Upsala J Med Sci 95: 229–232, 1990

Quality Specifications in Laboratory Medicine

C. G. Fraser

Department of Biochemical Medicine, Ninewells Hospital and Medical School, Dundee, Scotland

Since the aims of the NORDKEM project are:

I. to develop a practical procedure for assessing quality requirements,

II. to apply this procedure to a selected number of analytes (one at a time), and

III. to use the requirements in design of quality assurance procedures,

the real crux of the project is the delineation of numerical quality goals.

The project plans suggested that the first two steps in the definition of quality specifications are to:

I. appraise available formulae and then

II. apply these to calculate allowable limits of error. The next step would be to apply or develop other more sophisticated methods. The third step is the most exciting, in my view.

It may be relevant to consider that most of the available formulae have major disadvantages (1). Traditionally, goals have been based on:

I. fractions of the reference interval (Tonks' Rule),

II. the opinions of clinicians (Barnett's Medically Significant CV),

III. the state of the art,

IV. views of individuals and groups and

V. biological variation (Harris's Postulate).

The first two are very widely used to this day but,

I. reference values depend on performance characteristics, population studied and data reduction technique, and the fraction used is empirical, and

II. use of opinions of clinicians as to change satisfies only

0.50 of respondents, changes are due to pre-analytical and biological as well as analytical variation and the changes required are thought always to be necessary for $P < 0.05$.

In the past, we in Dundee have given much support to the postulate of Harris that $CV_{analytical} < 1/2\ CV_{biological}$.

The approach is simple to understand. Many data on within-subject biological variation are available. The estimates seem independent of age of subjects, number of subjects studied, geography, time scale of study, methodology and whether the subjects are healthy or have stable disease (2). The model seems applicable in haematology (3) and to generate a way of defining goals for therapeutic drug monitoring (8).

However, it has been more and more realized that the model has some disadvantages. Use of the fraction 1/2 is somewhat empirical and simply means that, if the goal is achieved, then 10% is added to test result variability due to analytical variability; this may be inappropriate in some clinical situations. Moreover, certain goals derived by strict use of the model are unattainable in correct practice and unlikely to be achievable in the near future.

Some new approaches would be advantageous.

In the last few years, further thoughts on defining quality goals have been published. These can be classified as:

I. repetitions of previous suggestions,
II. further empirical ideas, and
III. goals based upon clinical situations.

The third group includes suggestions made by the Nordic Group (5), Harris (4) and Ross (7). These are concerned with tests used for the monitoring of patients. It is generally agreed that this requires the most stringent analytical quality and, therefore, the strictest goals. The NORDKEM project clearly accepts the principle that the most demanding goal should be applied ubiquitously and this is to be commended.

It is considered that the approach proposed for the NORDKEM project is correct. The clinical approach should be used but with within-subject biological variation brought into consideration. The paper by Hyltoft Petersen et al (6) provides a model which is believed to be worthy of further study and emulation.

For some time, it has been suggested that goals should be

developed for performance characteristics other than imprecision and inaccuracy. The pressing need is for goals for detection limit, and the project may facilitate development of these using models similar to that described above.

The most difficult problem (but pressing need) is for us to be able to gain objective knowledge on clinical decision making in real medical situations. If such information was available, current theories and knowledge on analytical and variation are sufficient to enable relevant quality goals to be set. Then, appropriate quality assurance techniques could be invoked.

REFERENCES:

1. Fraser CG. Disirable performance standards for clinical chemistry tests. Adv Clin Chem 1983;23:299-339.
2. Fraser CG, Harris EK. Generation and application of data on biological variation in clinical chemistry. CRC Crit Revs Clin Lab Sci 1989; 27:409-437.
3. Fraser CG. Desirable performance standards for hematology tests: a proposal. Am J Clin Pathol 1987;88:667-669.
4. Harris EK. Proposed goals for analytical precision and accuracy in single-point testing; theoretical basis and comparison with data from the College of American Pathologists proficiency surreys. Arch Pathol Lab Med 1988;118:416-420.
5. Hørder M, Ed Assessing quality requirements in clinical chemistry. Scand J Clin Lab Invest 1980;40, Supplm 155.
6. Lytken Larsen M, Fraser CG, Hyltoft Petersen P. A comparison of analytical goals for Haemoglobin A_{1C} assays derived using different strategies. Ann Clin Biochem 1991 (in press).
7. Ross JW. A theoretical basis for clinically relevant proficiency testing limits. Arch Pathol Lab Med 1988;118: 421-434.

8. Stewart MJ and Fraser CG. Desirable performance standards for assays of drugs. Ann Clin Biochem 1989;26:220-226.

Correspondence:
Dr CG Fraser,
Department of Biochemical Medicine,
Ninewells Hospital and Medical School,
Dundee DD1 9SY, Scotland.