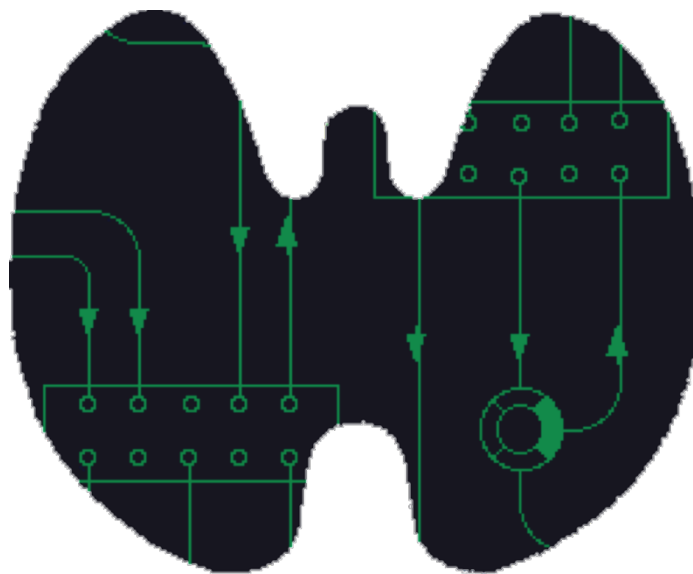


# SPINA Thyr 4.2

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## Handbook and Reference



## Preface

SPINA (structure parameter inference approach) is a systems method for advanced interpretation of laboratory results [1]. It allows for calculating constant structure parameters of endocrine feedback control systems *in vivo* from hormone concentrations that have been obtained from serum or plasma specimens. The method is based on mathematical and cybernetic modelling of processing structures [2, 3].

The first successful implementation applies to the evaluation of thyroid function. It allows for calculating the thyroid's maximum secretory capacity ( $G_T$  or SPINA-GT) and the sum activity of peripheral ("step-up") 5' deiodinases ( $G_D$  or SPINA-GD) from serum concentrations of TSH, (F)T4 and (F)T3 that have been determined once only (SPINA Thyr).

SPINA Thyr has been evaluated in clinical trials covering more than 10,000 subjects with various disorders of thyroid homeostasis [1]. SPINA-GT has been demonstrated to correlate with thyroid function [4, 5] and gland volume as obtained via ultrasonography [6]. Its retest reliability is higher than that of TSH, FT4 or FT3 [7].

SPINA-GD is reduced in nonthyroidal illness syndrome (NTIS) [8-12] and increased in states of hyperdeiodination [11, 13, 14], and it correlated in two large trials with TSH concentrations, thus mirroring intracellular cAMP levels [15, 16].

These structure parameters may therefore contribute to the diagnosis of rare or at least less obvious thyroid disorders. Additionally, they may facilitate differential diagnosis of primary and secondary disorders of thyroid homeostasis [1].

In addition to  $G_T$  and  $G_D$  the software SPINA Thyr is able to calculate TTSI and Jostel's TSH index, two static function tests for the assessment of pituitary function [17, 18].

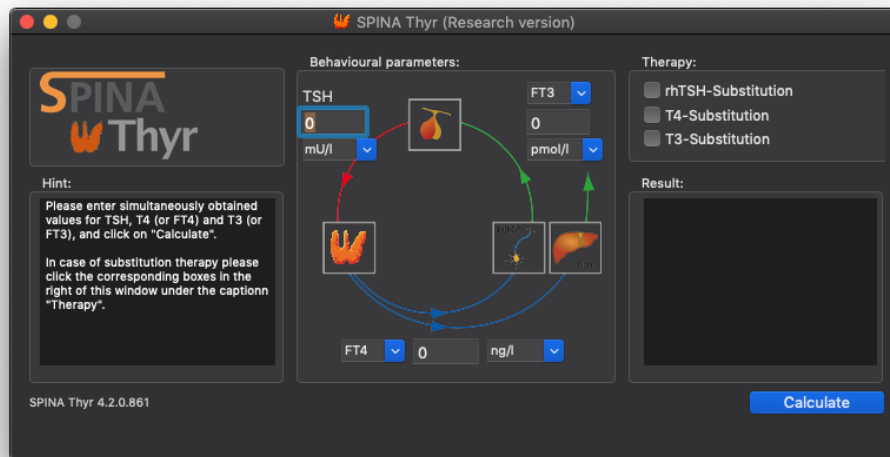
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## SPINA Guided Tour

