



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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Intended Use

The PKS Software is intended to be used purely as a decision support system that provides complementary reports for patient data to qualified individuals based upon established rules set up by relevant trained customer domain experts (hereafter referred to as "domain experts").

The PKS Software generates and collates comments into a patient centric report or workflow action based on rules created and maintained by domain experts. The PKS software presents all first-of-a-kind reports for review, modification (if applicable) and approval by the domain expert prior to release to clinicians or other individuals. Beyond this, the domain expert may automate the release of none, some or all identical reports. However, since a report may be generated and automatically approved for a case for which the domain expert has not previously considered, it is intended that the domain expert regularly review a representative sample of all output types.

It is intended that the clinicians receiving reports against patient results will consider the report in conjunction with all current and previous patient history and apply their own judgement when determining patient management. It is intended that the clinician does not rely on the existence of a report for the management of a patient.

The PKS software in itself does not provide automated diagnosis or treatment-making functions, or have the capability to control, in any way, the performance of a device or to treat or diagnose any disease.

All numeric fields present in the RippleDown applications use "." as the decimal place separator irrespective of the language/locale set on the host computer or CDS clients.



If the locale of the data source has a different decimal representation (for example ","), the data source or an intermediate integration engine will need to transform the number to a decimal point format.

Numerical fields returned as variables in reports will also use "." as the decimal separator irrespective of the language /locale set on the host computer or CDS clients. The Knowledge Builder may use derived attributes to return alternatively formatted values.

It is the responsibility of the licensee to use the product in accordance with its intended use. In support of this, it is recommended domain experts include a statement consistent with the following on all reports.



“This report has been generated using clinical decision support software. This report is intended to provide adjunctive information only and should not replace clinical judgement.

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Glossary

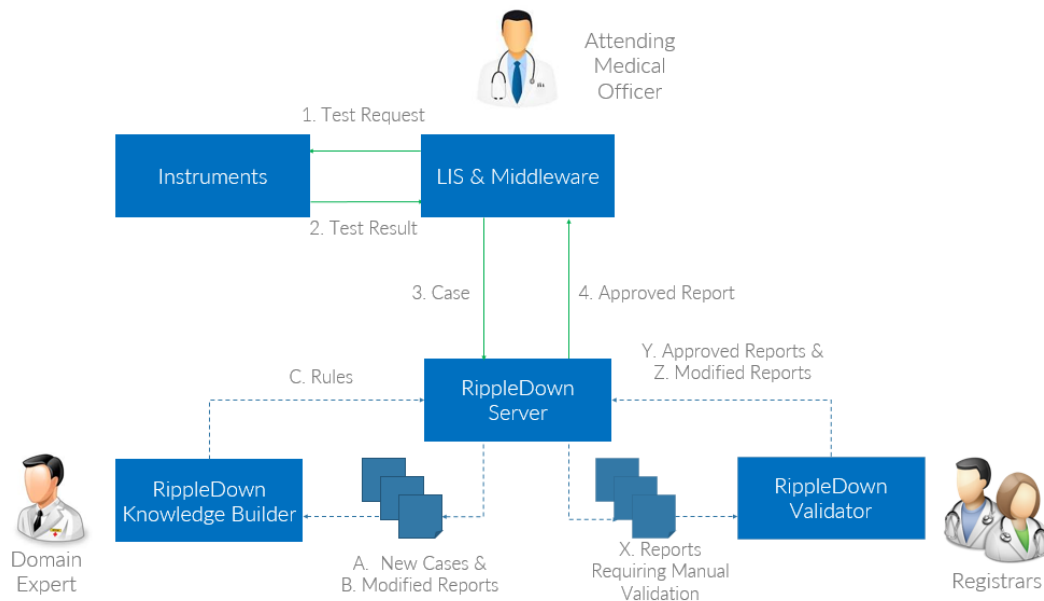
Attribute	Name representing each element or data item of a patient record Primary attribute: sent from the Online Information System Derived attribute: created from primary attributes as intermediate characteristic
Auto-validation	Release of reports from RippleDown without manual review. The degree and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



Each step in the above figure is described below:

1. An update to the patient record is made in the Primary Data Source (e.g. patient admitted, Physician orders test, Instrument results test).
 2. The Primary Data Source requests an interpretation of the patient Case from the RippleDown Server, ideally sending all available, relevant, current and historical data for the patient.
 3. If necessary, prior to interpreting the Case, to enhance the accuracy and precision of the interpretation the RippleDown Server can enrich the patient Case with additional data from Primary or Secondary Data Sources.
 4. The RippleDown Server interprets the Case using its configured rules to create a Report (being a combination of Comments and/or Actions). If eligible for automation, the RippleDown Server returns a Report to the Primary Data Source in real-time. If not eligible for automation, the RippleDown Server holds the Report until manually approved (see X. Reports Requiring Manual Validation).
 5. The Primary Data Source accepts the Report, stores the Comments against the patient record and executes any Actions. The Physician sees an enhanced patient record through the Primary Data Source without disruption to their user experience or test turnaround times.
- X. Reports not eligible for automation are sent to the RippleDown Auditor / Validator for review, modification (if necessary) and approval by Auditors / Validators.

Y. Approved Reports are returned to the RippleDown Server and immediately forwarded to the Primary Data Source (see 6. Approved Report)

Z. Modified Reports are returned to the RippleDown Server and immediately forwarded to the Primary Data Source (see 6. Approved Report) and forwarded to the RippleDown Knowledge Builder for rule refinement (see B. Modified Reports).

A. New cases are sent to the RippleDown Knowledge Builder for the Domain Expert to consider writing rules against.

B. Modified Reports are sent to the RippleDown Knowledge Builder to consider refining the existing rules (i.e. continual improvement).

C. The Domain Expert creates and modifies rules in the RippleDown Knowledge Builder, which automatically checks for any impacts to existing rules. New and modified rules are then returned to the RippleDown Server and applied immediately and safely.

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. 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.

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

- Patient demographics
- Episode details
- Test codes and results
- Historical results

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

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/s. The integrity, quality and accuracy of the primary attribute values received into RippleDown is completely dependent on the Online information system. All rules executed by RippleDown are solely based on these values. It is imperative that the Online Information System/s is used, managed and maintained in accordance to the manufactures specifications to ensure the correctness of the attribute values.

Derived attributes can be created from the primary attributes to capture examples of key concepts.

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 value attributes** 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. Go to [Edit | Features...](#) to build your features.

Report Sections

Comments are added to a specific report section through rules. 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.

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 fields

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:



RippleDown
Version: 8.0.5

Laboratory Systems

Report Validator
 Knowledge Builder

Business Audit Systems

Data Entry Auditor

Administration

Administrator
 Translator

Name

Password

OK Cancel

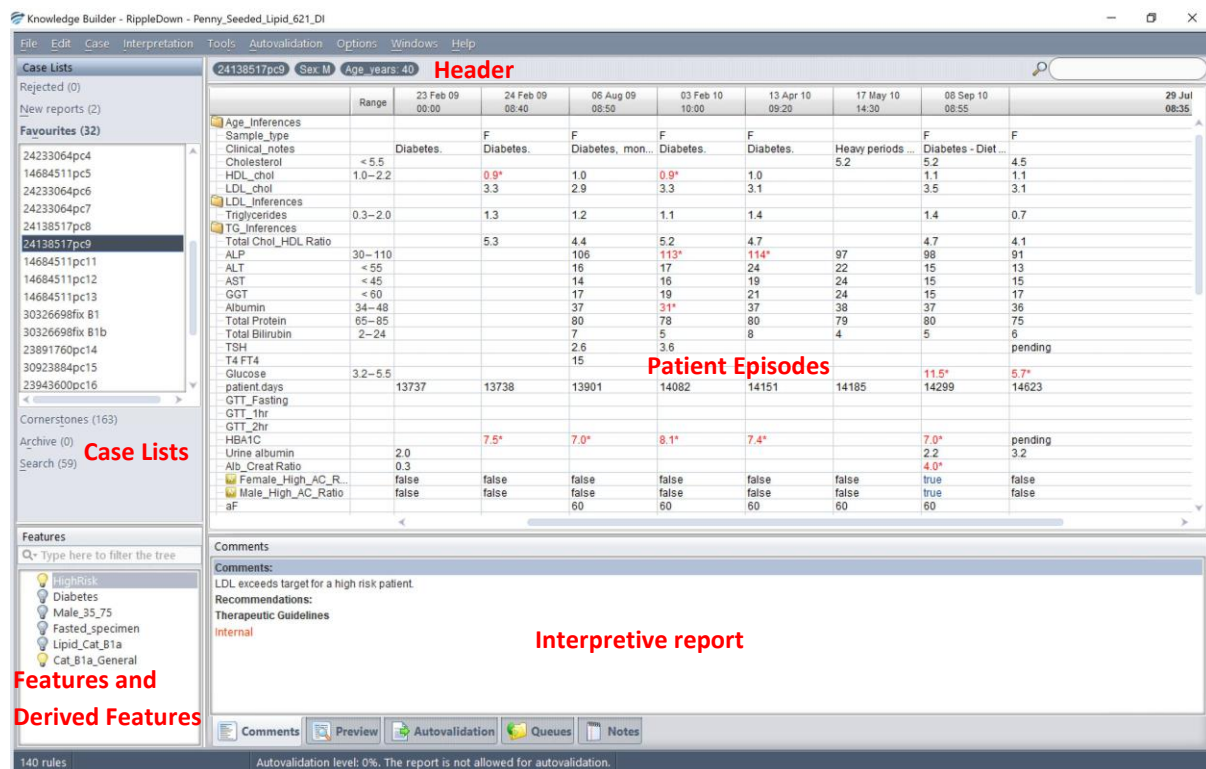
3. Enter your username and password and click OK. (Please contact your RippleDown Administrator to create these)
4. From the File menu use "Open Project" to select the relevant project.
5. The main case view opens.

