application.
2. From the screen shown below ensure the Knowledge Builder is selected:

The image shows the RippleDown 6.47 login screen. At the top left is the RippleDown logo, a blue stylized 'R' with a wave. To its right is the text 'RippleDown 6.47' in a large blue font, with '6.47.33 built on 13 July 2014' in a smaller font below it. The screen is divided into three sections: 'Laboratory Systems', 'Business Audit Systems', and 'Administration'. Each section has a title in blue and a list of options with radio buttons. In the 'Laboratory Systems' section, 'Report Validator' is selected with a blue radio button, and 'Knowledge Builder' is unselected. In the 'Business Audit Systems' section, 'Data Entry Auditor' and 'Audit Knowledge Manager' are both unselected. In the 'Administration' section, 'Administrator' and 'Translator' are both unselected. Below these sections are two text input fields labeled 'Name' and 'Password'. At the bottom right are two buttons: 'OK' and 'Cancel'.

3. Enter your username and password and click OK. (Please contact your RippleDown Administrator to create these)
4. From the File menu use “Open Project” to select the relevant project.
5. The main case view opens.

## Case View

Case View provides facilities for the user to view all aspects of the currently selected case including:

- The demographic data
- The current and previous episodes
- The current interpretation of the case
- The rules associated with each of the comments given in the interpretation
- Any notes added to the case by the person who reviewed the case in the Validator
- Any derived attributes or features that have been defined for the case.

**Case View**

NormoSevAnaemi... WBC... false AgeY... 71 AgeD... 25985 Sex F REG... VURDEN...

**Header**

14 Nov 13 00:00

**Patient Episodes**

**Case Lists**

Rejected (7)  
New reports (50)  
Favourites (232)  
LymphMedicr+40  
LymphMarkedIncr+40  
AcuteLeukaemia  
?? persisting anaemia  
MacroSev Retic available and raised emm  
MacroSev Retic available and low emm  
NormoSevAnaemia retics incr emm  
NormoSevAnaemia retics avail and decr emm  
MildLowRBC emm  
MildLowMCHC emm  
LymphMarkLowOtherWBCNorm

**Features and Derived Features**

Archive (0)  
Search (9)  
Features  
Type here to filter the tree

**Interpretive report**

HaemCommRBC  
Polychromasia.  
Persistent normocytic normochromic anaemia.  
HaemCommWBC  
Absolute leucocyte values are normal.  
HaemCommPlat  
Platelets are adequate.  
Interpretations  
Oncologist Comment  
Paediatric Comments

1080 rules | Autovalidation level: 100%. By report.

The Knowledge Builder provides the following facilities to enable case management:

- Finding and selecting a case
- Moving a case to the Favourites list
- Adding a new case
- Adding notes to a case for later reference
- Allowing a report to be auto-validated
- Renaming a case
- Editing the sample values within an existing case (to provide variants of the case that can be used for further rule building – only applicable to the Favourites List)

## Case View Toolbar

<b>File</b>	Used to open and close projects
<b>Edit</b>	Provides access to Editors for Constants, Attributes, Objectives, Comments, Queues and Report Sections
<b>Case</b>	Used to add/delete/copy and search for cases
<b>Interpretation</b>	Used for opening the rule wizard to add Comments, Features, Derived Features, Auto-validation and Queues. Also used to undo the last rule.
<b>Tools</b>	Provides access to the Project Explorer, Scratch pad and Project reports
<b>Auto-validation</b>	Used for managing Auto-validation and viewing Comment statistics
<b>Options</b>	Used to customise font type, size and format, set project settings such as case list properties and show/hide removed comments
<b>Windows</b>	Describes keyboard shortcuts for navigating through the CaseView screen. Can also be used to hide panes on the main screen
<b>Help</b>	Used to access the RippleDown online help facility

## Case Lists

Several case lists are found in the Knowledge Builder:

Case List	Functionality
<b>Rejected</b>	<p>These are the cases in which a change has been made to the RippleDown interpretations changed during validation in either RippleDown Validator or in the Online Information System.</p> <p>Rejected cases are the ones that you are likely to use when building rules for these interpretations.</p> <p>Only the most recent 1,000 rejected cases will be kept on this list. You can delete a case from the Rejected list once you have dealt with it, e.g. by building rules to fix its report.</p> <p>You cannot edit a case on this list. If you wish to edit a case on this list, copy it to Favourites and then edit it on the Favourites list.</p>
<b>New Reports</b>	<p>Cases which have reports that you have not yet allowed to be auto-validated. You can allow a specific report for a case on this list using the <b>Allow</b> button on the Preview window. Only the most recent 1,000 cases will be kept on the New Reports list.</p>
<b>Favourites</b>	<p>This list is manually created by the Knowledge Builder by copying cases from one of the other lists to the Favourites list.</p> <p>Once a case is on the Favourites list it may be kept for demonstration or training purposes and it can be edited for rule building and testing purposes. There is no limit to the number of cases on the Favourites list.</p>
<b>Cornerstones</b>	<p>These are the cases that have been used to build rules, and so will normally provide the best examples of each type of interpretation given by the Knowledge Base.</p> <p>You cannot edit or delete a case from this list. You can however copy a case to the Favourites. There is no limit to the number of cases on the Cornerstone list.</p>
<b>Archive</b>	<p>Stores 10,000 cases following interpretation by the RippleDown server.</p> <p>When a case is deleted from any of the other lists, it is stored in the Archive, where it can still be accessed if required. If a case is deleted from the Archive, it is permanently deleted from the project but may be retrieved from a backed up zip file stored by the server.</p>
<b>Search</b>	<p>When a search by condition is performed on one of the other lists, the cases found are copied into the search list</p>

## Case View

The first column displays the attribute / derived attribute / feature / derived feature name.

The next column displays the **reference ranges** (if any exist) for the analyte attribute.



*These ranges are not set-up in RippleDown, but are sent from the Online Information System with the case, and therefore only relate to the current episode.*

Columns from there onwards are for the episodes. Each episode has its own column, with results in the appropriate rows. The current episode column is the one farthest from the reference column.

## Information / Action Panel

The panel below the results has 6 tabs referring to screen panes:



<b>Comments</b>	The pane used to add comments
<b>Preview</b>	Displays the report as presented in the Validator and the Online Information System
<b>Approval</b>	Displays the report as approved by the RippleDown Validator and any differences between the original and approved reports.
<b>Auto-validation</b>	Pane used to define auto-validation settings
<b>Queues</b>	Pane used to define a special purpose queue
<b>Notes</b>	Displays any notes added to the case by either the Validator or a Knowledge Builder



## Attributes

Attributes are data items / elements for patient, episode, and test information, e.g. Given Name, DOB, Sodium, Chloride, etc.

Derived attributes are user defined manipulations of raw data (primary attribute results).

## Primary Attributes

These attributes represent the “raw” data items sent to RippleDown from the Online Information System. They appear in the Attribute Editor with an external and internal name.

The external name refers to the unique Online Information System codes. The internal name is initially identical to the external name but it is able to be customised in the Attribute Editor in RippleDown to make it user-friendly. It is this internal name that will be displayed in RippleDown Knowledge Builder and Validator case views.

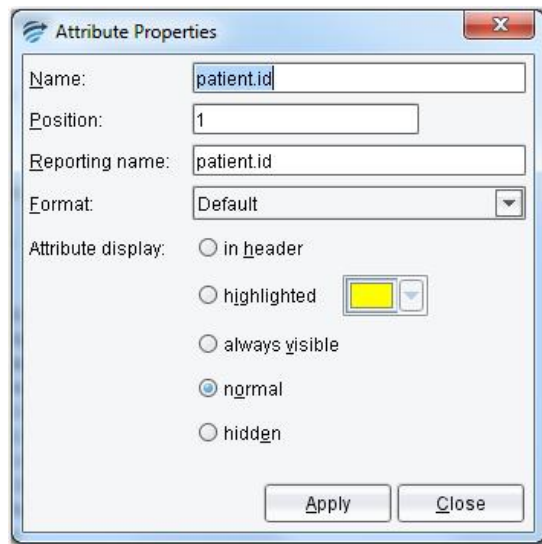
## Attribute Editor

Managing and manipulating attributes is done using the Attribute Editor, which can be found in [Edit | Attributes....](#)

You can search for attributes within the Attribute Editor using the search function. Go to [File | Find](#) (Ctrl + F). Alternatively mouse click on the search icon. This search is not case-sensitive. The first attribute that matches your search will be highlighted. To find the next matching attribute (and any subsequent ones) use the F3 function key.

To move the attributes to a new position in the list click on the attribute and drag it to the preferred location. Multiple attributes can be moved by using CTRL-Click or SHIFT-Click.

Other case view properties of existing attributes can be customised. Right click on the attribute and select Attribute Display:



Function	Description	
New Name	Enter the name to be displayed in Case View. Do not use spaces. Words can be separated by an underscore.	
New Position	Enter the position number in which the attribute is to be displayed in Case View. The “in header” option will override the position number.	
Attribute display	Select one of the options:	
	in header	To position the attribute and current value in the Case Header
	highlighted	To add a highlight colour to the row containing the attribute. The colour can be customised in the <a href="#">Attribute Editor   Options   Highlight colour</a>
	always visible	The attribute is always shown
	normal	The attribute and corresponding value at each episode are shown unless the sample value is empty. This the default.
	hidden	The attribute and sample values are not shown but may be used in creating rules
Format	Default	The attribute will not show in the body of a case if all of the samples for the attribute for that case are 'uninteresting'. For a primary attribute, a calculated value, delta, a double list or a merged attribute, 'uninteresting' means blank. For ranges, lists, text attributes and episode attributes, 'uninteresting' means having the value 'false'.
	No formatting	The attribute value will appear as presented by the Online Information System.
	1,2,3 or 4 significant figures	Attribute sample can be formatted to either 1,2,3,4 significant figures. This affects the display. Calculations using the attribute value will be performed on the data as it received from the Online Information System.

## Derived Attributes

The Knowledge Builder provides the user with the facilities to define “derived” attributes. These are user-defined attributes developed for each particular project.

These derived attributes and their values can be used for rule building in exactly the same way as primary attributes. RippleDown will evaluate each derived attribute for each episode in the case.



*Attributes cannot be deleted. To manage unwanted attributes, right click on the attribute in the Attribute editor, rename the attribute to, for example “DoNotUse”, and move it to the bottom of the list.*

The derived attributes available are:



### Numeric Range

A numeric range gives a true or false value relative to a sub-range of values for the selected numerical attribute, e.g. a high, low or normal range

For example: The attribute Baby is defined as a patient with an age in days between 7 and 365 days:

Referring to: Days\_Age

Range: 7 ≤ Days\_Age ≤ 365

Days\_Age <

< Days\_Age

Close



### List Range

A list range is used to detect episodes in which the value for a primary attribute matches one of a list of values. A list attribute will return a *true* if the primary attribute, on which it is based, contains one of the entries from a discrete list.

An example might be a list of known endocrinologists. The Endocrinologist list attribute will be true if the referring doctor for the episode appears in the list, see below:

Referring to: Requesting\_Dr

Requesting\_D... is one of:

- Dr Huy Tran TraH
- Dr Huy Tran TraH1
- Dr James Wilson WILJ1
- Dr James Wilson WILJ2
- Dr James Wilson WILJ3
- Dr James Wilson WILJ4
- Dr James Wilson WILJ5
- Dr Nikolai Petrovsky PetN

Add

Remove

Import

From the Case View it is possible to add elements to the list. To do this right click on the sample, select Add value to ... and select the appropriate list.



## Panic / Delta Check

A panic / delta check refers to a detailed set of numeric ranges defined in a tabular fashion for that test. These ranges may be separately defined according patient age, sex or other demographic, and for sub-ranges of the test values.

The alert is generated if the current value is outside some defined range, or alternatively, if the value has increased or decreased from its previous value by an amount greater than what is allowed.

A Panic Delta will give a value of "true" if the alert has been triggered for the **current** case. If the Panic Delta is not triggered for the case, it simply will not show.

Constraint	Reference Range	Panic/Action Range	Variation Range	Allowable Increase	Allowable Decrease	Days
30 < DaysAge	8.4-15.4	7.0-22.4	< 8.0	50.0 %	10.0 %	30
30 < DaysAge	8.4-15.4	7.0-22.4	8-15	50.0 %	40.0 %	30
30 < DaysAge	8.4-15.4	7.0-22.4	> 15	50.0 %	40.0 %	30
DaysAge < 31	8.4-15.4	7.0-16.4	> 0	30.0 %	30.0 %	30

Each row of the Panic Delta contains the following:

### Constraints

- These are criteria that must be satisfied for the panic delta processing to continue. Examples are, age > 50, sex is "F".
- Up to 2 constraints can be defined per row.
- To edit or add a constraint, select a constraint cell and use the right-click menu "Edit Constraint".
- The constraints can refer to primary or derived attributes of the case, and often refer to demographics such as age or sex, rather than the test attribute itself.
- All other ranges in the Panic Delta refer to the test attribute.
- If you leave a constraint empty, then it is assumed to be satisfied.
- If both constraints are satisfied by the current case, then the panic delta processing will continue, looking next at the Reference Range.