### Starting SPINA

Start SPINA Thyr by double-clicking its icon. After a short while a dialog box asking for hormone values is presented:



When first run SPINA creates a set of new preferences including standard reference values for thyrotropin, thyroid hormones, structure parameters and units of measurement. Please make sure that units of measurement match those used by your laboratory. You may edit units and reference ranges in the preferences settings (see below).

### Calculating

Before using SPINA, it is critical to check and adjust laboratory methods (i.e. free or total hormones) and units of measurement as required. Subsequently you may enter hormone values of your patient or proband and click the button labelled **Calculate**. This will cause SPINA to calculate structure parameters and to display the results in a dialog box.

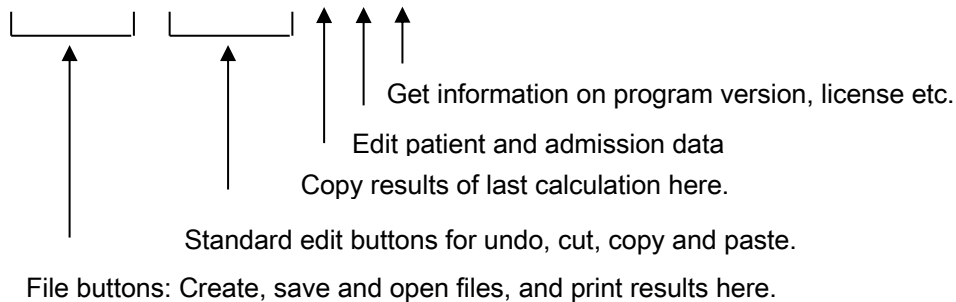


You may want to print the results via corresponding commands from the menu bar or the tool button palette. It is also possible to export the results of your calculation as a text file or HL7 message.

## User Interface

### Toolbar

Most functions of SPINA Thyr are accessible from the toolbar. If you move the mouse cursor to a button and leave it there for a second without clicking, a small tool tip is displayed explaining its function.



### Main Menu

Additional options are available from the main menu. It will look slightly different on macOS, Windows and Linux. However, the principal functions are identical.



SPINA Thyr menu: Application-wide options, e.g. Preferences and Services (macOS only)

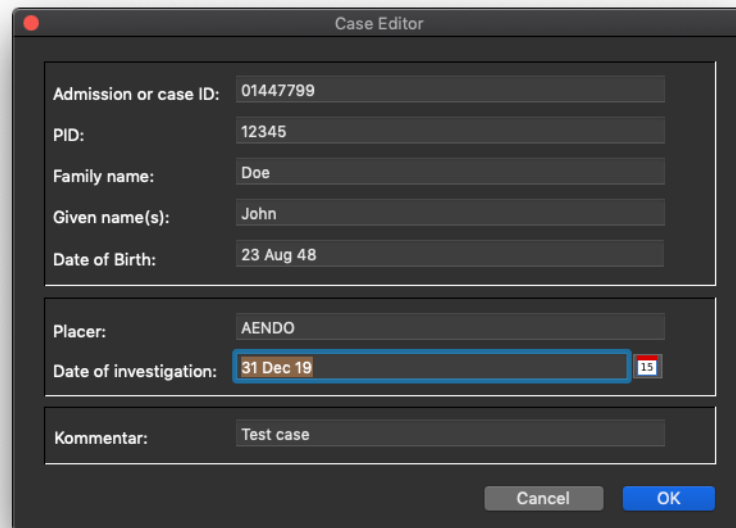
File menu: File- and scenario-wide options, e.g. for opening and saving files and editing case data.