- To change your password, select “Reset Password” from the help menu and follow the prompts.

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.



The screenshot displays the Knowledge Builder Case View interface for a patient with ID 24138517pc9. The interface is divided into several sections:

- Case Lists:** A sidebar on the left shows a list of cases, with the current case (24138517pc9) selected. Other cases listed include 24233064pc4, 14684511pc5, 24233064pc6, 24233064pc7, 24138517pc8, 14684511pc11, 14684511pc12, 14684511pc13, 30326698fix B1, 30326698fix B1b, 23891760pc14, 30923884pc15, and 23943600pc16.
- Header:** Shows patient information: 24138517pc9, Sex: M, Age: years: 40.
- Table:** A table of lab results and patient episodes. The columns represent dates and times: 23 Feb 09 00:00, 24 Feb 09 08:40, 06 Aug 09 08:50, 03 Feb 10 10:00, 13 Apr 10 09:20, 17 May 10 14:30, 06 Sep 10 08:55, and 29 Jul 08:35. The rows include various lab tests such as Cholesterol, HDL, LDL, Triglycerides, Total Chol_HDL Ratio, ALP, ALT, AST, GGT, Albumin, Total Protein, Total Bilirubin, TSH, T4 FT4, Glucose, patient days, GTT (Fasting, 1hr, 2hr), HbA1c, Urine albumin, Alb_Creat Ratio, Female_High_AC_R, Male_High_AC_Ratio, and aF.
- Interpretive report:** A section at the bottom right containing a comment: "LDL exceeds target for a high risk patient." and a recommendation: "Therapeutic Guidelines Internal".
- Features and Derived Features:** A section on the bottom left showing a tree view of features like HighRisk, Diabetes, Male_35_75, Fasted_specimen, Lipid_Cat_B1a, and Cat_B1a_General.

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

- Finding and selecting a case
- Copying 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

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

Case Lists

Several case lists are found in the Knowledge Builder:

Case List	Functionality
Rejected	<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>
New Reports	<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 Allow button on the Preview window. Only the most recent 1,000 cases will be kept on the New Reports list.</p>
Favourites	<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>
Cornerstones	<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>
Archive	<p>The amount of cases retained is configurable in Options Settings Days to keep archived cases. It is recommended that no more than 100,000 cases are kept for any individual project.</p> <p>Cases in the archive cannot be deleted manually.</p>
Search	<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 / folder name.

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



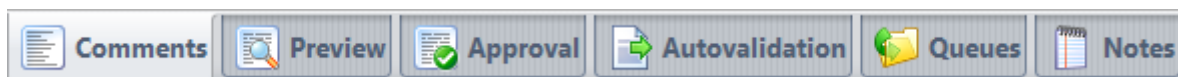
These ranges are not set-up in RippleDown, but are sent from the Online Information System with the case, and therefore only relate to the current episode.

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

There is a way to filter and search for a desired attribute or result in the case view. In the top right-hand side of the screen is a filter box that will filter the case view with the characters that are entered, and only show the attribute names and results that match the entered criteria.

Information / Action Panel

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



Comments	The pane used to add comments and workflow comments.
Preview	Displays the report as presented in the Validator and the Online Information System.
Approval	Displays the report as approved by the RippleDown Validator and any differences between the original and approved reports.
Auto-validation	Pane used to define auto-validation settings.
Queues	Pane used to define a special purpose queue.
Notes	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.

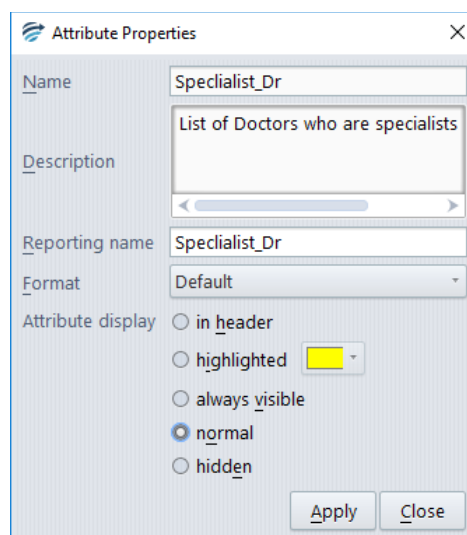
Attribute Editor

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	
Name	Enter the name to be displayed in Case View. Do not use spaces. Words can be separated by an underscore.	
Description	Enter a description if required for the Attribute.	
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 Attribute Editor Options Highlight colour
	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.
Format	hidden	The attribute and sample values are not shown but may be used in creating rules
	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.
	0, 1 or 2 Decimal places	Attribute sample can be formatted to either 0, 1 or 2 decimal places. This affects the display. Calculations using the attribute value will be performed on the data as it received from 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.

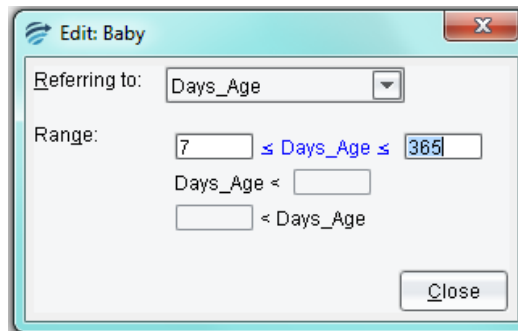
The derived attributes available are:



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

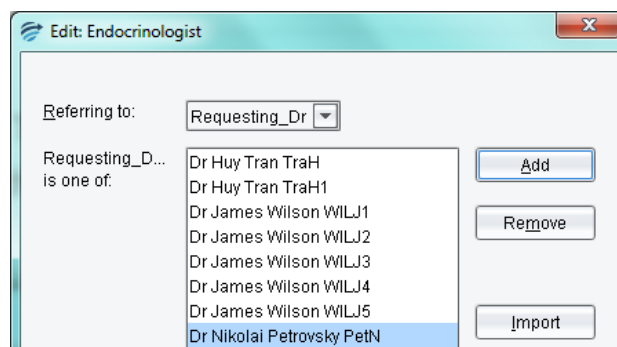
For example: The attribute Baby is defined as a patient with an age in days between 7 and 365 days:



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:



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.

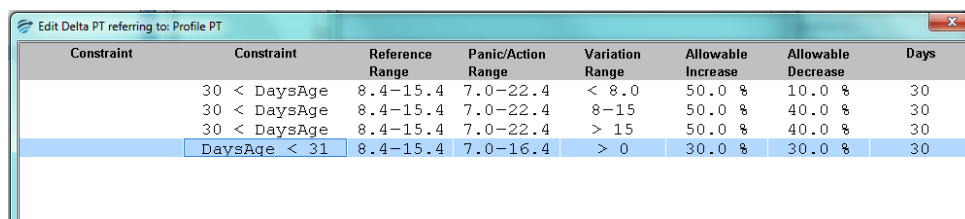


Panic / Delta Check

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.

- 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)

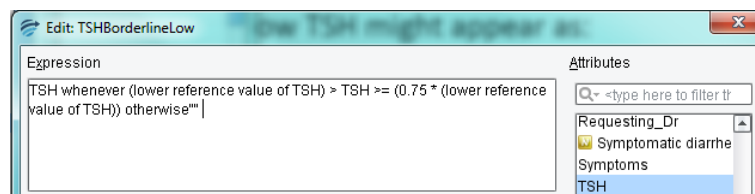
Rules may be defined to take the appropriate action according to the value of a panic / delta check. For example, rules may be added to ensure that if a check is triggered, the case is never auto-validated. When the case is shown to the user in Validation, the reason why the check was triggered is shown.



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:

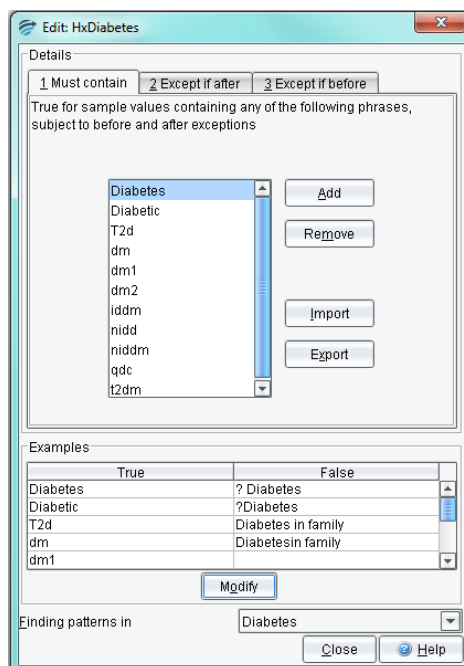


The formula can involve other calculated values as long as circular references are avoided i.e. A calculated attribute A can refer to calculated value attribute B as long as B does not already refer to A.