### Reference range

- The Panic Delta reference range is something you define for the test attribute - it may or may not correspond to the reference range supplied by the Online Information System as part of the case.
- If there is only 1 episode in the case, then the panic delta will trigger if the attribute is outside the reference range.
- You should not leave the reference range blank, otherwise all single episode cases will trigger the panic delta.
- To edit or add a reference range, select the reference range cell and use the right-click menu "Edit reference range"

- If there are 2 or more episodes in the case, and they are sufficiently close in time, then the reference range is ignored and the panic / action range is used.

#### **Panic / Action range**

- Used if there are 2 or more episodes in the case, and the time between the current test value and the previous test value is less than the specified number of days, then the panic delta will trigger if the attribute is outside the panic / action range.
- This enables you to define a wider panic / action range than reference range, for those situations where you are closely monitoring the trend of a test value.
- To edit or add a panic / action range, select the panic / action cell and use the right-click menu "Edit panic/action range"
- If the test value is within the panic / action range (and we have the situation of the 2 episodes close in time), then the variation range and allowable delta processing is done.

#### **Delta Check** (variation range, allowable increase, allowable decrease, units, days)

- A variation range defines the range of test values for which the allowable increase or decrease is checked.
- This allows you to define different allowable increases or decreases depending on the absolute value of the test attribute.
- To edit any of the delta check fields, select a delta check cell and use the right-click menu "Edit delta check fields"
- By default, each allowable increase or decrease will be interpreted as being in absolute units. However, you can change this to percentage.
- To add several variation ranges, each with a different allowable increase or decrease, use the right-click menu "Copy this row", then change just the delta check fields for the new row.

Multiple rows can be defined if you require different reference ranges, panic / action ranges, or delta checks for different constraints, e.g. a new set of ranges if the patient is female, or over a certain age. To do this, use the right-click menu "Add a row", then edit the constraints and ranges for the new row.

Rows in the Panic Delta can be re-ordered using the right-click menus "Move up", "Move down". They can also be removed if required.

When you have finished defining the Panic Delta, click the [Close] button. The new Panic Delta will appear as an attribute in all cases where it triggers.

Once the panic / delta ranges have been defined, the logic to trigger the check is as follows:

1. If there is only 1 episode for the case (i.e. the first presentation of this patient), the check is triggered if the test value is outside the reference range.
2. If there is more than 1 episode, and the previous episode is within the specified time period, the check is triggered if the test value is outside the panic range.

3. If the test value is inside the panic range, then the check is triggered if the change in the test value from the previous to the current episode is outside the allowable increase or decrease (specified either in absolute units or percentages)

Rules may be defined to take the appropriate action according to the value of a panic / delta check. For example, rules may be added to ensure that if a check is triggered, the case is never auto-validated. When the case is shown to the user in Validation, the reason why the check was triggered is shown.



### Calculated Value

A calculated value refers to a formula involving one or more attributes, e.g.

A determination of borderline low TSH might appear as:

The formula can involve other calculated values as long as circular references are avoided i.e. A calculated attribute A can refer to calculated value attribute B as long as B does not already refer to A.



### Text Attribute

A text attribute is used to refer to the presence of a word or phrase in an attribute that has textual values, e.g. looking for “diabetic” in a patient’s clinical notes. Facilities are provided to refine the search so as to exclude similar but unwanted words or phrases, e.g. diabetic.

True	False
Diabetes	? Diabetes
Diabetic	?Diabetes
T2d	Diabetes in family
dm	Diabetesin family
dm1	



## Double Lists

Double Lists are used to relate values of two primary attributes, where for certain values of one attribute, only a limited list of values of the second attribute are allowed.

Edit: Dr CodeMatchesWard

This attribute will check that, for each of the listed values of Ward, only the corresponding values for ConsultingDrCode are given.

First: Ward  
2.ps  
5.bb  
6.inf  
6.sshc  
6.wake  
7.ms  
7.prof

Second: ConsultingDrCode  
a422  
c18492  
c4670  
c735  
e2293  
k2467  
k5931

Add Remove Add Remove

This attribute will be "true" if Ward is 2.ps and ConsultingDrCode is a422 or c18492 or ....

Close Help

In the example if the Ward is 2ps and the ConsultingDrCode is a422, the attribute will evaluate as true



## Merged Lists

A merged attribute is one that takes its value from two or more primary attributes. For example if a test is superseded in the Online Information System, the old test name may appear in historical episode and the new name in the current episode. A merged attribute combines the two tests into a single attribute for use in the project. When defining a merged attribute, each test may be provided with a scaling factor to take into account changes in units between superseded and new test.

Define merged attribute - FT4\_Merge

FT4\_Merge will be created by merging values from the following primary attributes, taking into account the specified scale factors. See the Help for more details.

Primary Attribute	Scale factor
FT4	10
FT4new	1.0

Add Remove



## Group Attribute

A group attribute refers to a set of related primary attributes. They can be useful in the situation where the project deals with possibly very many primary attributes, but where the comments and rules can be more simply expressed in terms of groups rather than the individual attributes.



For example, we can define the following groups of allergen attributes:

Group	Attributes in Group
pollen	birch mugwort
food	milk peanut
animal	dog cat




## Episode Attribute

Episode attributes are used to identify episodes in a case, at which all of a number of defined conditions apply. Along with primary attributes, the conditions can include other derived attributes. These are useful to identify clinical patterns. For example, suppose that we need to identify patients who have had gestational diabetes. One indication of this will be that there is an episode at which:

- the 'Pregnant' attribute has value "true"
- the 'CollectionType' attribute has value "Fasting"
- the 'Glucose' value is elevated.



The episode attribute, "GestDiab" will be true for when all three conditions are met, for example:

	05 Feb 12	06 Oct 12	07 Nov 12
Pregnant	false	True	false
Glucose	4.1	7.8*	4.5
CollectionType	R	F	F
 GestDiab	False	True	False

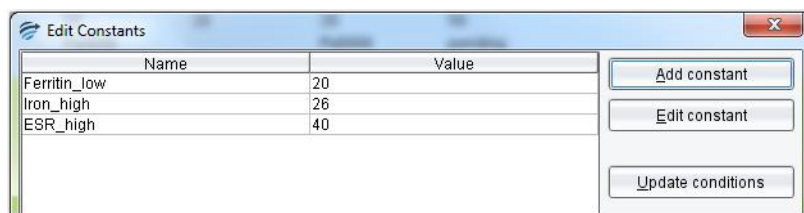
## Constants

Numerical or textual values used in conditions can be defined as constants. For example, in a glucose Knowledge Base you might define a constant GLUCOSE\_HIGH = 5.5. Then, instead of "hard-coding" numbers into your rules like "glucose > 5.5" you can use the constants, e.g. "glucose > GLUCOSE\_HIGH".

Using constants rather than hard-coded numbers is strongly recommended. The advantages are:

- A constant such as GLUCOSE\_HIGH is more understandable than the number "5.5", especially for someone who is exploring the Knowledge Base, and
- Once you have defined a constant, you can change its value at a later stage if required. This means that any conditions that use that constant will not have to be changed, saving you a lot of time.

Constants are defined and modified using the Constants Editor [Edit | Constants](#). Each constant consists of a name and a value. Multiple constants can be defined and will appear listed in a table:



The table can be sorted either by name or value simply by clicking on the heading.

### To use constants:

Constants can be used by typing the constant name into expressions, for example:

Ferritin < Ferritin\_Low

Note: The constant name must be typed and it cannot be selected from the tabs in the rule wizard.

## Updating an existing Knowledge Base to use constants

Once you have defined a set of constants, you can update the existing conditions in your knowledge base to use these constants. Use the 'Update conditions' button. The system will then find all the conditions that use one of the constant values you have defined. You will then be asked to confirm each condition before the replacement is made, as shown in the example above in which the value 20 will be replaced with the newly defined constant called Ferritin\_Low.

## Features and Derived Features

### Features



Features are indicated by the grey light globe icon:

Each feature represents a high-level concept that is defined by rules and may in turn be used in other rules. Features, as derived attributes, are not added to the interpretive report.

An example of a feature could be 'Is\_Diabetic'. This feature may be added to a case for many different reasons, e.g. *more than 3 Glucose > 11.0* or *clinical notes contains "diabetic"*. Once this feature has been defined, the interpretive comment "History of diabetes noted" can be added, with condition 'Is\_Diabetic' is true".

There are several advantages to using features:

- Conditions using features may be more intelligible than using more complex expressions involving attributes
- A feature is a shorthand way of expressing a pair (or more) of conditions that often are used together
- A feature is easy to find and re-use in different rules
- The same feature may be defined in more than one way, e.g. "IsDiabetic" could also be given if the GTT 2 Hr result was at a certain level

### Derived Features



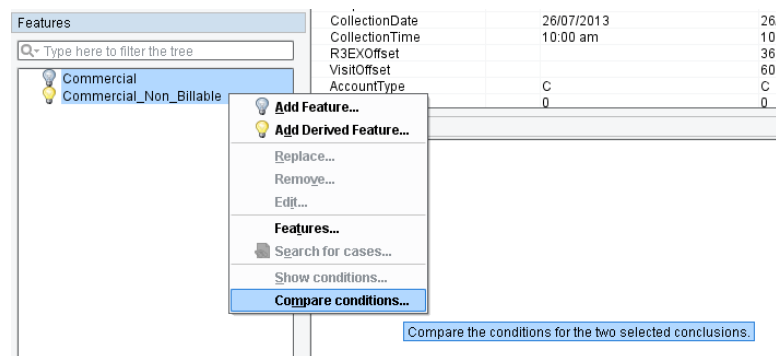
Derived features are indicated by a yellow light globe icon:

Derived features are higher level features. The only difference from features is that derived features can be defined using features.

For example, you might have already defined three features XNormal, YNormal and ZNormal. There may be rules where you want to use these 3 features together. Rather than repeating these 3 features in conditions each time, you can then define a derived feature XYZNormal which is given if the other three are given, thus simplifying these rules.

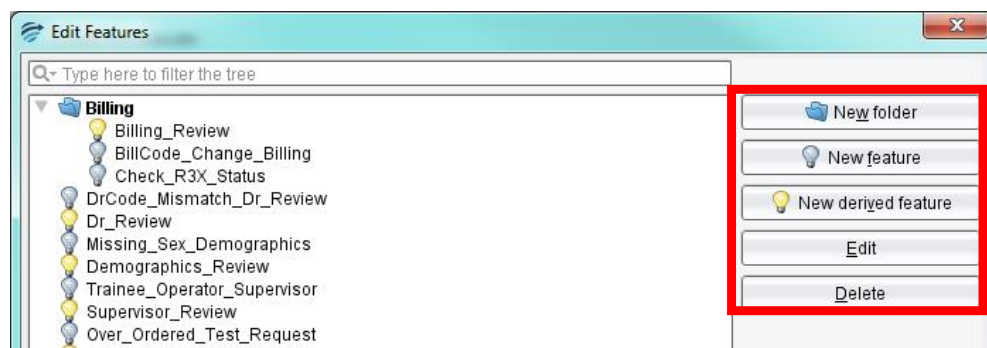
## Compare conditions for Features and Derived Features

You can compare the conditions set for Features and Derived Features. Simply highlight the Features or Derived Features to be compared and right click, then select “Compare conditions...”.



## Feature and Derived Feature Organisation

Features and Derived Features can be edited and organized into folders. This can be done through the Edit Features window. They can be reorganized into folders by using Drag and Drop.



## Rules and the Rule Wizard

A rule is a set of conditions to create an action, for example adding or deleting a comment. RippleDown employs case-based reasoning and a rule can be only be built against the conditions presented in the current case showing in Case View.

