Parts are published in: Computer Methods and Programs in Biomedicine 1997; 191‑200 and the Proceedings of the Nineteenth Annual Symposium on Computer Applications in Medical Care. 1995; 52–56.

Figure 5–1. Main window of the ABTRANS program to guide a user through the process of defining a multivariate reference model for acid-base data. At the left-hand side of the window, the essential five steps to define a complete model are displayed. Pressing the associated button activates each step. Results of each step are displayed at the right-hand side of the window.

Figure 5–2. Patient data editing window (foreground) and laboratory data editing window (background) of the ABCHART program.

Figure 5–3. Charts and classification window of the ABCHART program. In the upper left corner the tri-axial chart is displayed with an acid-base path of a patient. Acid-base measurements are numbered 1 to 25. In the lower left corner, the time trend of the Mahalanobis distance (here called ‘Abnormality index Dm’ for clarity of the user) is shown. Note that the horizontal line in this plot represents the 30% equal probability ellipse, displayed as the inner ellipse in the tri-axial chart. Acid-base measurements falling below the line are inside this ellipse, while measurements above the line are located outside the ellipse. In the lower right corner, classifications according the Astrup and Siggaard-Andersen method and the vector method are given for acid-base observation number 11.

Figure 5–4. Set-up for automatic data-entry of an ABCHART program running at an ICU. An arterial blood sample of an ICU patient is sent to a central clinical chemistry laboratory (Lab) elsewhere in the hospital. Results of the analysis are sent back to the ICU through the Hospital Information System (HIS). At the ICU, the incoming serial signal from the HIS is duplicated by a line-sharing device and sent to both a printer and a personal computer (PC) installed at the ICU. On the PC, a running ABCHART program processes the incoming data and performs an update of its database and windows accordingly.

Table 5–1. Relevant numerical routines used in the programs ABTRANS and ABCHART.

|  |  |  |
| --- | --- | --- |
| name | type | description |
| invert | NR-procedure | Calculates the inverse of a matrix. Uses the NR-procedures *ludcmp* and *lubkdsb*. |
| moment | NR-procedure | Calculates mean, standard deviation, variance, kurtosis and skewness from an array of input values. |
| gammp | NR-function | Incomplete gamma function for the calculation of the theoretical cumulative probability for a specific 2-value with a given number of degrees of freedom. |
| erff | NR-function | Error function for the calculation of a theoretical cumulative probability for a specific Gaussian z-score. |
| pearsn | NR-procedure | Returns Pearson’s correlation coefficient *r* and corresponding *p*-value for two arrays of input values. |
| betai | NR-function | Incomplete beta function for the calculation of a theoretical cumulative probability for a specific F-value with a given number of degrees of freedom. |
| jacobi | NR-function | Returns the eigenvectors and eigenvalues of a symmetrical matrix. |
| eigsrt | NR-function | Sorts eigenvectors in the eigenvalue matrix after ‘jacobi’. |
| sKS | VB-function | Calculates the adapted size-adjusted Kolmogorov-Smirnov test-statistic and associated *p*-value for a theoretical and empirical cumulative probability distribution. |

**All routines and functions of type NR are from the numerical routines library *Numerical Recipes in C. The Art of Scientific Computing* (Used with permission. Copyright © 1987-1992, Numerical Recipes Software)** **[2] and are located in the file NUMREC.DLL. The function of type VB is written in Visual Basic.**