Text Attribute

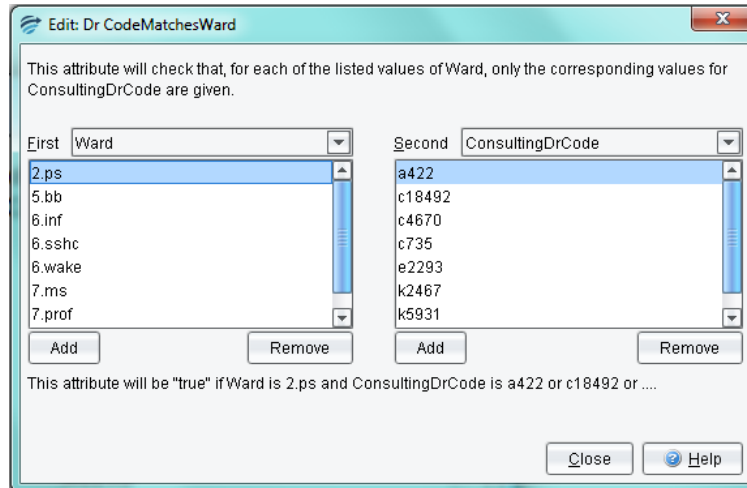
A text attribute is used to refer to the presence of a word or phrase in an attribute that has textual values, e.g. looking for “diabetic” in a patient’s clinical notes. Facilities are provided to refine the search so as to exclude similar but unwanted words or phrases, e.g. diabetic.





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.

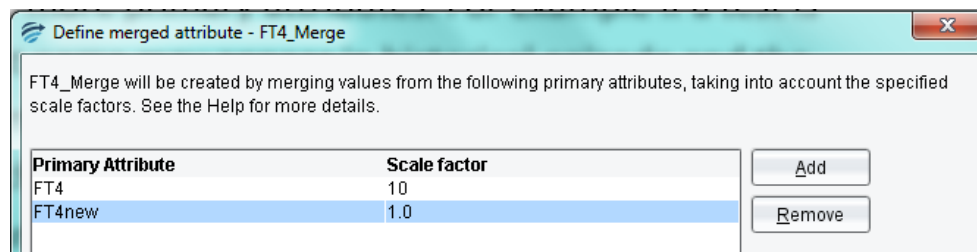


In the example if the Ward is 2ps and the ConsultingDrCode is a422, the attribute will evaluate as true



Merged Lists

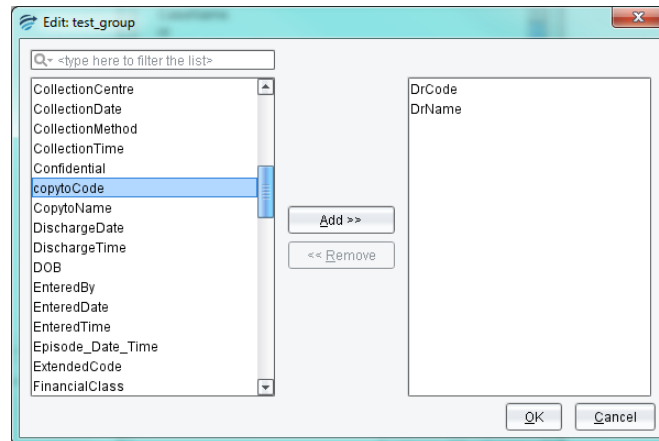
A merged attribute is one that takes its value from two or more primary attributes. For example, if a test is superseded in the Online Information System, the old test name may appear in historical episode and the new name in the current episode. A merged attribute combines the two tests into a single 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.





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 or one 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 at least one abnormal lipid test or all lipid tests are normal. Examples of these are below:

Edit episode attribute - Some_Lipids_Abnormal [X]

Conditions

false	Cholesterol is not normal and Cholesterol is numeric
false	HDL is not normal and HDL is numeric
false	LDL is not normal and LDL is numeric
true	Triglyceride is not normal and Triglyceride is numeric

True if All conditions are true
 At least one condition is true

[+ Add] [Edit] [X Remove]

[Close] [Help]

Note: 'Some_Lipids_Abnormal' will evaluate as true as the "At least one condition is true" radio button is selected.

Edit episode attribute - All_Measured_Lipids_Normal [X]

Conditions

true	Cholesterol is normal or Cholesterol is not available
true	Cholesterol is numeric or HDL is numeric or LDL is numeric or Triglyceride is numeric
true	HDL is normal or HDL is not available
true	LDL is normal or LDL is not available
true	Triglyceride is normal or Triglyceride is not available

True if All conditions are true
 At least one condition is true

[+ Add] [Edit] [X Remove]

[Close] [Help]

Note: 'All_Measured_Lipids_Normal' will evaluate as true as the "All conditions are true" radio button is selected.

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



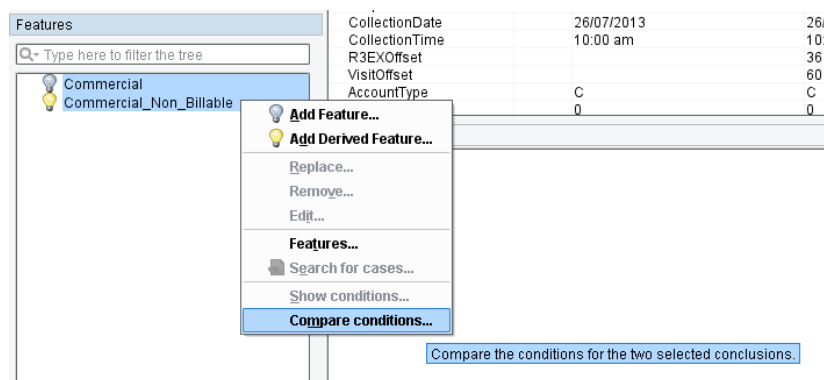
Derived features are indicated by a yellow light globe icon:

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. There are 5 simple steps to creating a rule in RippleDown:

1. Identify the Conditions for the new rule
2. Open the rule wizard using an action within the area you wish to modify
3. Select or create the item to be used within that area
4. Add the conditions
5. Check cornerstones

Rule Wizard - Define the Action

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

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

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

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

Select Attribute or Feature		
Select an attribute or feature from the list below, then click Next to continue.		
Q:-		
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	WDLDO
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.

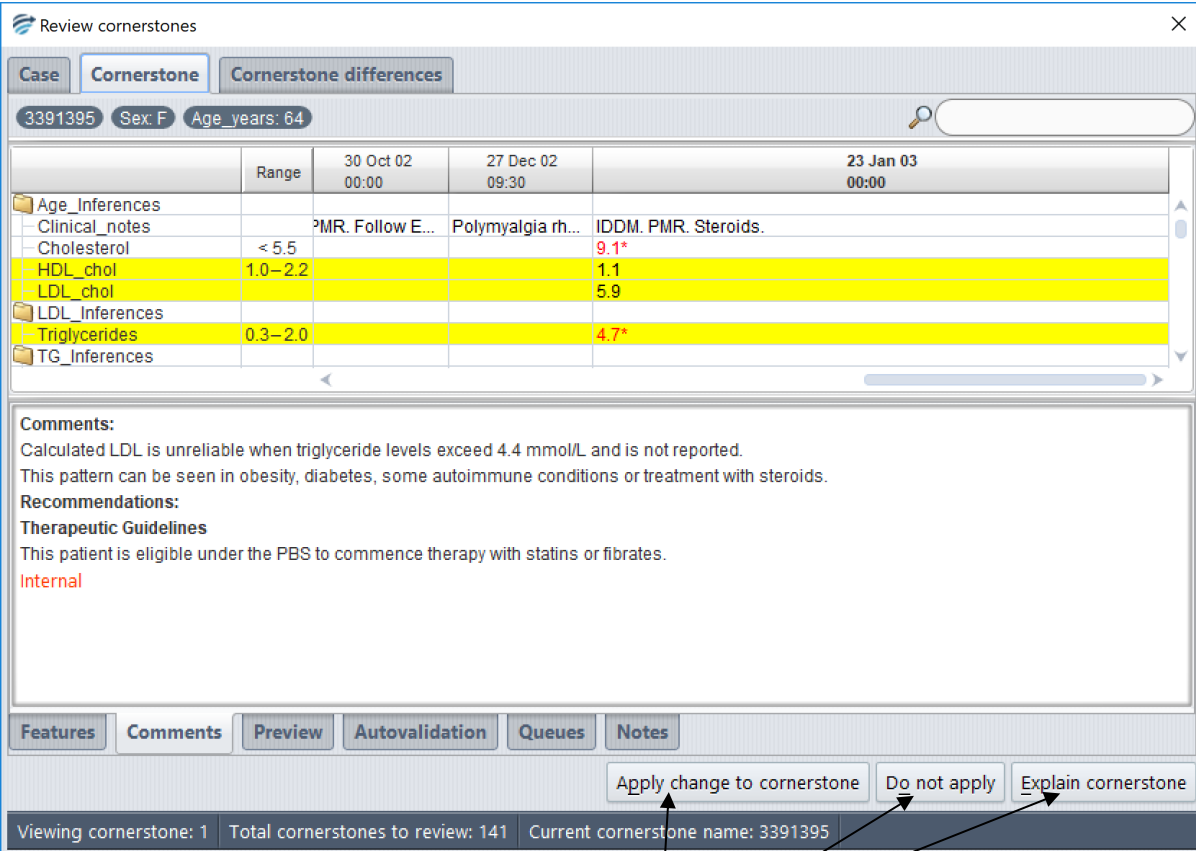
Note: a single click will move the suggestion to the Current field. Click the Add button to move the suggestion to the Completed field

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 'Impacted cornerstones'. The total number is shown in the 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 Review Cornerstone screen shown below:



	Range	30 Oct 02 00:00	27 Dec 02 09:30	23 Jan 03 00:00
Age_Inferences				
Clinical_notes		MR. Follow E...	Polymyalgia rh...	IDDM. PMR. Steroids.
Cholesterol	< 5.5			9.1*
- HDL_chol	1.0-2.2			1.1
- LDL_chol				5.9
LDL_Inferences				
- Triglycerides	0.3-2.0			4.7*
TG_Inferences				

Comments:
 Calculated LDL is unreliable when triglyceride levels exceed 4.4 mmol/L and is not reported.
 This pattern can be seen in obesity, diabetes, some autoimmune conditions or treatment with steroids.