RippleDown provides the Rule Wizard to guide the process of updating the knowledge base for the currently showing case. The stages of the Rule Wizard are

1. Define the rule action
2. Set an objective
3. Add conditions
4. Review cornerstone cases.

## Rule Wizard - Define the Action

A variety of actions can be controlled by rules. These are

Function	Action
<b>Comments</b>	<ul style="list-style-type: none"><li>▪ Adding a comment</li><li>▪ Replacing the selected comment by another one.</li><li>▪ Removing the selected comment</li><li>▪ Re-adding a removed comment</li><li>▪ Enabling or disabling a report section</li></ul>
<b>Features and Derived Features</b>	<ul style="list-style-type: none"><li>▪ Adding a feature</li><li>▪ Replacing the selected feature by another one</li><li>▪ Removing the selected feature</li></ul>
<b>Auto-Validation settings</b>	<ul style="list-style-type: none"><li>▪ Adding an auto-validation setting</li><li>▪ Replacing the selected auto-validation setting by another one</li><li>▪ Removing the selected auto-validation setting</li></ul>
<b>Review queues</b>	<ul style="list-style-type: none"><li>▪ Adding a review queue</li><li>▪ Replacing the selected review queue by another one</li><li>▪ Removing the selected review queue</li></ul>
<b>Report items</b>	<ul style="list-style-type: none"><li>▪ Enabling the selected report item</li><li>▪ Disabling the selected report item</li></ul>

To initiate an action use the right-click function in the required tab.

## Rule Wizard - Set Objective

Objectives are used to document a Knowledge Base by adding to each rule an explanation of why the rule is being built. An Objective can be further refined into a set of sub-Objectives. For example, an Objective could consist of a local commenting policy within the laboratory, and a sub-Objective could be a specific aspect of that policy. Therefore, it is possible to have several levels of Objectives.

The Objective Editor ([Edit|Objectives](#)) is used to view and manage objectives. The available operations are to:

- create new Objectives
- modify existing Objectives
- delete unused Objective
- supersede one Objective with another
- re-order or move an Objective under a new parent Objective using drag-and-drop

An extract of the Objective Editor is shown below.



The very first item is the heading "**Objectives**". Underneath this heading are the top level Objectives shown in **bold** font.

Objectives can be created before rules are built using the Objective Editor from the main screen. Alternatively, an Objective can be created and selected at the time of building a rule from the Select an Objective rule wizard step.

## Rule Wizard - Add Conditions

Conditions are specifications that are used to justify the comments added in a rule. Each condition therefore evaluates to true or false for a case. Conditions are written in a near natural language syntax built up from various pre-defined functions. The following screen is used to add conditions:

The list of conditions to be applied

These fields are used to add conditions

Cornerstones

Search Bar

The Differences List

3 Derived Attributes		4 Features	5 Derived Features
1 Attributes		2 Unused Attributes	
	Case	Cornerstone	
Age_years	68	63	
Alb_Creat_Ratio			
Cholesterol	5.2	4.6	
Clinical_notes	Diabetes, H/T	Screening // high BP.	
Glucose	8.0*	4.2	
GTT_2hr			
GTT_Fasting			
HBA1C	7.3*		
HDL_chol	0.8*	0.8*	
LDL_chol	2.5	2.8	
request.doctor	ADADO	WOLD0	
Sample_type			
Sex	M	M	
Triglycerides	4.2*	2.1*	

Conditions to be applied will be listed in the Completed pane. Further information on condition syntax is located in the next section.

There are three methods of adding conditions:

## Using the Current tab

1. Type the condition directly into the Current field (information on conditions can be found in the next chapter)
2. Use the Test button to determine:
  - a. Whether the condition is true for the case;
  - b. Whether the condition is true for the cornerstone case, if there is one;
  - c. How each part of the condition has evaluated.
3. If the condition is true, click the Add button.

## Using the Difference List

The difference list shows the following tabs:

- Attributes: (Only those that have been used in conditions)
- Unused Attributes: (Only those not yet used in conditions)
- Derived Attributes (numeric range, list, text, or calculated value attributes)
- Features
- Derived Features
- Report Sections

Each tab contains a table that shows the names of the respective items (attributes, features etc.), their values for the current case, and their values for the current cornerstone case if there is one. If an item's value is different for the case and cornerstone case, it is shown in bold type. If an item has already been used in the current rule session, it is shown as coloured in the difference list.

When an item is selected, it is automatically inserted into the Current field. Pressing the next button will then show the templates that can assist the condition. Only those items in the difference list that are relevant for the current rule session will appear.

Some items (derived attributes, features and derived features) can be double-clicked to quickly add them as conditions. For example, double-clicking a feature called 'Diabetic' will add it as a condition if it is true for the case, otherwise the condition 'not Diabetic' will be added.

When selecting one of the tabs on the difference list, the suggested conditions are correspondingly filtered. For example, when selecting the derived attributes tab, then only conditions that use a derived attribute will be shown as suggestions.

## Using Suggestions

Suggestions are conditions that have previously been used in this Knowledge Base and might be relevant. To add one of these suggestions, double click and it will be placed into the Completed field.

Note: a single click will move the suggestion to the Current field. Click the Add button to move the suggestion to the Completed field

## Rule Wizard - Check Cornerstone Cases

As conditions are added to the Completed field, the conditions are compared to Cornerstone cases. A cornerstone case is one against which a rule has already been built. RippleDown keeps, in each project in the Cornerstone case list, a store of cornerstone cases that help prevent rules having unintended side-effects.

Cornerstone cases affected by the conditions are presented as 'Conflicting cornerstones'. The total number is shown at the Total cornerstones: dialog.

Each of these cases must be reviewed to determine whether the rule is appropriate. To do this click on the Show button to reveal the Check Cornerstone screen shown below:

The screenshot shows the 'Cornerstones' dialog box. At the top, there's a 'Cornerstones' label with a value of 5. Below it are three tabs: '1 Case and Cornerstone', '2 Case only', and '3 Cornerstone only'. The first tab is selected. The main area displays a table with columns for 'Case' and 'Cornerstone', and a 'Range' column. The 'Case' column shows a tree structure with 'OccultBloodChemical' expanded, showing 'Demographics' with sub-items: 'Suburb', 'Given', 'Surname', 'DOB', 'Sex', 'Addr1', and 'Postcode'. The 'Cornerstone' column shows 'S'. The 'Range' column shows '18 Apr 13 10:00' to '18 Apr 13 10:05'. Below the table is a 'Comment' section with the text: 'Cpos\_lpos & CS\_lpos Faecal Occult Blood: Positive. Blood detected in stool sample. Bleeding from the gastrointestinal tract shown Internal'. At the bottom, there are two buttons: 'Apply change to cornerstone' and 'Do not apply'. Arrows point from the text below to these buttons.

If the rule is to apply to the Cornerstone case, click the 'Apply change to cornerstone' button. If not, click Do Not Apply and add a condition that differentiates between the rule case and the cornerstone, thus excluding the cornerstone and preventing the rule from affecting it.

Once all Cornerstone cases have been reviewed and the Cornerstone count is shown as 0. Close the dialog using the red X in the top right corner.

The Rule Wizard screen is shown again. Click Finish to apply the rule.

## Conditions

RippleDown has a rich language for writing rule conditions for analysing numeric and text results. The functions range from simple comparisons to complex pattern matching.

When building rules in RippleDown you often want to restrict the conditions to some of the episodes of a case. For example, you might only be interested in glucose values where the patient was fasting

## Basic syntax

The first table shows some results for a patient:

		10 Jan 11	16 Jul 12	5 Dec 12	3 Mar 13
Status			Non Fasting	Fasting	Fasting
Therapy		Y		N	
ClinicalNotes		?DM			Is diabetic
Glucose	3.45 – 5.45	6.3*	5.9*	5.8*	5.2
HbA1c	3.3 – 5.7	4.1			
Cholesterol	< 5.2	6.8*	5.0	5.3*	

Current episode

Previous results                      Most recent result

This second table shows examples of simple syntax based on the results above.

Type	Condition	Example
Comparison - numeric	<, >, ≤, ≥, =	Glucose < 5.3 Glucose = 5.2
Comparison - text	is, is not, contains	Status is "Fasting"; ClinicalNotes contains "diabetic"
Existence	is available	Glucose is available
	is not available	Cholesterol is not available
Normal Range comparison	is normal is low/is high	Glucose is normal
The most recent available sample (could be the current)	Most recent	Most recent Cholesterol is high Most recent Glucose is normal
Previous episode/s (i.e. before the current)	previous	Previous HbA1c is not available Previous Cholesterol is 5.3 Some previous Cholesterol is normal
All episodes	Some	Some Glucose ≥ 6.2
	None/no	No HbA1c is high
	At most, At least	At most 3 Glucose are high At least 12 months since HbA1c is available
	Exactly	Exactly 3 Glucose are high
All episodes (including current) within a time period	Within last	Some Cholesterol within last year is normal No HbA1c within last year is available
All previous episodes within a time period (i.e. not the current)	Within last	Some previous (Cholesterol within last 6 months) is high
Change in result	After/where	some Therapy is "N", after Therapy is "Y"



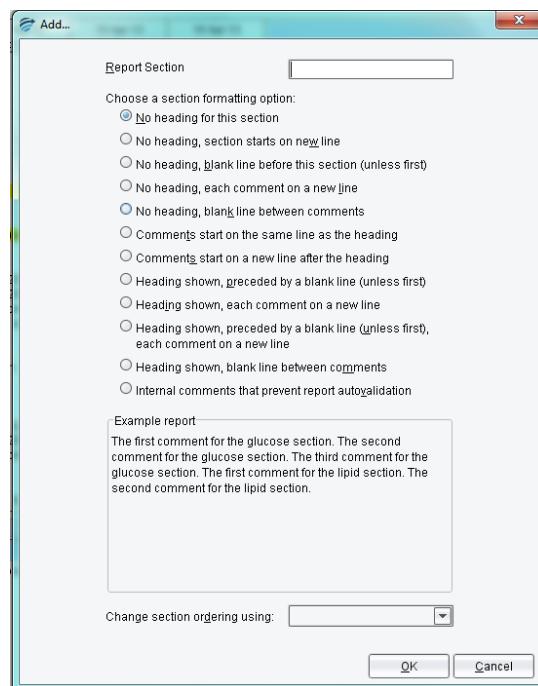
## Reports

A "Report" is the ordered set of comments provided by the Knowledge Base for a case and may be divided into report sections containing one or more comments.

When a new project is created, there are two pre-defined Report Sections available:

1. A Report Section called "Comments" and is enabled by default.
2. A Report Section called "Internal", which has the pre-defined Internal format properties:
  - a. Neither the heading nor the comments in this section are included in the report.
  - b. Any comments for this section will appear in the Validator in a separate window as an "internal" comment for the reviewer.
  - c. Comments will not be released to the Online Information System if you are using the Validator to review cases.
  - d. The Internal Report Section can never be enabled by rules.

Report sections may be created, modified and ordered using the Report Section Editor: [Edit | Report Sections....](#) and either selecting *add* or *modify* from the edit menu to show the properties of a specific Report Section:



Here it is possible to name the report section and to select one of the predefined format options. An example of the format type is shown in the lower once an option is selected.

By default, report sections will appear in the order specified in the Report Section Editor. It is possible to specify that Report Sections should be ordered on a case-by-case basis, See the Help topic on "Report Section Ordering"

## Interpretive Report

An interpretive report is created by adding comments using the rule syntax. Please see next section on creating and managing comments.

The Knowledge Builder provides facilities for the user to view the current interpretation, either in a “preview” mode, to view the interpretation as it is presented to the Validator or Online Information System, or in a more detailed “comments” view.

Any notes associated with the case can also be seen in the Notes Tab. These generally consist of memos from the Validator user as to what sort of changes need to be made to the interpretation of this case before it is suitable for release.

## Interpretive Actions

As well as an interpretive report, the Knowledge Builder can be configured to provide a defined set of actions. The same knowledge building methodology used for comments also applies to actions. The types of actions that can currently be defined are:

- Instructing the RippleDown Server to auto-validate cases with a particular report (see the Auto-validation section ),
- Instructing the RippleDown Server to refer cases to project or specific user queues of the Validator as appropriate,
- Generating alerts within the Online Information System.
- Sending emails
- Producing PDF versions of the report
- Instructing the Online Information System to add a new test or test panel for this patient,
- Instructing the Online Information System to set some data value in the patient record, e.g. a diabetic status flag, or billing flag,

To **disable** a report section in the interpretation for a particular type of case (that is, so that any comments in this section will not be reported), select the report section heading in the "Comments" window and use the right-click menu **Disable Report Section**. The Wizard will immediately open the rule wizard to the steps that allow you to give the reasons why you wanted the report section to be disabled for that case. Similarly for enabling a report section that is currently disabled.

