The mathematical formulae for this is a bit more complex than the description, as follows:

$$S = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n - 1}}$$

Graphs – how to construct them

Right, so now we know how to calculate means and SDs, so what do they mean? Well, nothing until we use them to create some sort of control chart.

Westgard writes that "in the beginning there was Shewart" and he said let there be light on quality control matters. Shewart was an industrial chemist with an interest in displaying his quality control results on some sort of wall-chart. Later, in 1950, these charts were introduced into clinical chemistry by Levey and Jennings.

What has since become known as a Levey-Jennings Chart is created as follows:

Take your control material - serum, urine, or blood - and analyse it at least twenty times, as described above, so that you have a good idea of the variations in measurement in your lab. If we measure a single control material on a single run, we get a result with some sort of bias and imprecision built into it. The result might be good, or it might not. If we then measure the material on another day, this next result will have a different set of potential biases and imprecision built into it - there will be variations between results. Between-day testing variation is a fact we must accept and therefore the range you work out must include it as a factor. Let us see what sort of results you get for a single analyte. If we say that on day 1, the analyte in question gives you a result of 123 mmol/l on your control material, and on subsequent days the results are as follows.

Table 1: Consecutive control results.

Day	Result	Day	Result
1	123	11	126
2	124	12	121
3	121	13	123
4	125	14	122
5	123	15	120
6	129	16	123
7	122	17	122
8	125	18	124
9	124	19	122
10	124	20	123