Recommendations:
Therapeutic Guidelines
 This patient is eligible under the PBS to commence therapy with statins or fibrates.

Internal

Buttons: **Apply change to cornerstone**, **Do not apply**, **Explain cornerstone**

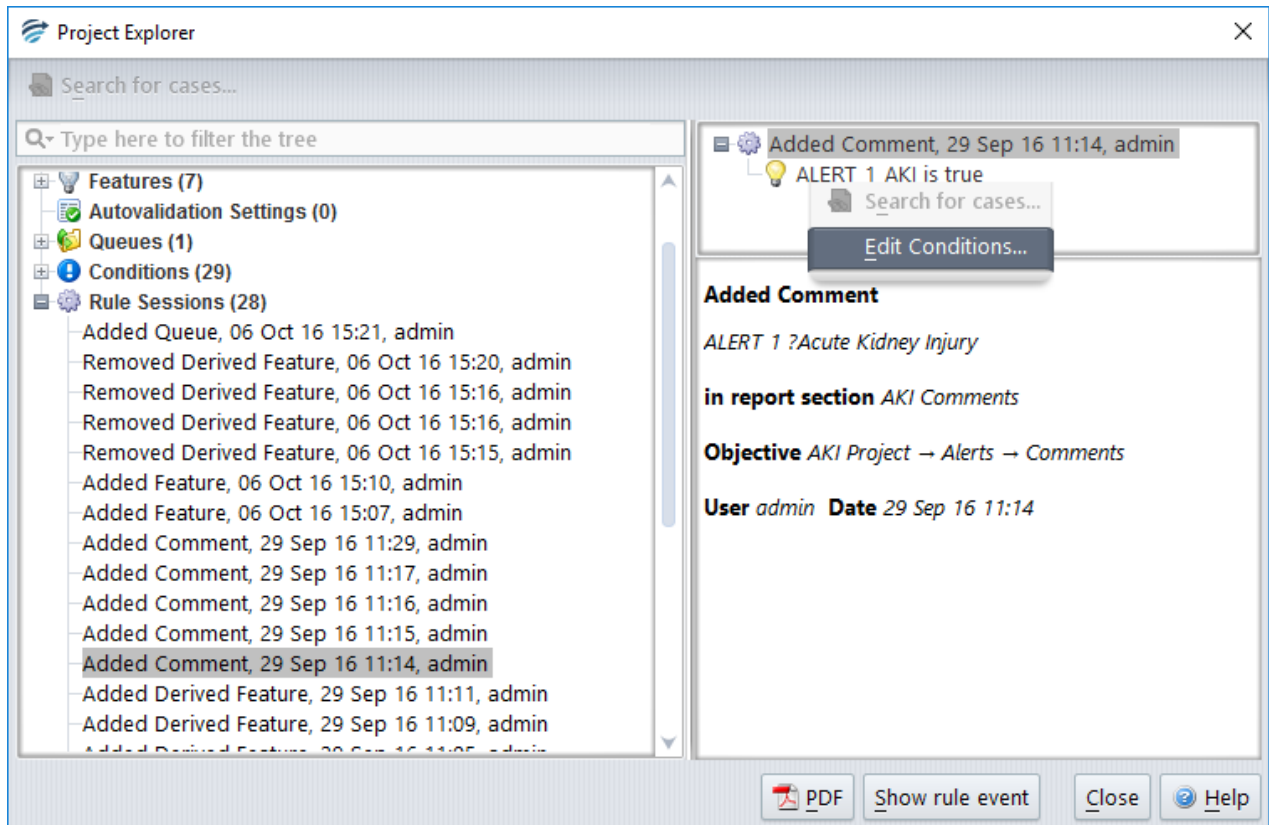
Status bar: Viewing cornerstone: 1 | Total cornerstones to review: 141 | Current cornerstone name: 3391395

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. An explanation as to how the cornerstone case and the report will be effected if the rule is applied can also be shown.

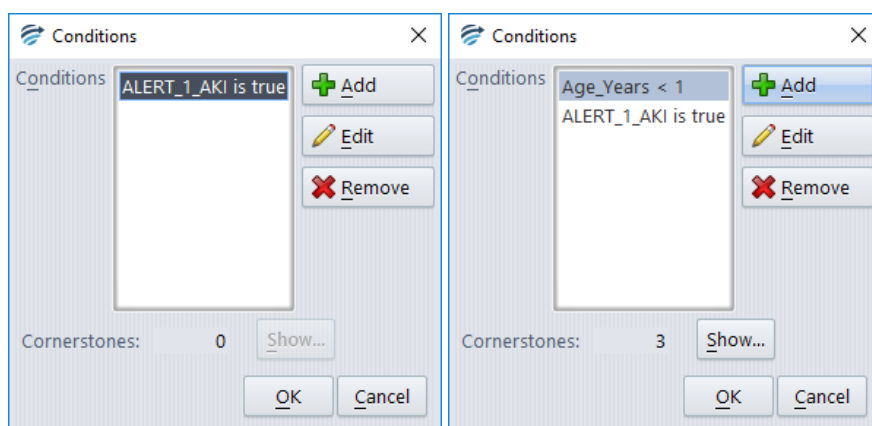
Once all Cornerstone cases have been reviewed and the Cornerstone count is shown as 0. The Rule Wizard screen is shown again. Click Finish to apply the rule.

Edit Rules

In the circumstance where a rule needs to be edited, there is the ability to do this through the Project Explorer. The specific rule session concerning the rule that requires its conditions to be edited needs to be selected in the Project Explorer. By right clicking on the conditions the user can select to edit these conditions.



The following window will then appear, giving you the option to add, remove or edit the conditions.



Similar to when writing the rule in the Rule Wizard, as the conditions are edited, cornerstone cases will be checked against to identify examples that would be impacted by this change. Once the edited conditions are completed then the user can select the 'Show' button and review the cornerstone cases that would have their interpretation altered by this rule change. As it is important to determine if this edit requires further refinement, the cornerstone cases can be viewed before and after the edit and displayed with their differences highlighted.

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

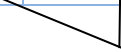
The first table shows some results for a patient:

		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"

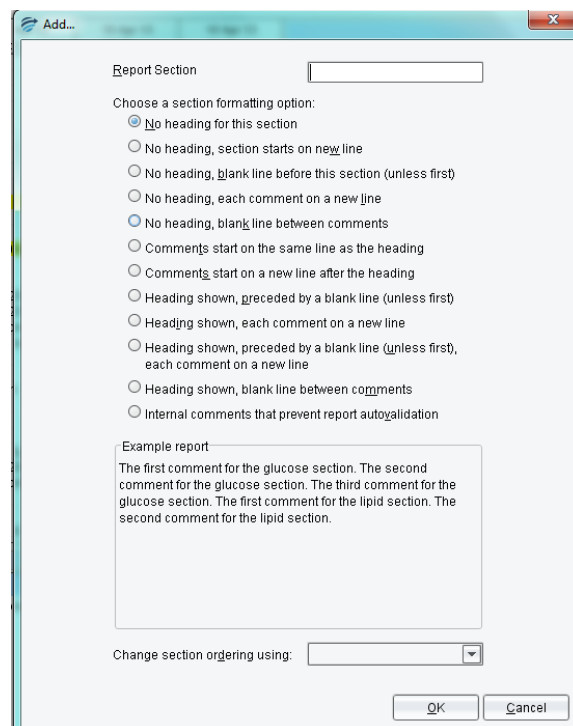
Reports

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
Add	<p>Select the "Comments" window and use the right-click menu Add comment.</p> <p>Select the comment you want to add, or to create a new one.</p> <p>Use the Objective to give the reasons for adding the comment</p>
Replace	<p>Select the comment you want to replace, then use the right-click menu Replace comment.</p> <p>Choose the comment you want to be given as the replacement. You can also create a new comment as the replacement.</p> <p>Use the Objective to give the reasons for replacing the comment</p>
Remove	<p>Select the comment you wish to remove and use the right-click menu Remove comment.</p> <p>The Wizard will jump immediately to the steps that allow you to give the reasons why you wanted the comment removed. .</p>

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.

Project Explorer

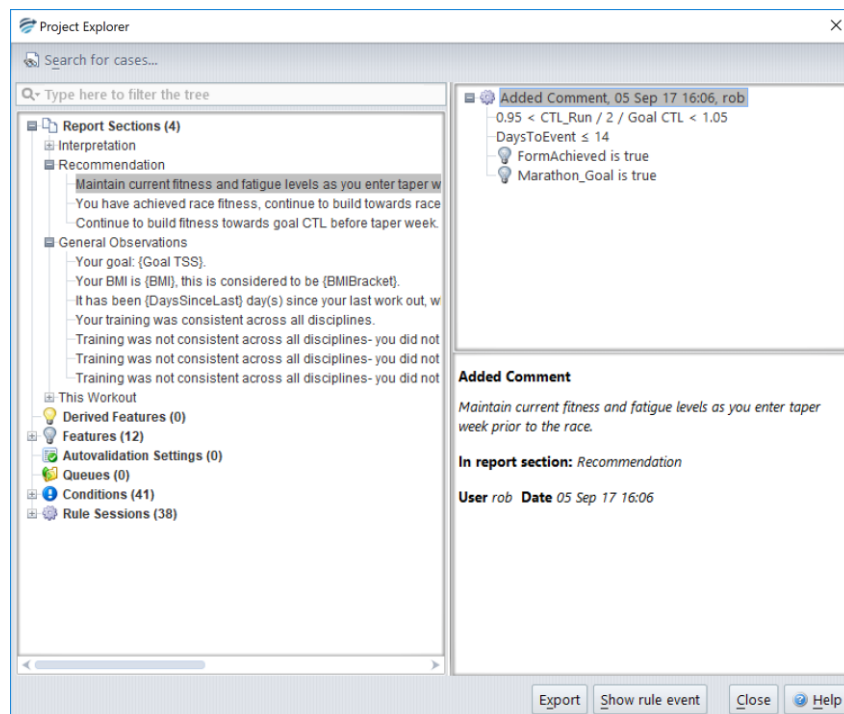
Project Explorer is an invaluable tool showing the history of the project and a display of all major components of the project with a tracking user id, date and time stamp.