## Comments

The Knowledge Builder provides facilities to modify the currently given interpretation, so that subsequent interpretations by the Knowledge Base give the appropriate interpretation. These facilities include:

- Creating and adding a new comment to the interpretation
- Adding an existing comment
- Replacing one comment with another one
- Removing a comment
- Changing the position of a comment in the report
- Showing why a comment is part of the interpretation
- Showing why a comment was not removed from the interpretation
- Showing other comments that have been removed from the interpretation
- Adding or removing a report section that groups related comments

Functions	Steps
<b>Add</b>	Select the "Comments" window and use the right-click menu <b>Add comment</b> .  Select the comment you want to add, or to create a new one.  Use the Objective to give the reasons for adding the comment
<b>Replace</b>	Select the comment you want to replace, then use the right-click menu <b>Replace comment</b> .  Choose the comment you want to be given as the replacement. You can also create a new comment as the replacement.  Use the Objective to give the reasons for replacing the comment
<b>Remove</b>	Select the comment you wish to remove and use the right-click menu <b>Remove comment</b> .  The Wizard will jump immediately to the steps that allow you to give the reasons why you wanted the comment removed. .
<b>Re-add</b> a removed comment	Use the <b>Show Removed Comments</b> option in the <b>Tools</b> menu. Any comments that have been removed from this interpretation will be shown in blue in the "Comments" window. Select the comment you want to re-add, then use the right-click menu <b>Re-add comment</b> . The Wizard will jump immediately to the steps that allow you to give the reasons why you wanted the comment re-added.

## Comment Editor

In addition to the facilities provided for changing the interpretation of the currently selected case, the Knowledge Builder provides the facilities to manage the list of all comments in the Knowledge Base.

Comments are grouped by “report section”. The facilities available to the user to manage comments include:

- Adding a new comment
- Inserting a variable expression into a comment, e.g. referring to a test value
- Editing a comment
- Superseding one comment by another
- Deleting a comment, provided it has not been used in rules
- Moving a comment from one report section to another
- Reordering comments within a report section
- Filter facility to search for existing comments

It is also possible to import or export comments to and from text files external to RippleDown. To do this use the Edit menu in the Comment Editor and select Import values... The comments must be in a text (.txt) file.

## Variable Comments

The Knowledge Builder provides facilities to create comments that have embedded variables. When a case is interpreted, the specific value for these variables can be inserted into the report.

This feature enhances the ability of the Knowledge Builder to generate reports that are highly specific to the patient, referring doctor and test results, for example,

“Last ferritin level 118 ug/L noted over 3 months ago on 29/May/13.”

Where the variables have been embedded into the comment as follows:

“Last ferritin level {last available Ferritin} ug/L noted over 3 months ago  
on {date at last available Ferritin}.”



*This facility is not recommended in general for sites that use the standard Ultra interface, as library codes are used to represent reports, and an excessive number of library codes could be generated if the variables take on many different values.*

## Internal Comments

"Internal" comments are intended to be seen in the process of reviewing reports in the RippleDown Validator. They are not intended to be released. Typically, these comments indicate a workflow instruction, a problem in the case or an alert situation.

To create an internal comment for a case, use the Rule Wizard to add a comment in the Report Section called "Internal".

If reports are being reviewed in the Validator, any internal comments will be shown in a separate window, and will not be sent to the External Information System once the report is approved. In particular, these comments do not need to be deleted.

If reports are being reviewed using the facilities of the External Information System, any internal comments will be appended to the report and so will have to be manually removed by the person reviewing the case.

If an Internal comment is added to a case it will never be auto-validated.

## Tables

If you have specified that the report should be produced as a PDF document, you are able to insert a table into the comment section.

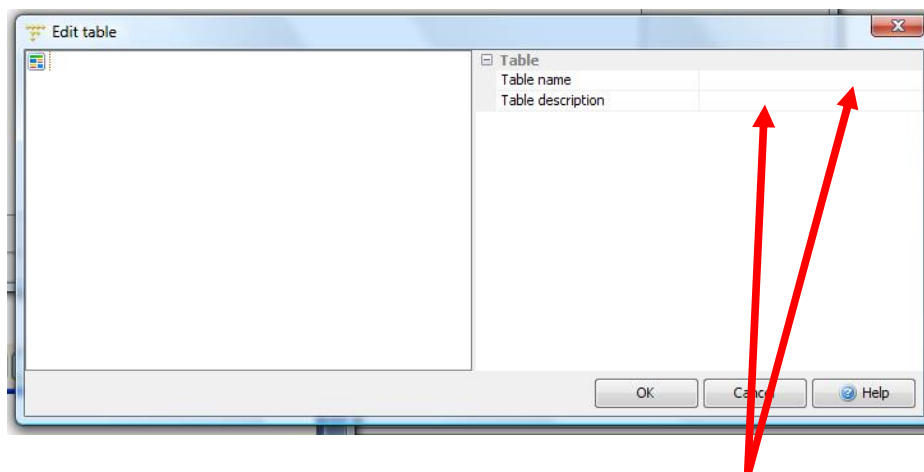
The table will be formatted as four columns containing attributes from the case and their corresponding values. The first and third columns will show the text you have entered to describe the attribute, and the second and fourth columns will show the values for those attributes for the case.

The table is added using the rule wizard in the same way as you would insert a text comment. Any attributes either primary or derived, can be used in the table.

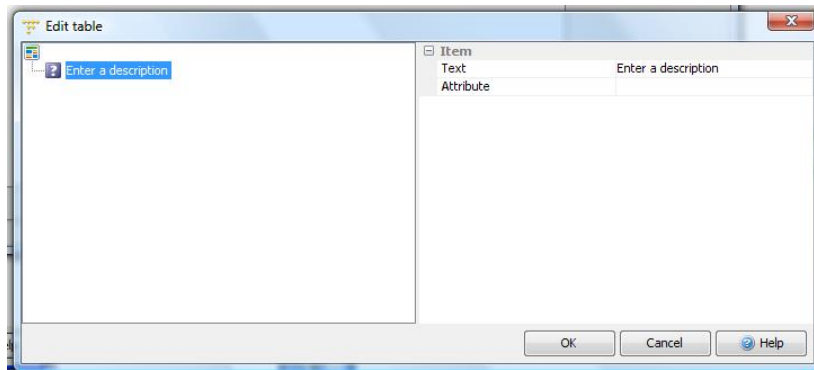
If the table is not in the correct place in the report section, you can re-order it using the Comment Editor in the same way as you would re-order a text comment, that is, using the 'Move | Move up' or 'Move | Move down' menus.

## To add a table

1. Right click in the Report Section where you want the table to appear.
2. Select **Add comment**
3. Click the **Create new table button** and a blank table will appear as follows.



4. Enter a table name and description in the right-hand panel.
5. Right click in the left hand pane and selecting the menu item "New item".



6. Enter a description in the 'Text' field. This will be the text appearing in the table representing the attribute.
7. Select the attribute by clicking the 'Attribute' field. This will bring up a list of all attributes in the project in alphabetical order. You can either scroll this list to find the attribute you need, or else type the first few characters of the attribute name which will automatically search for that attribute.
8. Add further attributes as required by right-clicking on the left pane.
9. Attributes in the table can be ordered by dragging and dropping them with the mouse in the left hand pane.
10. Click OK to finish creating the table. It will now appear with the list of comments for that report section.
11. The table can be ordered in the report section with respect to other tables or comments using the 'Move up' or 'Move down' menu items.
12. Click OK and continue adding conditions. The most common scenario is to add the table unconditionally i.e. to all reports.
13. To view the table format use the Preview Tab of Case View.

### To edit an existing table

1. Open the Comment Editor ([Edit](#) | [Comments](#) )
2. Choose the report section containing the table.
3. Select the table in the list. You can scroll the list or use the 'Edit | Find' menu.
4. To edit the table, double click it or use the menu item "Edit | Modify".
5. To delete an attribute, select it on the left hand pane and press the DELETE key, or use the right click menu item 'Delete'.
6. To add a new attribute, use the right click menu item "New item". Fill in the 'Text' and 'Attribute' fields as you would if you were creating a new table.
7. To edit the text of an existing attribute in the table, simply select the attribute and edit the 'Text' field.

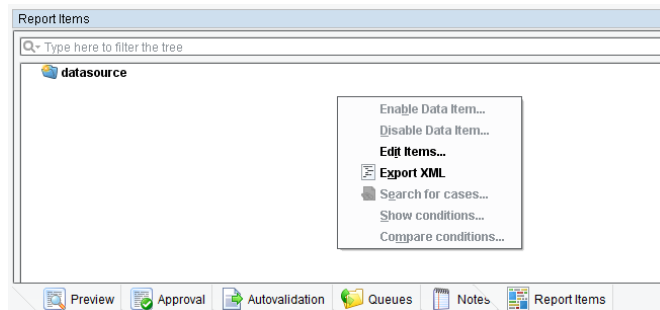
8. To re-order an attribute, drag and drop it to its required position in the left hand pane using the mouse.
9. Click OK to finish editing the table.
10. The changes you made to the table will immediately affect all subsequent reports where this table is given.

## Report Items

The Report Items Tab is used to generate an XML data source or schema for the reporting engine and report design tool.

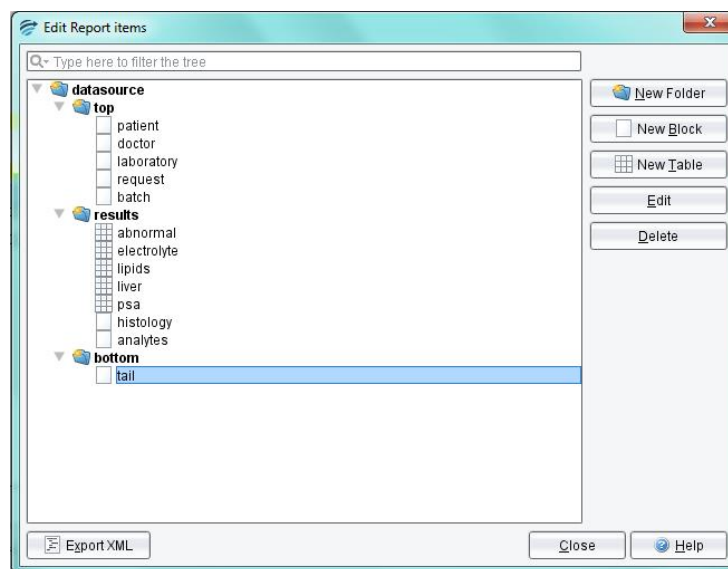
This Report Items docking pane is not shown by default. To display this pane select [Windows | Report Items](#).

Right click in the tab and select Edit items... as shown:



The Edit Report Items dialog will appear to display and/or edit the schema that consists of block and table items. Folders may be used to organise the report items.

The example shows 3 folders: top, results and bottom. The folders contain block items such as patient and/or table items such as electrolyte.

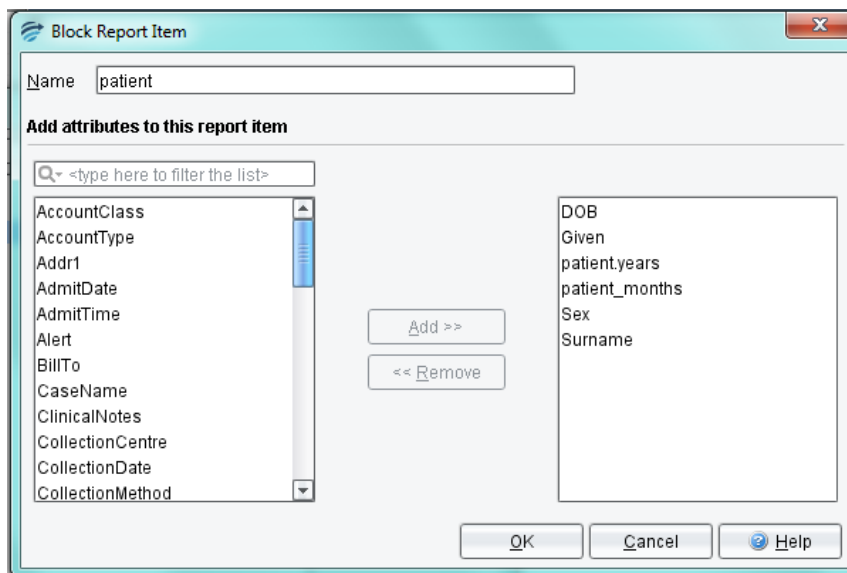


Several functions are available for use:

Functions	Description
<b>New Folder</b>	Allows report items to be grouped. The top level folder is always "datasource". Folders create tags in the exported XML schema.  <b>Note:</b> Do not use spaces when naming folders or report items.
<b>New Block</b>	To define a new block item (set of attributes for which the current value is to be displayed in the report)
<b>Table item</b>	Define a new table item (set of attributes for which the current and historical values are to be displayed in the report).
<b>Edit</b>	Used to modify existing items
<b>Delete</b>	To permanently delete a report item
<b>Export XML</b>	Once all items are defined click on Export XML and select an appropriate location for the exported files. This file will be used as a data source by the reporting engine

