FLINDERS MEDICAL CENTRE DXA STATISTICAL QUALITY CONTROL SPREADSHEET (DXASQC)

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DXASQC is a spreadsheet template designed to plot and assess the statistical significance of drifts in the calibration of DXA scanners. It uses standard statistical quality control (SQC) techniques to flag QC phantom measurements which indicate that the scanner calibration has drifted, or may be about to drift, outside accepted calibration limits.

The DXASQC program incorporates the following features:

* Shewart chart with superimposed moving average and control limits for both Shewhart and moving average.
* EWMA chart with control limits .
* Precision chart with control limits.
* Calculation and display of statistical parameters.
* Calculation of drift-corrected values.
* Control limits are user selectable to any number of standard deviations - around 3, however, seems to be about the optimum.
* Fast start-up for the averaged parameters.
* Sample size for averaging and precision calculations can be selected by the user - control limits are automatically modified as appropriate.
* Initialisation of SQC sequence after calibration.
* Visual and audible flagging of "Out of Control" (OOC) conditions. Audible flaggging can be switched off if desired.
* Chronological sorting of input data.
* Tracking of measured values over any time interval (down to one minute).
* Selection of time period for display/printing and data filtering for any combination of OOC conditions.
* Selection of a time window on charts plus scrolling forward and backwards in time.
* Easy-to-use user interface for data input, editing and deletion.
* Values can be read off charts by clicking and pointing with the mouse.

HARDWARE AND SOFTWARE REQUIREMENTS, INSTALLATION

To run this spreadsheet, you will need EXCEL 97 up for PC. Any PC hardware capable of running EXCEL will do the job. The software may be provided as a zipped file or in uncompressed format:

Zipped Format

Copy or download the file “Fmcdxasqc” to your desktop and double click on it – this will unzip the spreadsheet template DXASQC and any associated documentation into a folder named DXASQCvx.x (where x.x is the version number) on your desktop. This folder may then be moved to any desired directory on your machine.

Uncompressed Format

Simply copy or download the folder named DXASQCvx.x (where x.x is the version number) on your desktop or any other desired location on your machine.

A Mac version of the package is also available on request.

DISCLAIMER NOTICE

Whilst the utmost care has been taken to eliminate "bugs" from this software, the authors cannot guarantee that it is "bug-free". Consequently, they accept no responsibility for loss of data or any other difficulties which may arise from the use of this template. Also, the authors accept no responsibility for the interpretation of the results presented and any clinical actions taken on the basis of these results.

It is strongly advised that a physician or medical physicist with experience in bone densitometry be involved in the interpretation of results obtained using this spreadsheet.

USE OF SPREADSHEET PACKAGE

Open the DXASQCvx.x (x.x is the version number) directory and double click on the **DXASQC** icon. You may receive a standard message warning you that the template contains macros – choose to “enable” these macros. A new spreadsheet will be generated from the template. You may have to select "View: Full Screen" from the main menu to see everything. This template will contain some sample data with a simulated 1 SD drift and a simulated change in precision - you can use this data to familiarize yourself with the various functions of the package.. You can put your own basic input data (hospital/scanner name, serial numbers etc) in the highlighted cells which come up on first running the template. To enter your own measured data in the data entry region, simply select and delete the sample data in the yellow data entry region and enter your own - you can do this manually or use the cut and paste option if you have an electronic version of your data available. Use the “Save As” option to save a copy of the spreadsheet (with an appropriate name) for use on your system – on subsequent use, simply double click on the spreadsheet you have created to open it, do what you need to do, and use the “Save” option to save the data you have just updated. Insertion of new measured phantom data can be done easily by clicking on the "Insert Data" button - this takes you to the appropriate place in the database where you can enter the date and time, the measured value and any comments. If the text in the "Sort Data" button changes to red, click in this button to initiate a chronological sort. The vertical scroll bar at the side of the window allows you to scroll through the entered data.

You will need to enter the reference data for the quality control phantom you are using. The reference value will generally be supplied with the phantom .For most DXA systems, a reference precision of about 0.5% and an allowable drift of about 0.6% is probably appropriate; more stringent criteria will result in more flagged “out of control” conditions and service calls for the equipment (more sensitivity will allow the detection of smaller drifts, but will also give more false positives).

Three charts are generated (click on the tabs at the bottom of the spreadsheet to display them):

Shewhart
This is a standard Shewhart plot of the raw data and a moving average. The blue points are the raw data and the green line is the moving average. The green line should lie within the inner "tram lines" (control limits) and the blue points within the outer "tram lines". The time window can be selected (set the start date and end date and click on the "Set Time Window" button. Ensure that the time window will display the data you want to see. The window can be scrolled and the y-axis scaled as desired.

EWMA
The EWMA (Exponentially Weighted Moving Average) chart may be more sensitive to small drifts in calibration, and is included for this reason. Small drifts are more quickly picked up by MA and EWMA than straight Shewhart. For the EWMA, a lambda factor of around 0.15 seems appropriate - higher values will allow faster tracking of large changes , lower values will allow tracking of smaller changes, but the response will be slower.

Precision
This chart picks up any statistically significant changes in the precision of the measurements (due to changes in machine function, operator changes or other factors)

Measurements which fall outside the control limits on any of these charts will be flagged as "out of control" (OOC) on the main data entry sheet - an audible signal may also be given when "out of control" data is entered.

Other functions included in the main sheet include data filtering, extraction of basic statistics for selected data, setting of statistical control parameters and drift correction. Users are advised to adhere to the default control parameters unless they are experienced with the use of statistical control charts. A little experimentation using the sample data provided in the template should give users a feel of how things work

A manual containing additional information and more detailed operating instructions is in the process of being prepared. In the interim, if you have any problems with the installation or use of this program, contact :

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