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 “Recommendation” and the comment: “Maintain current fitness and fatigue levels as you enter taper week prior to the race”



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

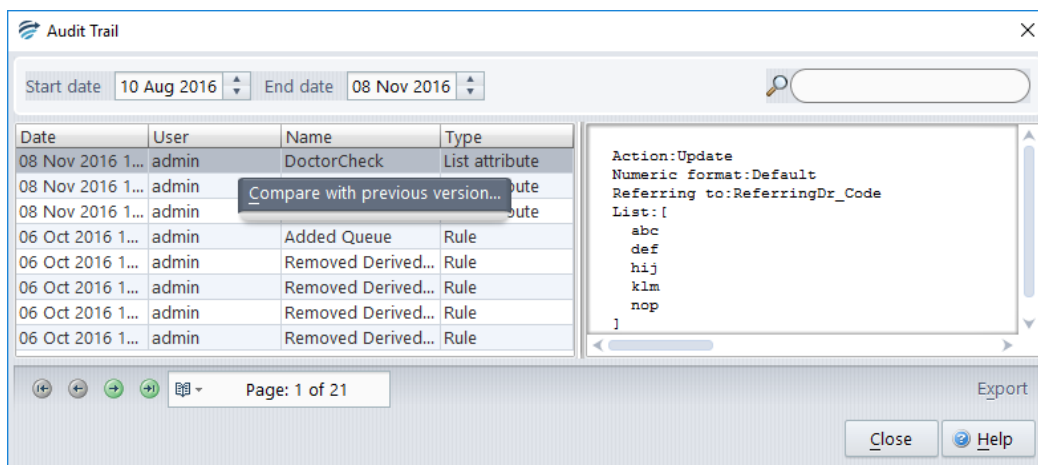
The Project Explorer may be exported in a HTML format:

1. Click the **Export** button
2. Enter a name
3. Select a location and click **OK**.

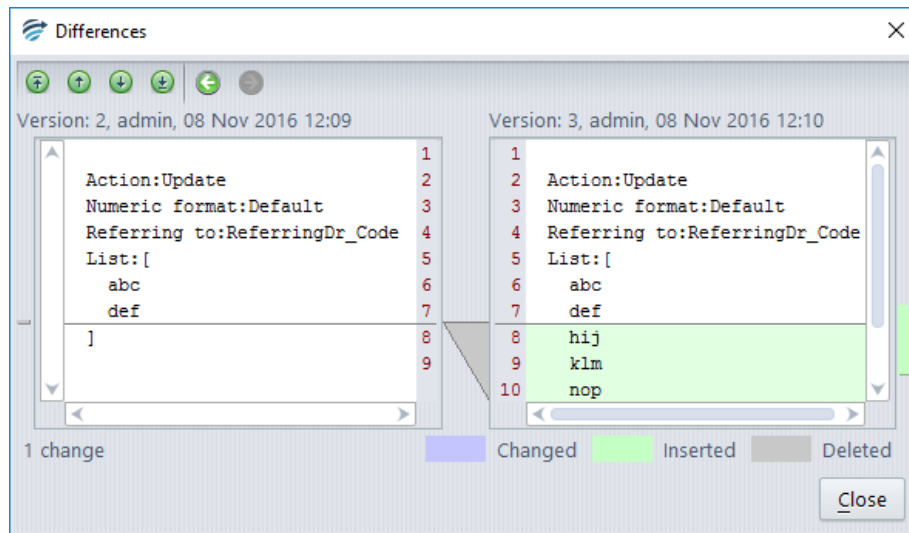
Audit Trail

Audit Trail is an additional record keeping function that is found in the tools menu. It enables the user to tracks any changes of any variables (like comments or derived attributes) within the project. The user can to compare the current status of the item with previous versions of the item, allowing full traceability in the project.

The Audit Trail has a multiple search options to locate particular entries, the period can be adjusted, all columns in the table are sortable and in the top right hand corner there is a free text search box.



Once a desired entry has been located, a list derived attribute in this example, in order to drill down and compare the current version and the previous version of the list simply right click.



Changes are clearly highlighted so you can see in this example that three new doctor codes were added to the list attribute at 12:10 on November 8th by the user: admin.

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
Report	A Report is the ordered set of comments provided by the Knowledge Base for a case
Report Section	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)
New Report	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.

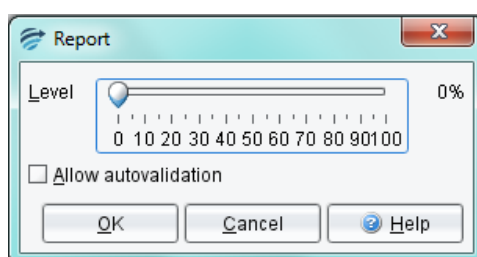
1. "per report" basis, a percentage auto-validation level is set for each unique report, regardless of the number of report sections, that is generated by the knowledge base. This is the most restrictive policy, but the safest.
2. "per report section" basis, a percentage auto-validation level is set 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:

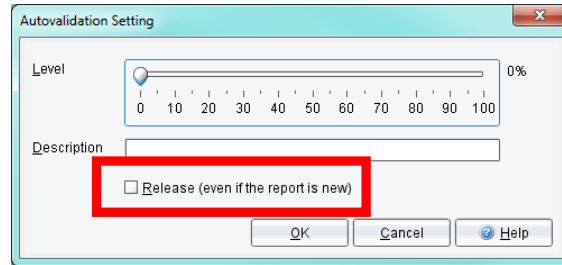


OR

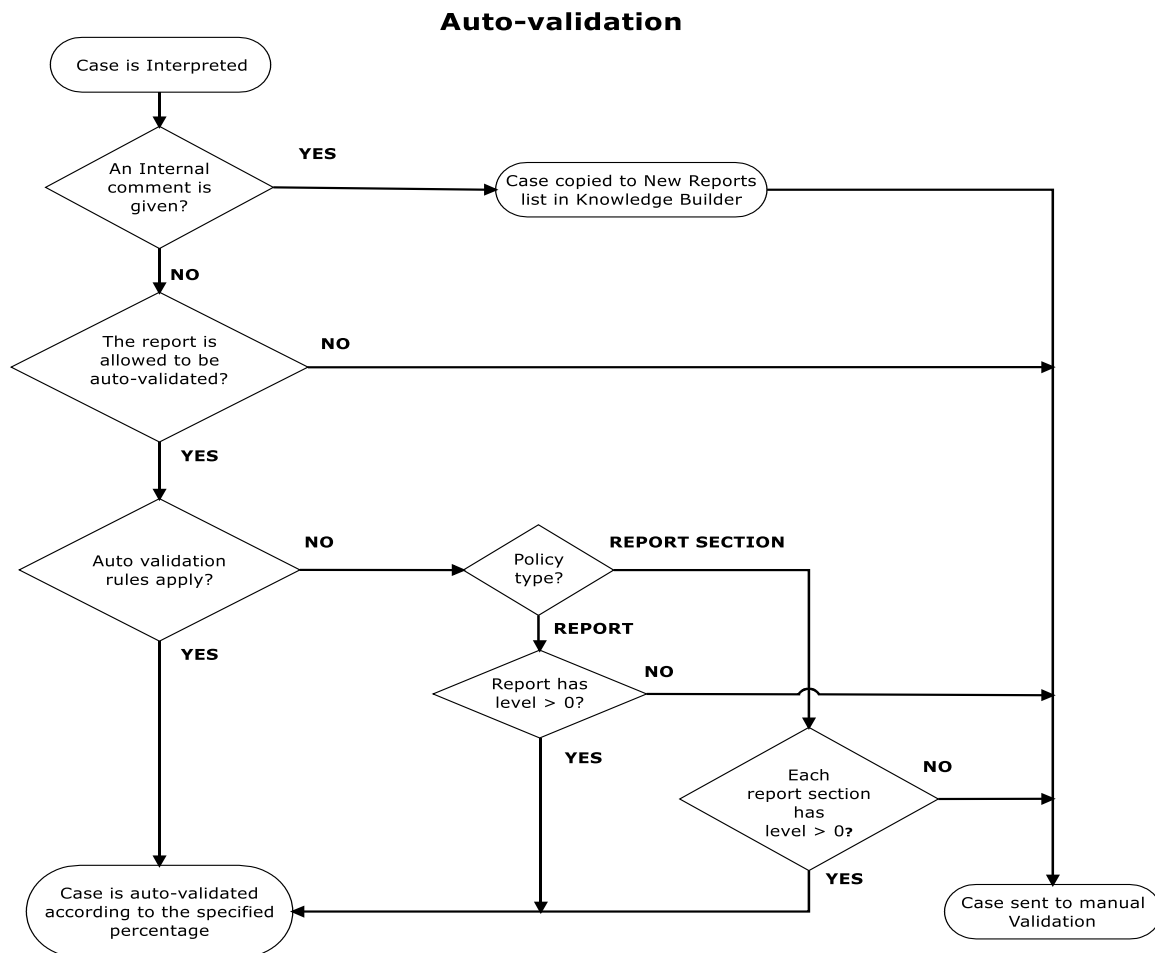
- c. Using the Validator to approve the case through normal lab workflow (this will only apply if the user has Knowledge Builder privilege)