## Block Items

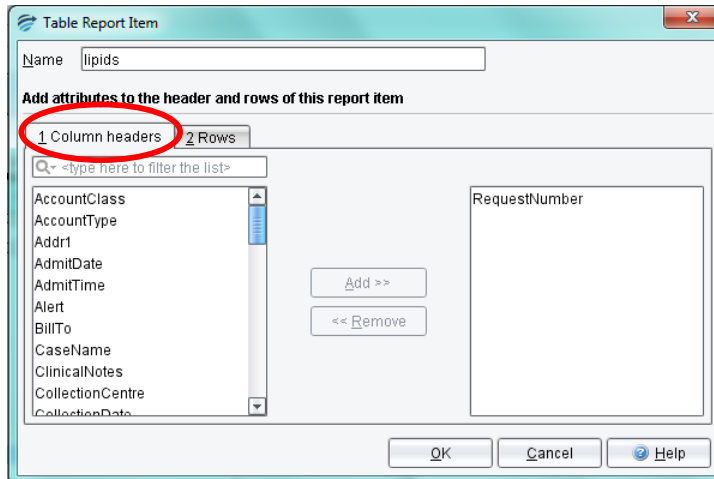
A block item is used when the current values of the attributes in the block item are to be printed in the report. The Edit Block Item dialog is used to name the block item and to add appropriate attributes. The example shows a block item for Patient:



## Table Items

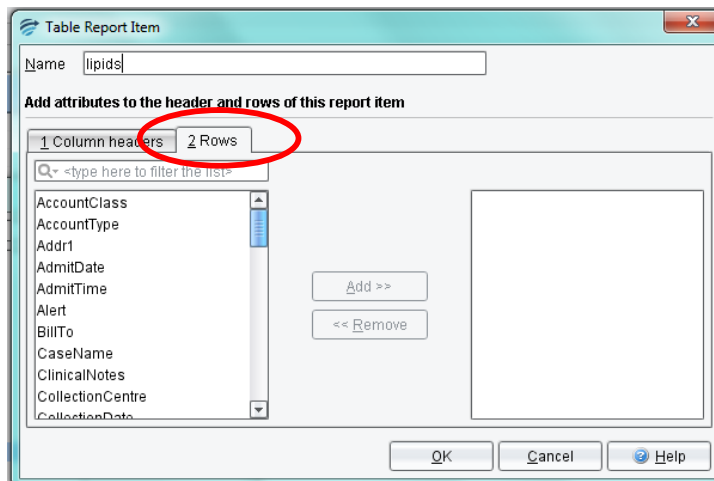
Table items are used to display both current and historical attribute values in the report. The edit table items dialog is used to name the table item and to allocate table and row data. The example shows a table item for Lipids firstly for the Column headers, secondly for the rows.





By default, RippleDown inserts the episode date and time into the table.

The RequestNumber is added as an additional item



The rows will be populated by the primary attributes included in the group attribute called Lipids

## Report Items and Rules

By default a new report item is enabled and appears as a report data source. However, any report item may be disabled using a rule. An example might be in a situation where certain report items are not required by a particular GP practice. To disable a report item, right-click on the item and select Disable Data Item. The Rule Wizard will be presented to guide the process. Once complete the disabled data item will appear in red.

Any disabled item may also be re-enabled, again using the RippleDown Rule Wizard.

## XML EXPORT

Once the report items are defined they can be made available for both a report designer tool and a report engine. Use the Export XML button to export both the XML schema (and XSD file) and an example XML file for use by a report designer tool. The values for the report items will be taken from the case currently on display in the Knowledge Builder and an example is shown on the next page.

## Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<datasource>
  <header>
    <patient>
      <PatientFirstName>ALLISON</PatientFirstName>
      <PatientLastName>TEST</PatientLastName>
      <PatientAddressLine1>C/-IT DEPARTMENT,DO NOT POST</PatientAddressLine1>
      <PatientCity>CLAYTON</PatientCity>
      <PatientState>VIC</PatientState>
      <PatientPostcode>3168</PatientPostcode>
      <PatientPhone_work>03 9538 2239</PatientPhone_work>
      <PatientBirthdate>1995-01-01</PatientBirthdate>
      <PatientSex>M</PatientSex>
    </patient>
    <doctor>
      <DrTitle>DR</DrTitle>
      <DrFirstName>.</DrFirstName>
      <DrLastName>EDP TESTING ...</DrLastName>
      <DrCode>EDP</DrCode>
      <DrProviderNumber>2037213L</DrProviderNumber>
      <DrAddressLine1>EDP DEPARTMENT</DrAddressLine1>
      <DrAddressLine2>1868 DANDENONG ROAD</DrAddressLine2>
      <DrCity>CLAYTON</DrCity>
      <DrState>VIC</DrState>
      <DrPostcode>3168</DrPostcode>
      <DrPhone_work>03 9828 7748</DrPhone_work>
      <DrPhone_mobile>0411206657</DrPhone_mobile>
      <DrPhone_pager>94831611</DrPhone_pager>
      <DrPhone_fax>0395386742</DrPhone_fax>
      <DrPhone_home>03 9543 6853</DrPhone_home>
    </doctor>
    <laboratory>
      <LabName>LABORATORY 3427</LabName>
      <Lab_info>DR D DEAM</Lab_info>
      <LabAddressLine1>1868 DANDENONG RD</LabAddressLine1>
      <LabState>VIC</LabState>
      <LabCity>CLAYTON</LabCity>
      <LabPostcode>3168</LabPostcode>
      <LabPhone_work>03 9538 6777</LabPhone_work>
    </laboratory>
    <request>
      <ReferralDate>2007-06-25</ReferralDate>
      <CollectionDateTime>2007-06-25 00:00:00</CollectionDateTime>
    </request>
    <batch>
      <RunNumber>10680</RunNumber>
      <PrintingDateTime>2010-05-11 19:49:00</PrintingDateTime>
    </batch>
  </header>
  <results>
    <table>
      <name>abnormal</name>
      <header>
        <date>25/06/2007 00:00</date>
        <RequestNumber>07-1111661</RequestNumber>
      </header>
      <header>
        <date>07/03/2007 00:00</date>
        <RequestNumber>07-3333331</RequestNumber>
      </header>
      <row>
        <name>PSA</name>
```

```

    <sample>
      <value>1000.0</value>
      <low>&lt;</low>
      <high>2.6</high>
      <units>µg/L</units>
      <flag>1</flag>
    </sample>
    <sample>
      <value>0.1</value>
      <units>µg/L</units>
    <flag>0</flag></sample>
  </row>
</table>
<table>
  <name>electrolyte</name>
  <header>
    <date>25/06/2007 00:00</date>
    <RequestNumber>07-1111661</RequestNumber>
  </header>
  <header>
    <date>07/03/2007 00:00</date>
    <RequestNumber>07-3333331</RequestNumber>
  </header>
</table>
<table>
  <name>lipids</name>
  <header>
    <date>25/06/2007 00:00</date>
    <RequestNumber>07-1111661</RequestNumber>
  </header>
  <header>
    <date>07/03/2007 00:00</date>
    <RequestNumber>07-3333331</RequestNumber>
  </header>
</table>
<table>
  <name>liver</name>
  <header>
    <date>25/06/2007 00:00</date>
    <RequestNumber>07-1111661</RequestNumber>
  </header>
  <header>
    <date>07/03/2007 00:00</date>
    <RequestNumber>07-3333331</RequestNumber>
  </header>
</table>
<table>
  <name>psa</name>
  <header>
    <date>25/06/2007 00:00</date>
    <RequestNumber>07-1111661</RequestNumber>
  </header>
  <header>
    <date>07/03/2007 00:00</date>
    <RequestNumber>07-3333331</RequestNumber>
  </header>
</table>
  <row>
    <name>PSA</name>
    <sample>
      <value>1000.0</value>
      <low>&lt;</low>
      <high>2.6</high>
      <units>µg/L</units>
      <flag>1</flag>
    </sample>
  </table>

```