Edit menu: Standard editing options like cut, copy and paste.

Help menu: Help and additional information.

## Case Editor

The case editor provides a user interface for entering patient and case data. Although this functionality is not necessary for basic operation, these data are valuable and often essential for printing and import/export functions.



The screenshot shows a 'Case Editor' dialog box with the following fields and values:

Admission or case ID:	01447799
PID:	12345
Family name:	Doe
Given name(s):	John
Date of Birth:	23 Aug 48
Placer:	AENDO
Date of investigation:	31 Dec 19
Kommentar:	Test case

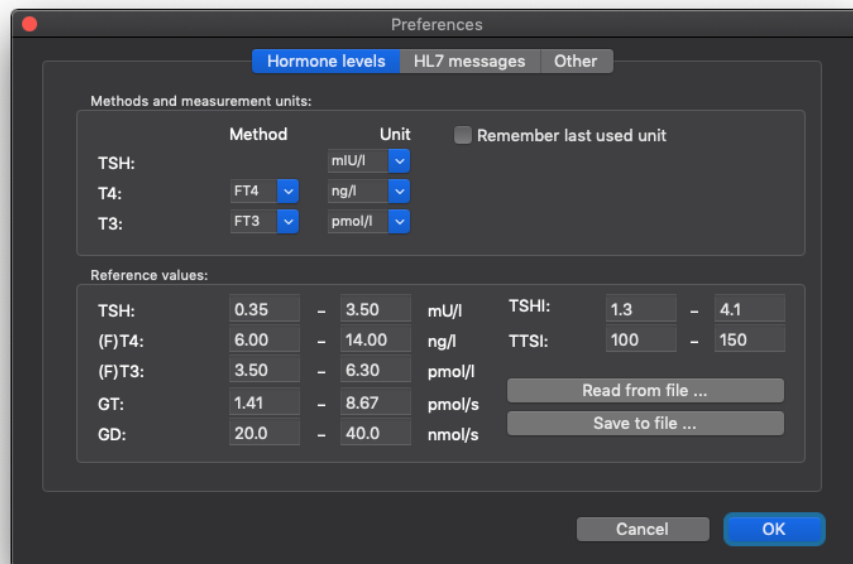
At the bottom of the dialog box, there are two buttons: 'Cancel' and 'OK'.

## Import and export functions

Hormone concentrations and results of calculations may be read or saved as files. SPINA Thyr expects data to be provided as HL7 ORU-R01 messages and it saves data in this format per default. This allows for maximum interoperability with hospital information systems or electronic health records. In addition, it is also possible to export results as text files.

## Preferences

The preferences window (accessible via the Application menu in macOS or the Edit menu on Windows or Linux) provides you with options to adjust global units of measurement and other settings. From this window, you may also import reference values from XML files according to the CDISC laboratory data model (CDISC LAB Base model version 1.0.1).



## Important hints

Preferably, all hormone concentrations should have been obtained at the same time in order to avoid bias by transitional effects (hysteresis).

Calculating SPINA-GT in patients who are treated with levothyroxine (L-T4) is of little, if any, value. Likewise, it is not recommended to calculate SPINA-GD in patients who receive substitution therapy with liothyronine (L-T3) or (due to interactions with most hormone assays for T3) with triiodothyroacetate (TRIAC). It may be interesting, however, to obtain a value for the unaffected structural parameter in affected cases, e.g. for SPINA-GD in patients on L-T4 substitution. You may select the appropriate check boxes for substitution therapy in the upper right of the main window in this situation. This causes SPINA Thyr to suppress the calculation of parameters that would be misleading. This information is also stored in HL7 messages.

Usage of SPINA implies that you agree to its license and conditions with respect to the council directive 93/42/EEC of the European Union. This information is included with the license file that comes with SPINA Thyr, and it is available online from <http://spina.sf.net>.



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More information is available from <http://spina.sf.net>.