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



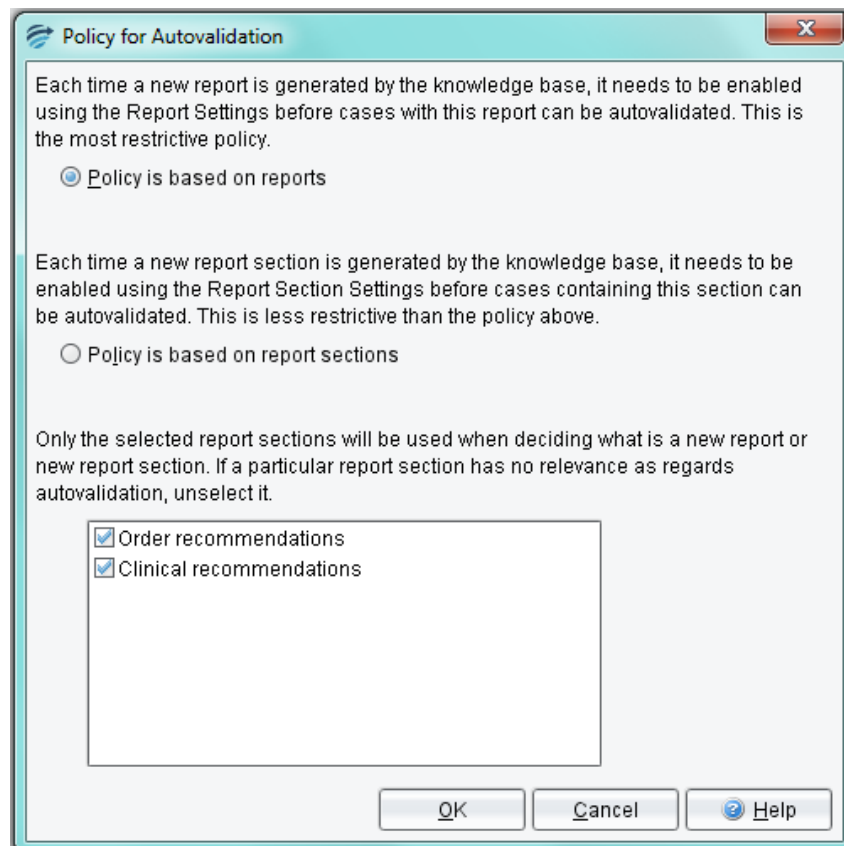
Auto-Validation levels

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](#).



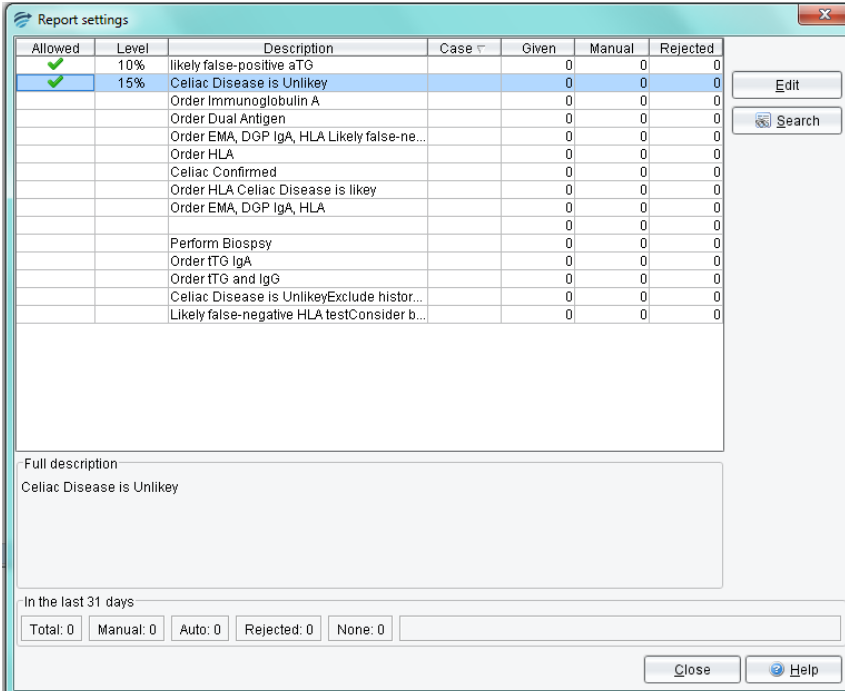
The default setting for a project is “Policy based on reports” with all report sections being selected.

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 Unlikey		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 likey		0	0	0
		Order EMA, DGP IgA, HLA		0	0	0
				0	0	0
		Perform Biopsy		0	0	0
		Order tTG IgA		0	0	0
		Order tTG and IgG		0	0	0
		Celiac Disease is UnlikeyExclude histor...		0	0	0
		Likely false-negative HLA testConsider b...		0	0	0

Full description
Celiac Disease is Unlikey

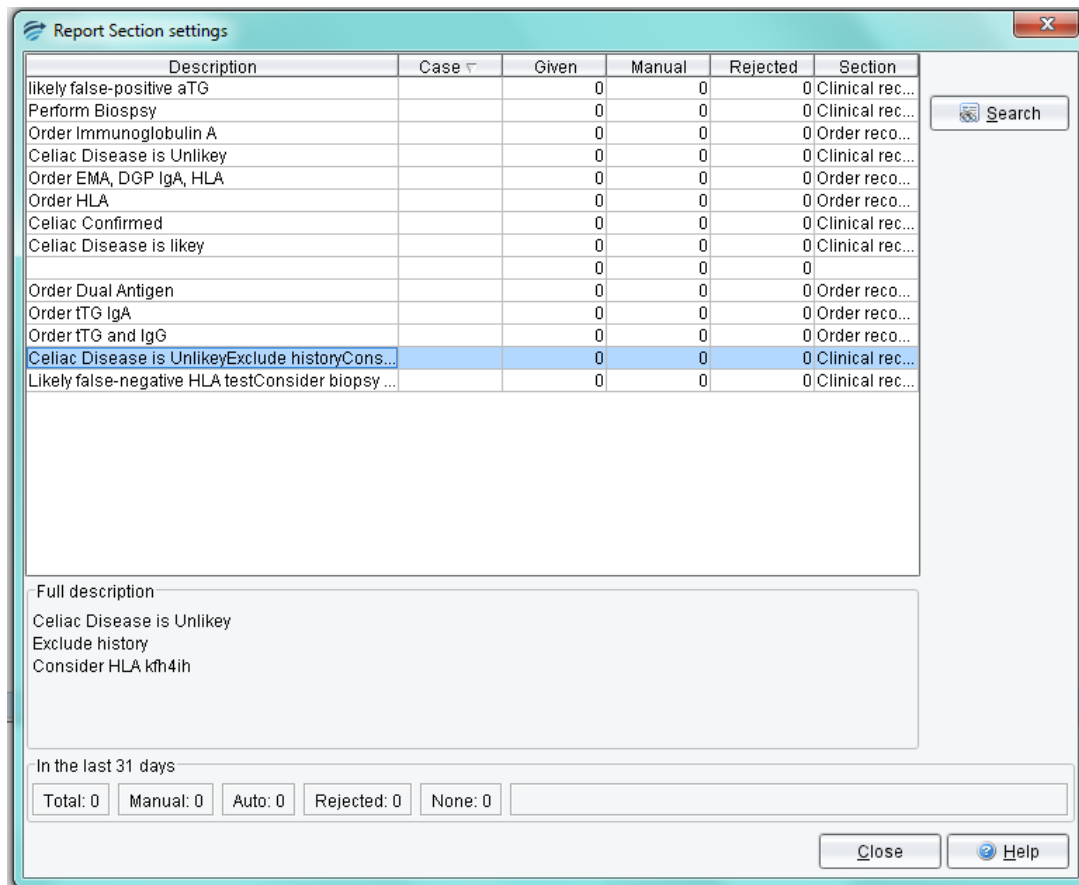
In the last 31 days
Total: 0 Manual: 0 Auto: 0 Rejected: 0 None: 0

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 kfh4ih

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

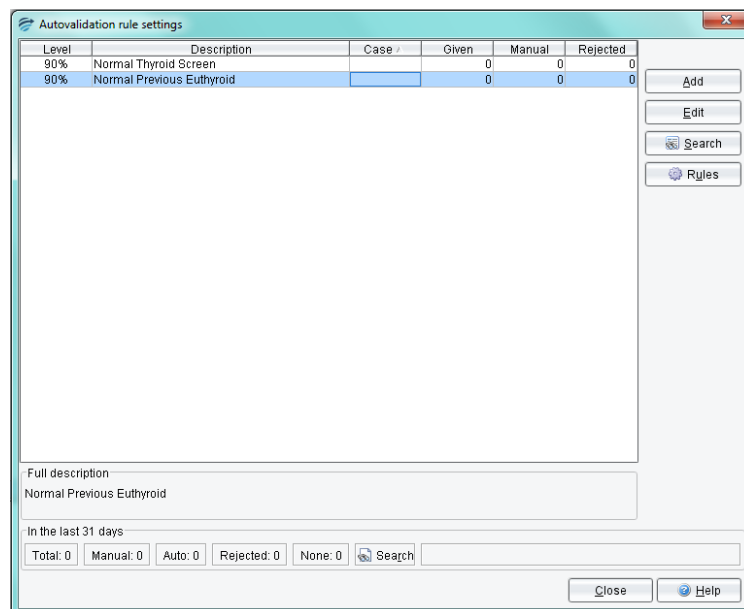
To use rules to manage auto-validation, you add an auto-validation setting to a case using the rule wizard, in exactly the same way as you would add a comment to a case.