```

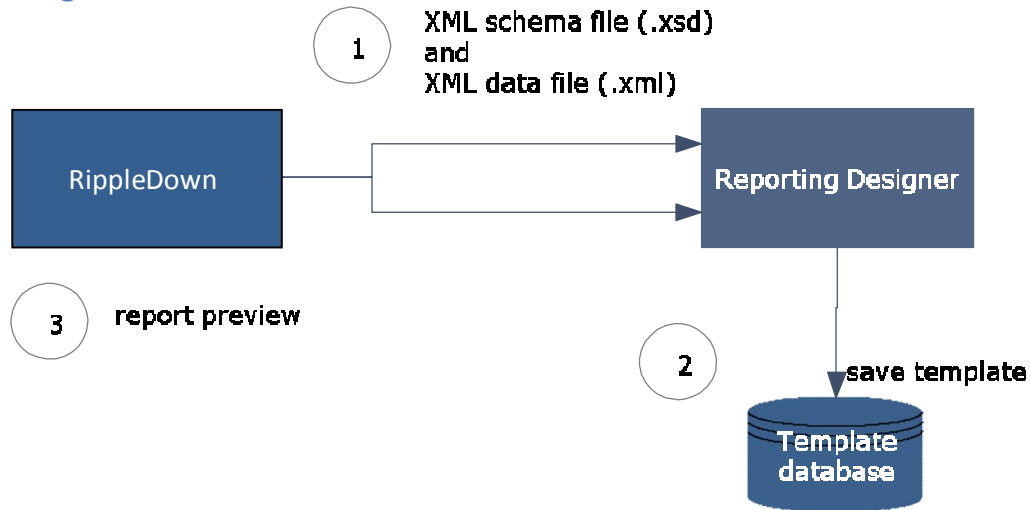
        <value>0.1</value>
        <units>mg/L</units>
        <flag>0</flag>
    </sample>
</row>
</table>
<histology/>
</results>
<patient_footer>
    <footer>
        <DrLastName>EDP TESTING ...</DrLastName>
        <PrintingDateTime>2010-05-11 19:49:00</PrintingDateTime>
    </footer>
</patient_footer>
</datasource>

```

## Template Design

Templates for pdf reports are created in a Report Design tool such as iReport and Adobe→ LiveCycle→ Workbench Designer using data defined in RippleDown.

## Design Workflow



1. RippleDown exports two files to the design tool. The .xsd is a schema file and the .xml contains data from the current case.
2. Template is created and saved in the template database.
3. Report preview in RippleDown. To preview the pdf report in RippleDown open the Preview Tab and select the Pdf Preview button. This action will export an XML file of the current case to the report engine which will select the specific template and return the pdf file to RippleDown.

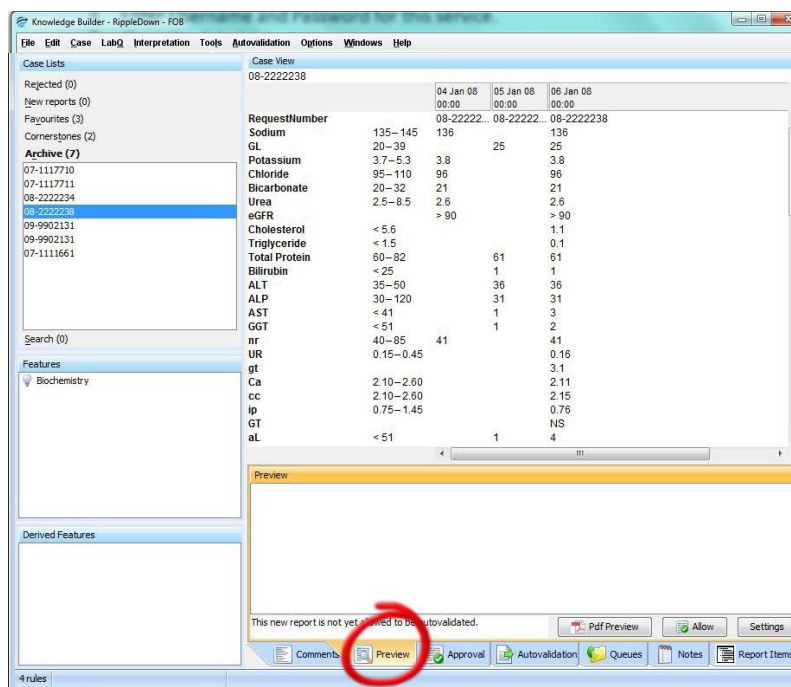
## Report Preview

In RippleDown it is possible to preview the PDF output generated by the reporting engine.

This function requires configuration of the RippleDown server. To do this:

1. Open the RippleDown Administrator client.
2. Use the Tools menu and select Edit server settings.
3. Enter the URL of the print service and click Apply.
4. Enter Username and Password for this service.
5. Close the Administrator.

In the Knowledge Builder, select the Preview tab (adjacent to the Comments tab as shown):



Click the PDF Preview button. This action will cause RippleDown to send an XML export to the reporting engine. A PDF report will be created and returned to RippleDown.

## Project Explorer

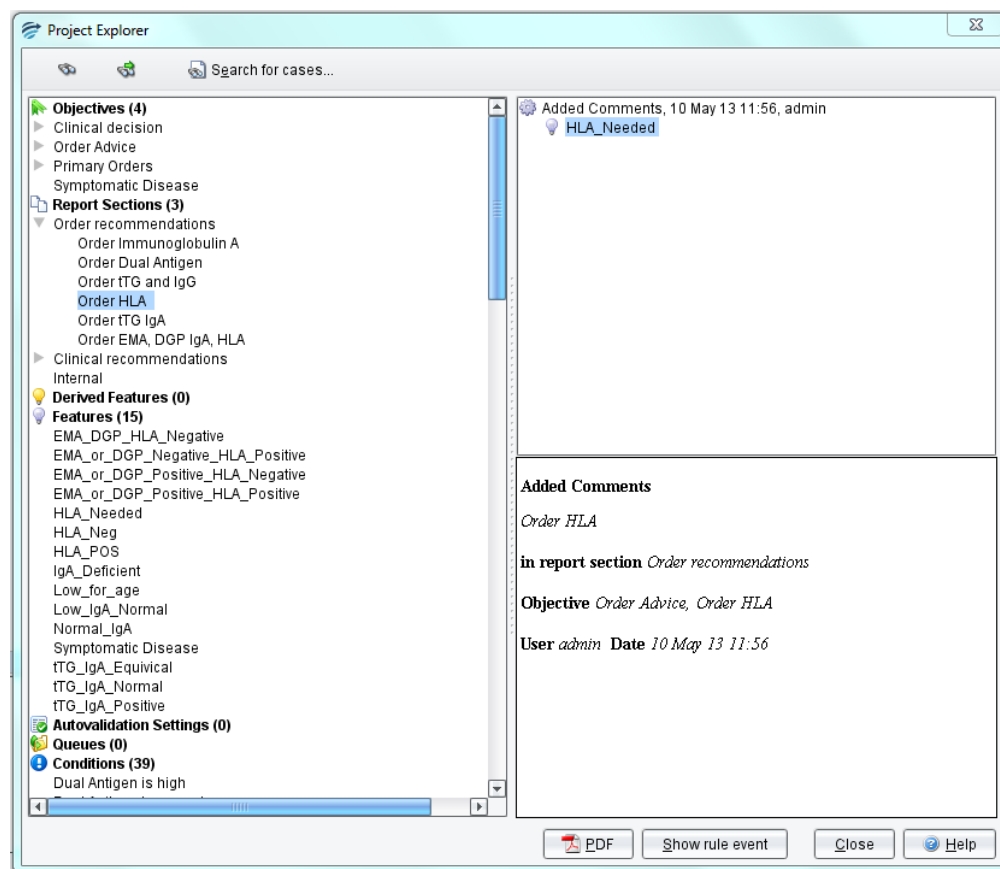
Project Explorer is an invaluable tool showing the history of the project and a display of all major components of the project with a tracking user id, date and time stamp.

Start Project Explorer by going to menu **Tools | Project Explorer** (this may take a minute or two depending on the size of the project. A progress bar is shown at the bottom left hand corner of the screen).

Each of the sections are listed in the index, along with the number of each in parenthesis.

To see the details of a section double click on the name.

The example shows the Report Section “Order recommendations” and the comment: “Order HLA”



In the upper right pane it shows the history of the comment and all the reasons for it being added or removed.

The lower right pane displays location and tracking details of the comment.

To view the specific details associated with the rule event select the **Show Rule Event** button. A window will be displayed, showing the case on which the rule was made (i.e. the cornerstone case). The window will have 2 tabs, the 1st showing the case details before the rule was created, and the 2nd showing the case details after the rule was created.

## Export Project Explorer

The Project Explorer may be exported in a PDF format:

1. Click the **PDF** button
2. Enter a name (ensure it is suffixed by .pdf)
3. Select a location and click **PDF**.

## Auto-validation

Auto-validation is the facility by which cases receiving particular types of interpretations are released to the Online Information System without the need for human intervention.

Auto-validation may be appropriate when:

- You have reviewed a large number of cases giving a particular interpretation, and that interpretation is now always correct whenever it is given, or
- The rules giving a certain type of interpretation are so general and simple that only minimal review is needed, or
- The project is not being used to provide reports, but to automate processes in the laboratory such as reflexive testing or billing actions.

## Definitions

	Description
<b>Report</b>	A Report is the ordered set of comments provided by the Knowledge Base for a case
<b>Report Section</b>	A Report Section is a component of a report. It consists of a series of comments and may or may not contain a heading (depending on settings defined in the report Section Editor)
<b>New Report</b>	A new report is automatically created when a comment is first given for some case, or when a new combination of comments is first given

There are three ways of managing auto-validation, either by reports, or by report sections or by rules

1. "per report" basis, a percentage auto-validation level is set for each unique report, regardless of the number of report sections, that is generated by the knowledge base. This is the most restrictive policy, but the safest.
2. "per report section" basis, a percentage auto-validation level is set for each unique report section that is generated by the knowledge base. This is less restrictive than the "per report" policy. It is used if the Report Sections are relatively independent.



3. Rule-based auto-validation, use the rule wizard to add, modify or remove auto-validation settings that are given by the project, in exactly the same way as you would if you were adding, modifying or removing comments using rules. This is the most flexible approach.

For any particular project, the choices of "per report" or "per report section" are mutually exclusive. However, auto-validation by rules will take precedence over any "per-report" or "per report section" based levels

## Allow Autovalidation

Auto-validation cannot occur unless the report or report section has been allowed to be considered for auto-validation. This can occur in one of three ways:

- a. Either use the Preview pane on the Knowledge Builder and select the Allow button  
OR
- b. Open Auto-validation/Report Settings and double click the report to open the screen shown below. Click the checkbox to allow auto-validation:

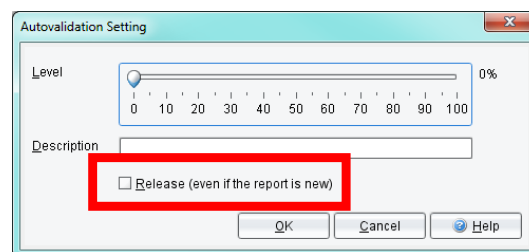


OR

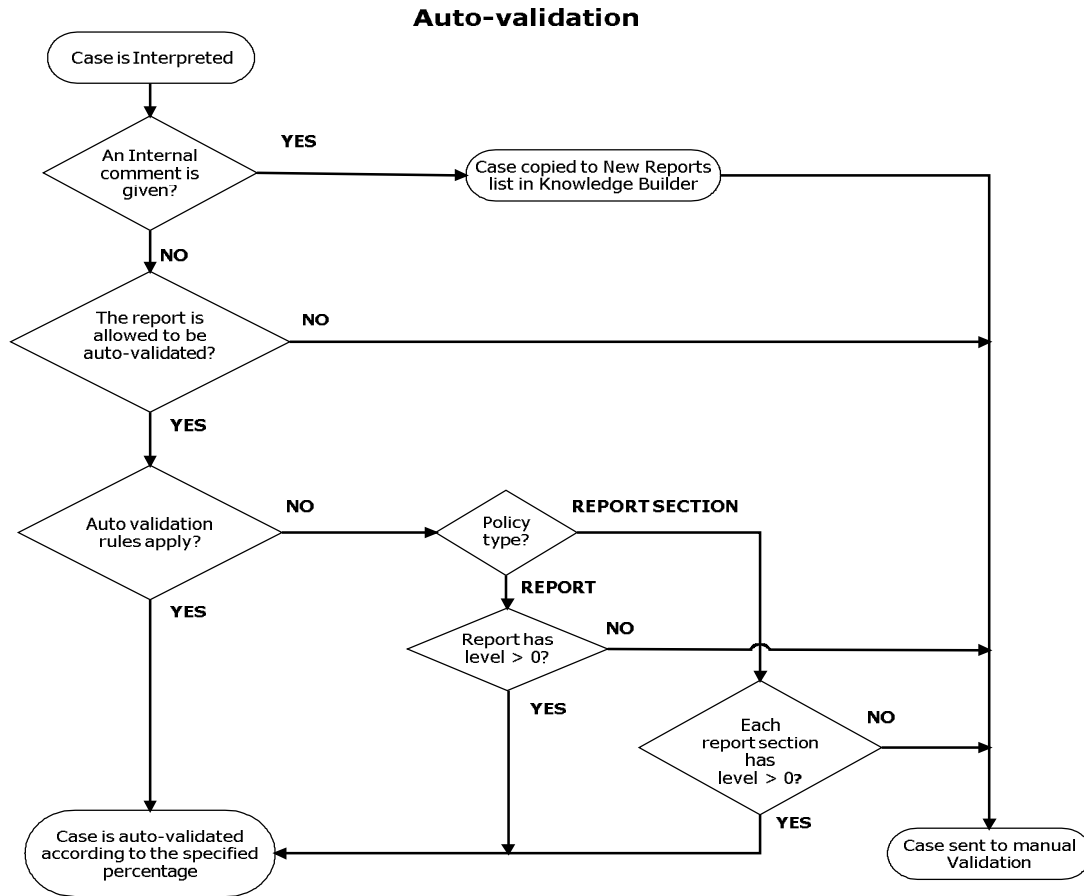
- c. Using the Validator to approve the case through normal lab workflow (this will only apply if the user has Knowledge Builder privilege)

## Auto-validation setting to release a new report.

There is a check box in the Auto-validation setup screen that will release a report and apply the set Auto-validation rate even if it has not been specifically allowed. This will occur once the report has been reviewed by a Knowledge Builder user or a Validator user with the corresponding permission.



## Auto-validation Options



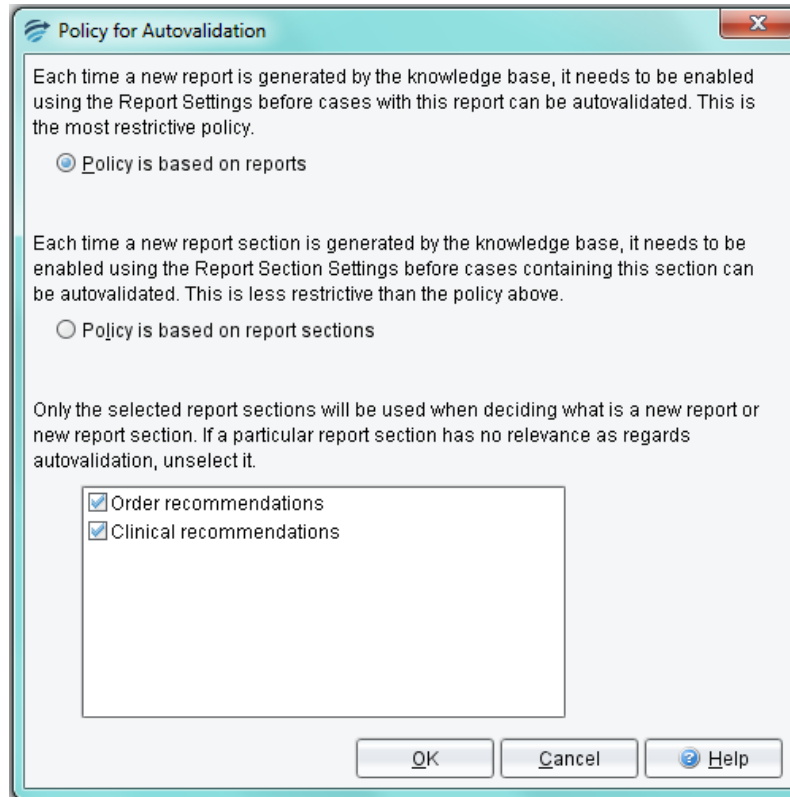
## Auto-Validation levels

The knowledge builder is able to define an auto-validation level between 0% and 100% for each report, report section or auto-validation rule setting

**Note:** In normal situations, it is advisable not set an auto-validation level above about 95%. This ensures that a small number of cases continue to appear for review in validation and provides continuing quality audit of the knowledge base.

## Policy

The choice between the "per report" and "per report section" policy is done using the menu [Autovalidation | Policy](#).



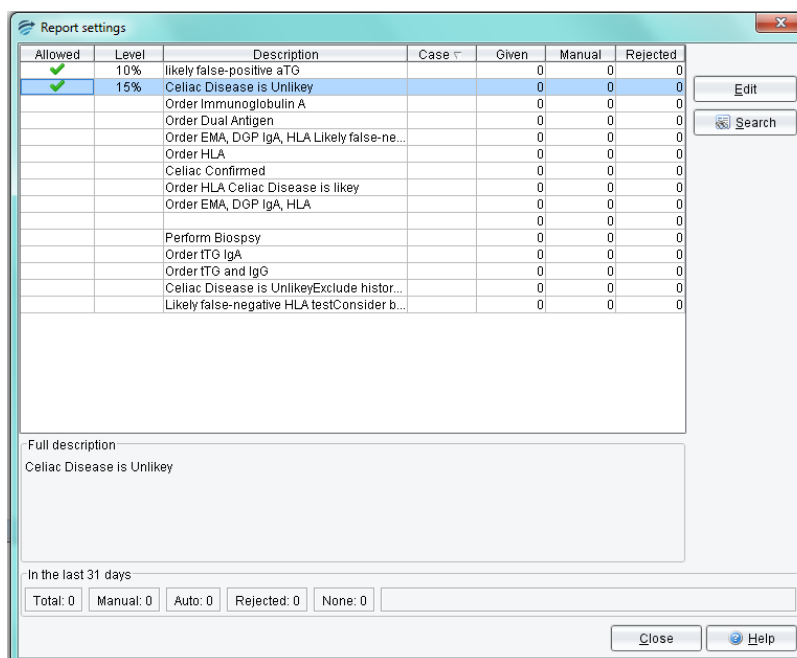
The default setting for a project is "Policy based on reports" with all report sections being selected.

## Policy based on reports

This option allows each unique report to be considered for auto-validation once the report has been allowed for auto-validation consideration.

To set auto-validation levels on a report-by-report basis:

1. Set the Policy to Policy based on reports in [Autovalidation | Policy](#).
2. Use the menu [Auto-validation | Report Settings](#) to show a table of all reports that have been recently given by the project, that is, given within the last month.



Allowed	Level	Description	Case	Given	Manual	Rejected
✓	10%	likely false-positive aTG		0	0	0
✓	15%	Celiac Disease is Unlikely		0	0	0
		Order Immunoglobulin A		0	0	0
		Order Dual Antigen		0	0	0
		Order EMA, DGP IgA, HLA Likely false-ne...		0	0	0
		Order HLA		0	0	0
		Celiac Confirmed		0	0	0
		Order HLA Celiac Disease is likely		0	0	0
		Order EMA, DGP IgA, HLA		0	0	0
		Perform Biopsy		0	0	0
		Order ITG IgA		0	0	0
		Order ITG and IgG		0	0	0
		Celiac Disease is UnlikelyExclude histor...		0	0	0
		Likely false-negative HLA testConsider b...		0	0	0

Full description  
Celiac Disease is Unlikely

In the last 31 days  
Total: 0   Manual: 0   Auto: 0   Rejected: 0   None: 0

3. Review each report in the table. Reports that already have some level of auto-validation set will have a tick in the **Allowed** column, and possibly a percentage in the **Level** column. Note that clicking on a column heading will sort the table by the values in that column. For example, clicking on the **Given** column will order the reports according to how often each report has been given by the project in the last month.
4. The **Rejected** column shows how many times the corresponding report was corrected during validation, that is, after being inappropriately given by the project. Reports that are never, or rarely, rejected are possible candidates for auto-validation.
5. If you decide to set a non-zero auto-validation level for a report, click the **Edit** button and set the desired auto-validation level for that report. The Allow auto-validation check box will be checked automatically if you set a non-zero auto-validation level.

Changes made to auto-validation settings are effective immediately.

## Policy based on report sections

This option allows each unique report section to be auto-validated. This is appropriate when comments given on one report section are independent of comments given in other report sections.

Description	Case	Given	Manual	Rejected	Section
likely false-positive aTG		0	0	0	Clinical rec...
Perform Biopsy		0	0	0	Clinical rec...
Order Immunoglobulin A		0	0	0	Order reco...
Celiac Disease is Unlikey		0	0	0	Clinical rec...
Order EMA, DGP IgA, HLA		0	0	0	Order reco...
Order HLA		0	0	0	Order reco...
Celiac Confirmed		0	0	0	Clinical rec...
Celiac Disease is likey		0	0	0	Clinical rec...
		0	0	0	
Order Dual Antigen		0	0	0	Order reco...
Order tTG IgA		0	0	0	Order reco...
Order tTG and IgG		0	0	0	Order reco...
Celiac Disease is UnlikeyExclude historyCons...		0	0	0	Clinical rec...
Likely false-negative HLA testConsider biopsy ...		0	0	0	Clinical rec...

Full description  
Celiac Disease is Unlikey  
Exclude history  
Consider HLA kfh4lh

In the last 31 days  
Total: 0 Manual: 0 Auto: 0 Rejected: 0 None: 0

To set auto-validation levels on a report section basis:

1. Set the policy to policy based on report sections in Autovalidation | Policy.
2. Use the menu Autovalidation | Report Section settings to show a table of all report sections that have been recently given by the project, that is, given within the last month.
3. Review each report section in the table. Report sections that already have some level of auto-validation set will have a tick in the **Allowed** column, and a percentage in the **Level** column. Note that clicking on a column heading will sort the table by the values in that column. For example, clicking on the **Given** column will order the report sections according to how often each report section has been given by the project.
4. The **Rejected** column shows how many times the corresponding sub-report was corrected during validation, that is, was inappropriately given by the project. Report sections that are never, or rarely, rejected are possible candidates for auto-validation.
5. If you decide to set a non-zero auto-validation level for a report section, click the **Edit** button and set the desired auto-validation level for that report section. The Allow auto-validation check box will be checked automatically if you set a non-zero auto-validation level.

Changes made to auto-validation settings will be effective immediately.

## Auto-validation by Rules

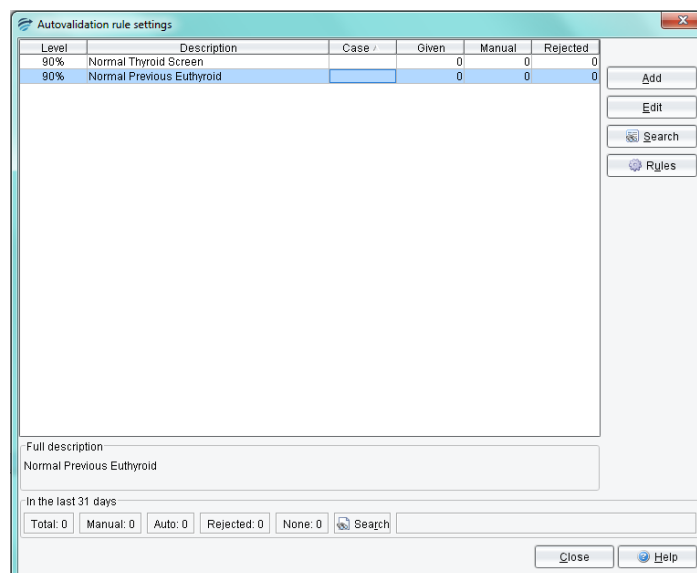
To use rules to manage auto-validation, you add an auto-validation setting to a case using the rule wizard, in exactly the same way as you would add a comment to a case.

1. Find a case (e.g. on the Archive case list or the Rejected case list) which is representative of the type of case that could safely be auto-validated at some level.
2. Click on the Auto-validation Pane (adjacent to the Preview Pane)
3. Right click to start the rule wizard to add an "auto-validation setting", consisting of a percentage level and a textual description. You can select an existing setting, or create a new one.
4. Create or select an objective for this rule, and finally
5. Add conditions for the rule, check cornerstone cases, and finish the rule session.

To replace one auto-validation setting for a case with another using a rule, you select the current setting, then use the rule wizard to replace it with another one, in exactly the same way as you would replace a comment given for a case, giving only the conditions relevant to the change.

Finally, to remove the auto-validation setting for a case, you select the current setting and use the rule wizard to remove it.

You can see the list of all possible auto-validation settings using the menu from the main screen 'Autovalidation | Autovalidation rule settings...'



This facility also allows you to edit the level of an auto-validation setting. The new level will apply to all cases with that auto-validation setting.

## Notes:

1. If more than one setting is given for a case, the setting with the lowest auto-validation level will apply.
2. Auto-validation settings using rules will take priority over any levels that have been set using reports or report sections.
3. Even if an auto-validation setting is given for a case, it will NOT be auto-validated if the report for the case has yet to be allowed (or report section depending on the policy).
4. Auto-validation will not take effect if an earlier occurrence of the case exists on a Validation queue awaiting manual validation. NB: Interpretive comments WILL be updated.

**Suggestion for setting Auto-validation by rules:** Decide the characteristics of a report that may be suitable for Auto-validation e.g. all normal results or all negative results and/or relevant locations

1. Build a series of features that apply for the normal/negative situations
2. Build a derived feature that will apply when all the features apply
3. Build a rule to allow auto-validation based on the presence of the derived feature.

The screenshot displays the Knowledge Builder - RippleDown - FOB application. The interface is divided into several panes:

- Case Lists:** A sidebar on the left showing a list of cases, including 'Rejected (311)', 'New reports (50)', 'Favourites (53)', and 'Cornerstones (71)'. The 'Favourites' list is expanded, showing items like 'Syph Indeterminate', 'Syphilis Detected', 'Syph High Neg No Comment', 'HIV', 'Autoval', 'HepABC', 'HepAutovalABC', 'SyphAutoval', 'TestComment', 'check with Path', 'add silent comment', and 'AutoVal'.
- Case View:** The main central pane displays patient information and test results.
 

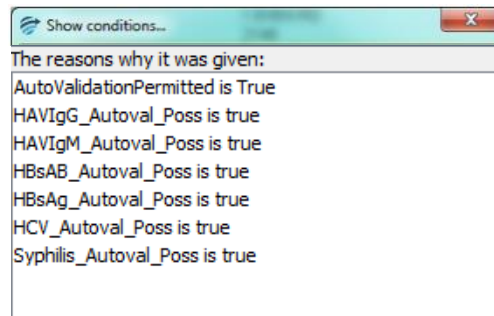
check with Path	Ward	CSHC	Sex	F	Age	20	Days...	7611	PtCla...O
21 May 07					18 Oct 07				
17:02					14:10				

TestsOrdered	ChicU, G...	Urog, ChicS, GonS, HIV, SYPH, LWEQC, HEPI, HBSA, HepC
AutoValTests	true	true
pregnant	N	N
AutovalWards	true	true
STWards	true	true
ClinicalNotes	No Clinic...	No Clinical Notes Provided.
SilentComm	No HCV e...	
HBsAg	0.00	0.00
HBsAgINT	Not Detec...	Not Detected
HBsAb Titre	7.57	7.85
HBV Comment	The abse...	
HCV		0.05
HCV Interp		Not Detected
HCV High_Neg	false	false
Syphilis Architect	0.04	0.06
Syphilis interpretation	Not Detec...	Not Detected
- Comments:** A section at the bottom of the Case View pane containing a 'MISC' comment: '<%Comment Silent Report Selected for Autovalidation%>'. Below this are sections for 'HISTORY', 'HEPATITIS A', 'HAV RECOMMENDATION', 'HEPATITIS B', 'HBV RECOMMENDATION', 'HEPATITIS C', 'HCV RECOMMENDATION', 'SYPHILIS COMMENT', and 'Rubella', each with associated text and comments.
- Features:** A sidebar on the left showing a list of features, including 'AutoValidationPermitted', 'HAVIgG\_Autoval\_Poss', 'HAVIgM\_Autoval\_Poss', 'HBsAB\_Autoval\_Poss', 'HBsAg\_Autoval\_Poss', 'HCV\_Autoval\_Poss', 'NoPrevHCV', 'STI\_screen', and 'Syphilis\_Autoval\_Poss'.
- Derived Features:** A section at the bottom of the Features sidebar showing 'AutovalidationConfirmed'.



In the example above the Derived Feature allowing auto-validation is applied under the following conditions:



These are all features describing auto-validation criteria for the separate tests. All of the criteria must be satisfied for the auto-validation setting to be given.

## Manual Validation and Queues

Whenever a case is processed by the RippleDown server it is assigned one of two possible status flags:

- a. Auto-validated (i.e. ready for release), or
- b. Manual validation required (i.e. must be approved by a user before release).

If the case has been auto-validated, it is sent to the Online Information System with a status flag indicating that the report has been approved and so is ready for release.