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...'



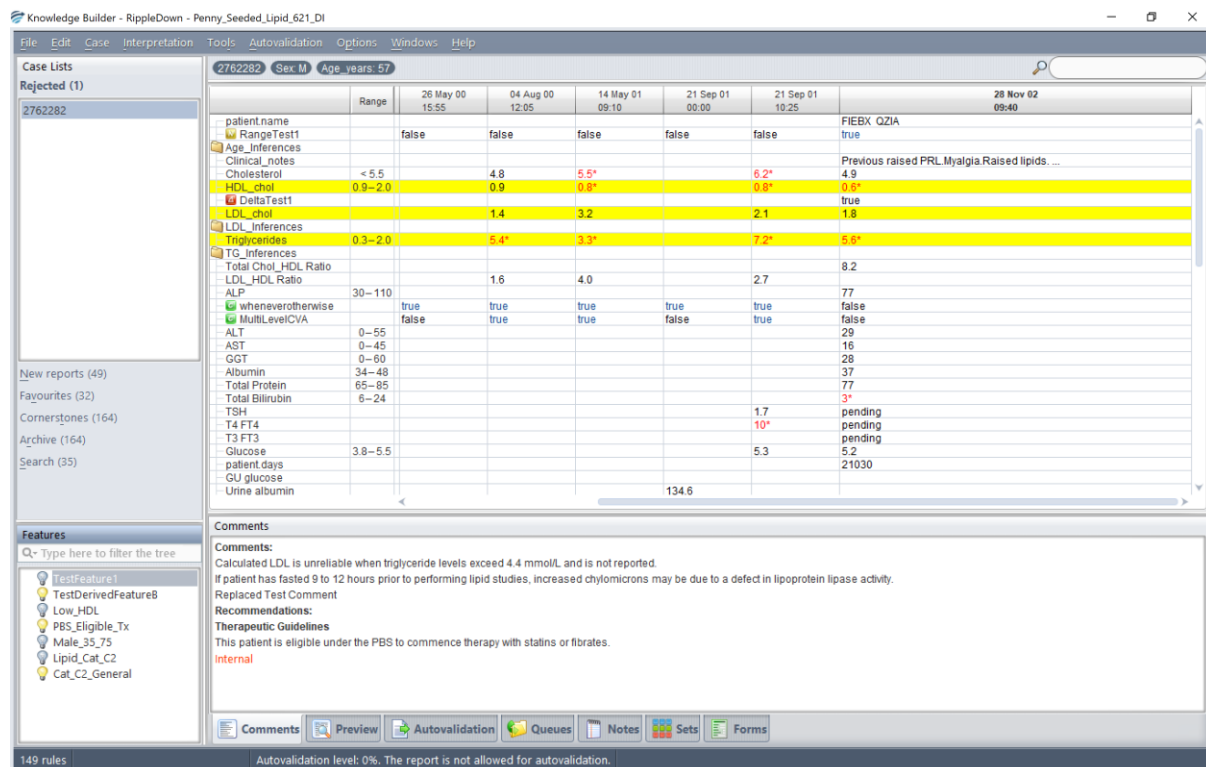
This facility also allows you to edit the level of an auto-validation setting. The new level will apply to all cases with that auto-validation setting.

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.

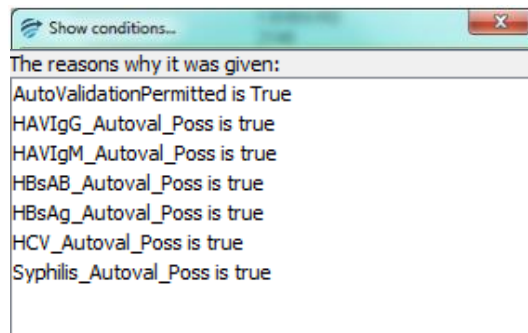


The screenshot shows the Knowledge Builder interface for a patient case (2762282, Sex M, Age years: 57). The main window displays a table of lab results with columns for different dates and times. The 'Range' column shows the normal range for each test. The '28 Nov 02 09:40' column shows the patient's results, with some values highlighted in yellow to indicate abnormal results (e.g., HDL_cholesterol 0.8*, LDL_cholesterol 2.1, Triglycerides 5.6*). The 'Autovalidation' column shows the auto-validation level for each test, with most tests set to 'false' or 'pending'.

Range	26 May 00 15:55	04 Aug 00 12:05	14 May 01 09:10	21 Sep 01 00:00	21 Sep 01 10:25	28 Nov 02 09:40
patient name						FIEXB OZIA
RangeTest1	false	false	false	false	false	true
Age_Inferences						Previous raised PRL Myalgia Raised lipids ...
Cholesterol	< 5.5	4.8	5.5*		6.2*	4.9
HDL_cholesterol	0.9-2.0	0.9	0.8*		0.8*	0.6*
DeltaTest1						true
LDL_cholesterol		1.4	3.2		2.1	1.8
LDL_Inferences						
Triglycerides	0.3-2.0		5.4*	3.3*		7.2* 5.6*
TG_Inferences						
Total Chol_HDL Ratio					8.2	
LDL_HDL Ratio		1.6	4.0		2.7	
ALP	30-110					77
wheneverotherwise	true	true	true	true	true	false
MultiLevelCVA	false	true	true	false	true	false
ALT	0-55					29
AST	0-45					16
GGT	0-60					28
Albumin	34-48					37
Total Protein	65-85					77
Total Bilirubin	6-24					3*
TSH					1.7	pending
T4 FT4					10*	pending
T3 FT3						pending
Glucose	3.8-5.5				5.3	5.2
patient days						21030
GU glucose						
Urine albumin						

At the bottom of the interface, a status bar indicates: "149 rules Autovalidation level: 0%. The report is not allowed for autovalidation."

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.

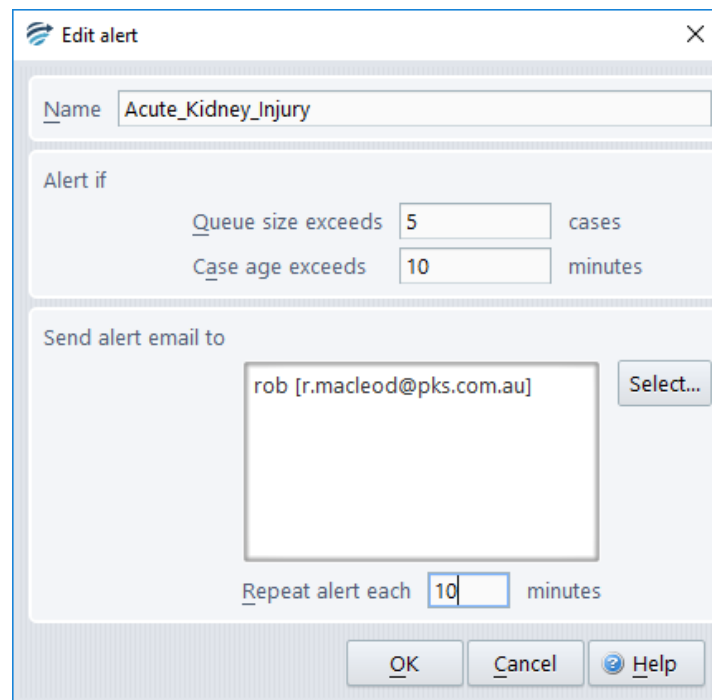
Conversely, if manual validation is required, there are the following possibilities for reviewing for the case, depending on how the Knowledge Base has been setup:

- 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.

Queue Alerts

Knowledge builders are able to define alerts for queues from [Edit | Queues](#) - emails will be generated to the assigned alert recipients when a case has been on a queue longer than a specified

number of minutes, or if more than a defined number of cases are exceeded on that queue. The intervals at which these alerts are sent can be customised to suit the alert and multiple alerts can be assigned to the one queue allowing escalation.



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.

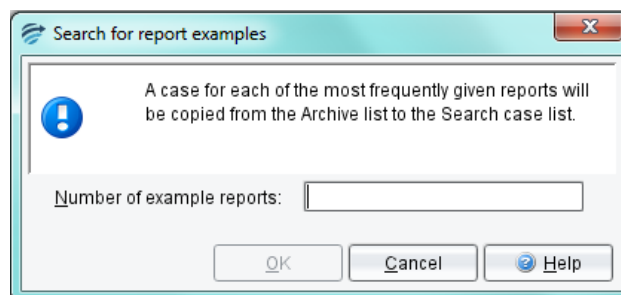
By default, each new search will clear any cases that were previously in the Search list.

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 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.

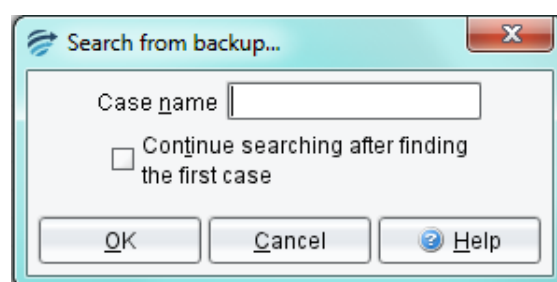
To start a search, select the **Tools** menu and click **Search for report examples**. A dialog will appear prompting you for how many reports you want examples of, as shown below:



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.