Conversely, if manual validation is required, there are the following possibilities for reviewing for the case, depending on how the Knowledge Base has been setup:

- a. If a review queue has been defined by the Knowledge Base for this case, then the case will be queued to that special-purpose queue on the Validator,
- b. Otherwise, if the Knowledge Base has been setup by the RippleDown Administrator to use the RippleDown Validator by default the case will be sent to the default project queue on the RippleDown Validator,
- c. Otherwise, the case will be sent to the Online Information System with the appropriate status flag indicating that it still needs to be approved. The facilities of the Online Information System can be used to review and possibly correct the report prior to release. This is known as External validation.

## Searching

### Find a Case in a Case List

To find a case by case name click on the Case List title and start typing the case name. The "\*" may be used as a wildcard in the search.

### Find cases by condition

You can search for cases that satisfy some condition, even if that condition has not been used in a rule.

To do this:

1. Select the case list you want to search (you can select any list, including the Search list),
2. Use the menu "Case | Search by condition" ,
3. Enter the condition you want to use (it does not have to be true for the currently selected case), then press OK.

By default, each new search will clear any cases that were previously in the Search list.

If you do not want to clear cases on the Search list before you do the search, then uncheck the option to "Clear the search list first". Any cases that are found will then be copied to the end of the Search list. In this way you can refine your search by using another search condition

### Find cases by comment

You can search for cases that give a specific comment, feature or derived feature. If the comment (or feature) is given by the current case, right click on the comment and select the pop-up menu Search for cases. A dialog will appear allowing you to refine the search:



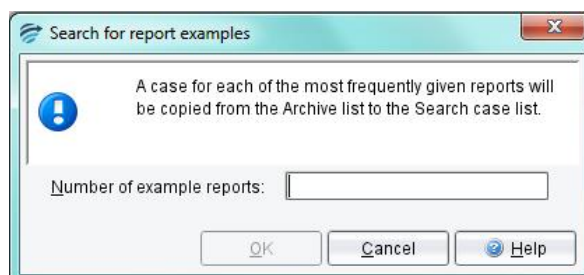
Any cases that are found will be copied to the Search case list.

If the comment (or feature) that you are interested in is not given by the current case, open the project explorer and select the comment or feature, and click the Search tool on the tool bar.

## Find cases for the most frequently given reports

A good way of getting a rough idea of what comments a project generating is to search for example cases for the most frequently given reports.

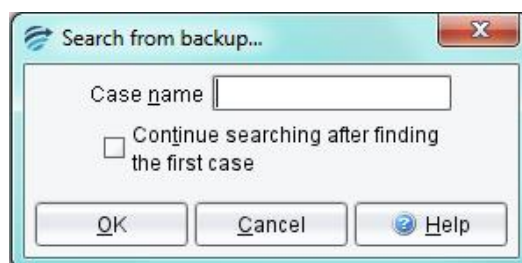
To start a search, select the **Tools** menu and click **Search for report examples**. A dialog will appear prompting you for how many reports you want examples of, as shown below:



Once you enter this number, the system will start analysing cases in the Archive case list and will put copies of them in the Search case list. Cases with the most frequently given reports will be first on the Search list.

## Find cases from backup

It is possible to search for a backed up copy of a case that has been interpreted by a project. To do this, activate the 'Case' menu and select 'Search from backup...'



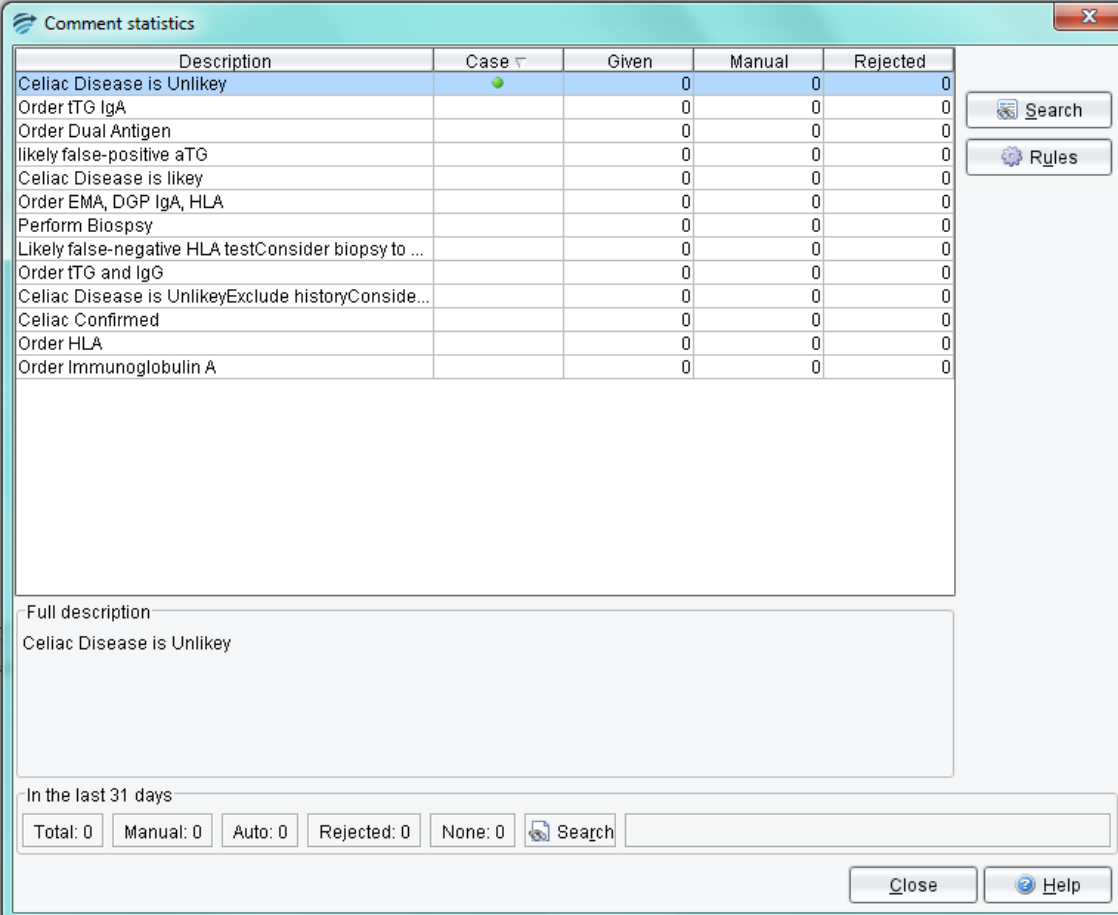
A dialog will appear, prompting you for the name (lab number) of the case. When you click 'OK', the server begins the search as a background process. A progress bar is shown at the bottom left hand corner of the screen to indicate how many of the backup files have been searched. As the cases are found, they are put into the Search case list.

Sometimes a case is sent several times by the online information system, over the course of a few days. If you want to see all of these versions of the case, choose the option 'Continue the search after the first case is found'. This will search all backups, and thus take longer, but can be cancelled at any stage.

## Performance Reports

### Comment Statistics

To see statistics on a particular comment given by the project, use the menu [Autovalidation | Comment statistics](#). This will show a table of all comments that have been recently given by the project, that is, given within the last month.



The screenshot shows a window titled "Comment statistics" with a table of comments and their statistics. The table has columns for Description, Case, Given, Manual, and Rejected. The first row, "Celiac Disease is Unlikely", is highlighted in blue and has a green dot in the Case column. Below the table is a section for "Full description" showing "Celiac Disease is Unlikely". At the bottom, there is a summary panel for "In the last 31 days" with buttons for Total, Manual, Auto, Rejected, and None, all showing a count of 0. There are also Search, Close, and Help buttons.

Description	Case	Given	Manual	Rejected
Celiac Disease is Unlikely	●	0	0	0
Order tTG IgA		0	0	0
Order Dual Antigen		0	0	0
likely false-positive aTG		0	0	0
Celiac Disease is likely		0	0	0
Order EMA, DGP IgA, HLA		0	0	0
Perform Biopsy		0	0	0
Likely false-negative HLA testConsider biopsy to ...		0	0	0
Order tTG and IgG		0	0	0
Celiac Disease is UnlikelyExclude historyConside...		0	0	0
Celiac Confirmed		0	0	0
Order HLA		0	0	0
Order Immunoglobulin A		0	0	0

Full description  
Celiac Disease is Unlikely

In the last 31 days  
Total: 0 Manual: 0 Auto: 0 Rejected: 0 None: 0 Search

Close Help

The statistics for each comment are:

- the number of cases with this comment that have been given
- the number of cases with this comment that have been manually validated
- the number of cases with this comment that have been rejected

Furthermore, the summary panel also shows the number of cases that did not receive any comment within the last month.

The **Search** button will activate a search facility for the comment that is highlighted.



Select the case list for the search and enter a limit, if required. Click OK to commence the search.

The cases that are found will be added to the Search Case List.

The **Rules** button shows all the rules in the project that add or remove the comments:



## Simulation reports

RippleDown has a Simulation tool that enables you to analyse the interpretations of all cases in any one of the case lists, such as the Archive or Cornerstone list.

Select the list you want to analyse, then use the menu [Tools | Simulation Report](#). After a short time, a dialog will appear that contains the following statistics:

- A summary statistic showing the number of cases that have an interpretation (that is, a non-empty report)
- A set of detailed statistics for each:
  - Feature
  - Derived Feature
  - Comment
  - Report Section
  - Auto-validation setting
  - Review Queue
  - Report

The detailed statistics are arranged in a set of tables, with each table containing the particular item (e.g. Feature) and the associated count (i.e. the number of cases giving that Feature). You can sort the information in each table by clicking on the column heading.

An example of the Simulation report run on the Cornerstone case list and sorted by the "Feature" column is shown below:

Simulation report for CORNERSTONE

Cases with a report: 31 out of 31 (100%)

Features	Derived Features	Comments	Report Section	Autovalidation	Queue	Preview
EMA_DGP_HLA_Negative						
EMA_or_DGP_Negative_HLA_Positive						
EMA_or_DGP_Positive_HLA_Negative						
EMA_or_DGP_Positive_HLA_Positive						
HLA_Needed						
HLA_Neg						
HLA_POS						
IgA_Deficient						
Low_IgA_Normal						
Low_for_age						
Normal_IgA						
Symptomatic Disease						
ITG_IgA_Equivical						
ITG_IgA_Normal						

Search Export to Excel Close Help

If you select any item from one of the tables (e.g. a Feature), the Search button becomes enabled, allowing you to search for cases that give this particular item. You can search any case list for the specified item, not just the list used for the Simulation Report.

The results of the search will go into the Search list on the main screen. You are able to access the main screen even while the Simulation Report dialog is showing.

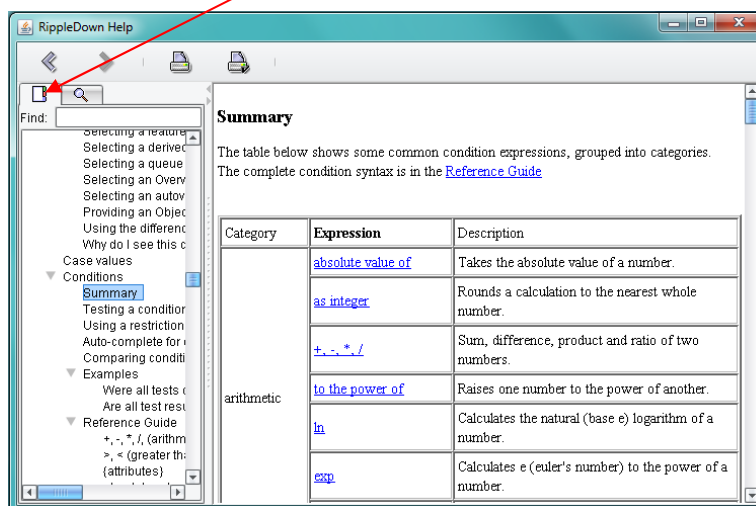
The Export button enables you to export the Simulation Report to an Excel spreadsheet for further analysis.

NB: Ensure the name given to the file is suffixed with .xls

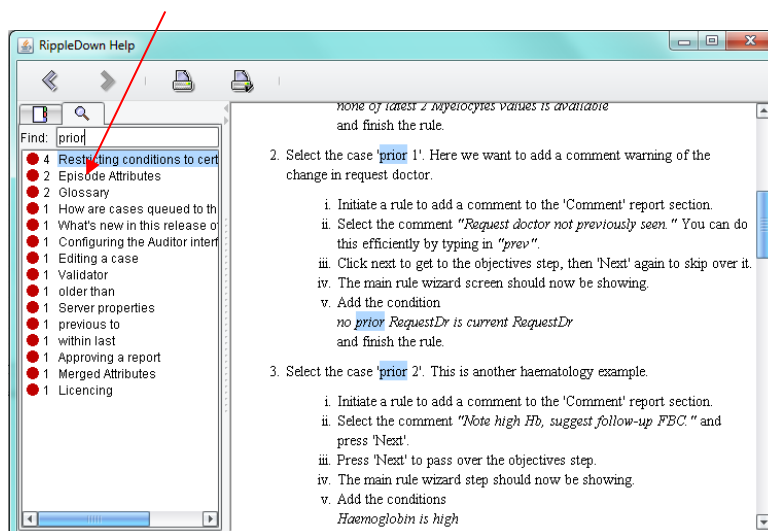
## Help

The help facility can be launched from the main screen and from within the various application components by selecting the **Help** button.

You are able to use the search facility using the index



Or the search facility as shown.



## Contact Us

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