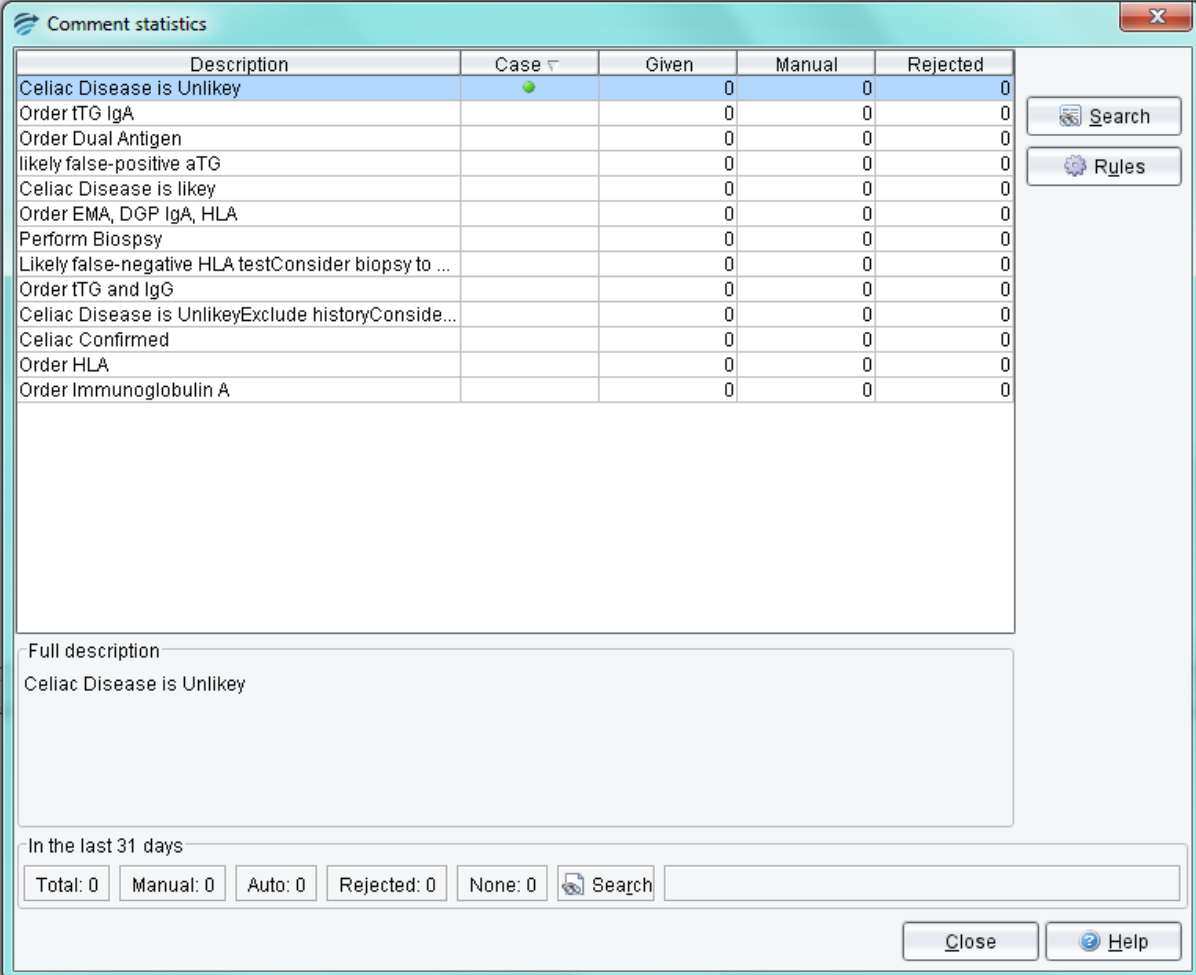
Sometimes a case is sent several times by the online information system, over the course of a few days. If you want to see all of these versions of the case, choose the option 'Continue the search

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 comment statistics. The table has columns for Description, Case (with a dropdown arrow), Given, Manual, and Rejected. The first row, "Celiac Disease is Unlikey", is highlighted in blue and has a green dot in the Case column. Below the table is a "Full description" section showing "Celiac Disease is Unlikey". At the bottom, a summary panel for "In the last 31 days" shows counts for Total, Manual, Auto, Rejected, and None, along with a search field and Close/Help buttons.

Description	Case ▾	Given	Manual	Rejected
Celiac Disease is Unlikey	●	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 likey		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 UnlikeyExclude 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 Unlikey

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

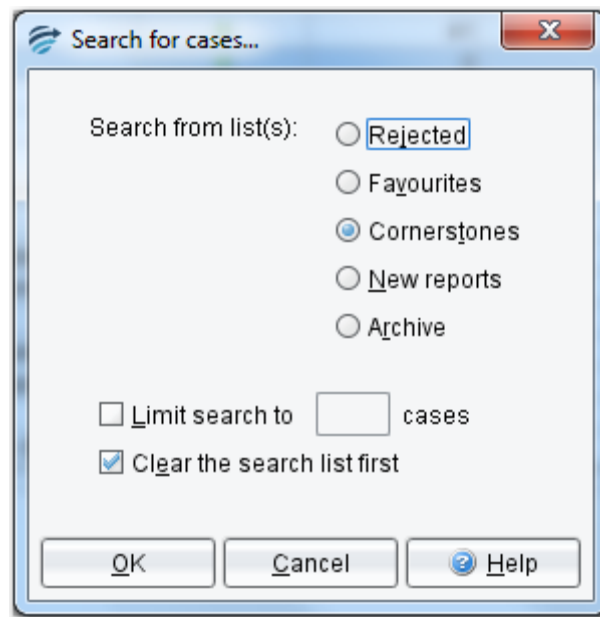
Close Help

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

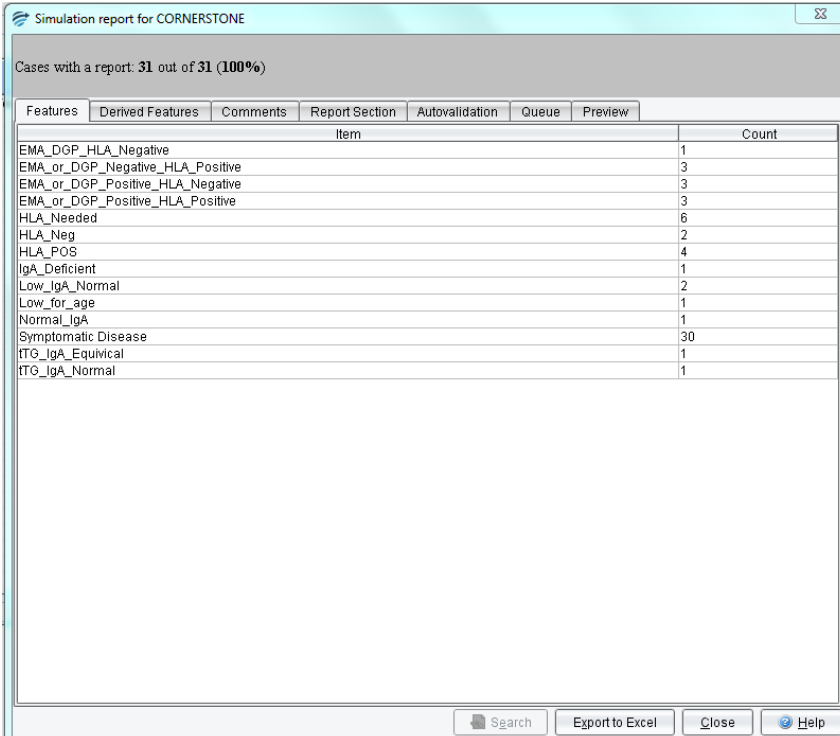
RippleDown has a Simulation tool that enables you to analyse the interpretations of all cases in any one of the case lists, such as the Archive or Cornerstone list.

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:



Item	Count
EMA_DGP_HLA_Negative	1
EMA_or_DGP_Negative_HLA_Positive	3
EMA_or_DGP_Positive_HLA_Negative	3
EMA_or_DGP_Positive_HLA_Positive	3
HLA_Needed	6
HLA_Neg	2
HLA_POS	4
IgA_Deficient	1
Low_IgA_Normal	2
Low_for_age	1
Normal_IgA	1
Symptomatic Disease	30
ITG_IgA_Equivical	1
ITG_IgA_Normal	1

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

Housekeeping

Housekeeping of the system is performed automatically once per day and typically takes 15minutes to complete. The default time for housekeeping to begin is 2am local time, however this can be modified if needed. When housekeeping begins, all users will be logged off automatically and will not be able to log back on until housekeeping is complete.

Housekeeping tasks:

- The archive case lists will be purged of the oldest cases and the number of days selected per project to keep archived cases will be retained.
- New reports that have been approved will be removed from the New reports case list.
- Rejected case list will be purged of the oldest cases and the number of days selected per project to keep rejected cases will be retained.
- Backups of all projects including the RippleDownServer and InterpStore projects will be created and replace the oldest backups.
- Sends the log files for evaluation to a specified monitoring address.
- Check of the licence file.
- Update of all statistics.

Note: If a user attempts to log into the application while housekeeping is being performed, when the OK button is selected, the application will not open and the application selector will remain on the screen.

Help

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

Known defects in this release

Reference	Summary	Description
LW-9335	Korean characters not displaying	We are aware that some specific characters in Korean do not display correctly- this is scheduled for development.
LW-9338	Edit rules warning when there are no cornerstones to check	If a user edits a rule and there are no resulting impacted cornerstones, the "show" cornerstones button is not available. Selecting "Ok", the user is still warned "would you like to finish without examining the remaining cornerstones. your changes will apply to all the remaining cornerstone cases"