Summary of Workshop 5: Establishing Analytical Performance Goals

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Key Questions:

1) How are analytical performance goals established and evaluated for new technologies?
2) How should such goals be established and evaluated?

Presentations and discussions in the workshop on establishing analytic performance goals focused on answering the above two key questions.

To set the stage for discussion of the issues among the 23 workshop participants, Presentations were made by Drs. Callum Fraser, Jan Krouwer, Charles Handorf, and Derek Lehane. Dr. Fraser provided historical and international perspectives on analytical goals as well as a challenge to journal editors, industry, and external quality assurance organizers to be more active in disseminating analytical goals. The use of analytical goals by health industry manufacturers and the problems of developing and communicating goals between the industry and laboratorians was described by Dr. Krouwer. Dr. Krouwer emphasized the importance of metrics, measurement-based protocols, and reiterative processes for establishing, monitoring, and achieving analytical goals. Dr. Handorf discussed analytical goals within the context of the total health and medical management system, reviewed what our track record has been in the use of analytical goals, and provided a look forward at how analytical goals could be applied to newer technologies such as point-of-care and molecular pathology. Finally, Dr. Derek Lehane put analytical goals into a larger perspective--the perspective of the total testing process and the perspective of patient care. Opportunities to incorporate engineering and electronic information systems were highlighted and the need to merge assessment of analytical goals with clinical outcomes measures were highlighted by Dr. Lehane. Manuscripts from the four speakers are included within this chapter.

In response to *how are analytical performance goals established and evaluated for new technologies and how should analytical goals be established and evaluated,* the answer appears to depend on who is using the analytical goal and who is developing the analytical goal. Two major groups are certainly involved, laboratorians and instrument manufacturers, but clearly, there is at least one more.

Laboratorians, as reviewed by Dr. Fraser, have developed a wide variety of different strategies. At least 17 different strategies have been used in the last approximately 30 years. These strategies continue to change, continue to be improved, and continue to be honed. Laboratorians usually use the

coefficient of variation (CV) as the statistic of choice for a measure of the analytical goal with inaccuracy and imprecision as the parameters used to describe analytical goals. In some cases, for example, qualitative analyses, no goals exist whatsoever.

Analytical goals are developed entirely differently by manufacturers. There is some interest paid in using the clinical goals established by laboratorians, but regulatory and competitive needs are also very important to manufacturers in establishing goals. Manufacturers have internal specifications which include data and warranty claims and rely on a system of metrics, targets, protocols, and analyses to develop, implement, and monitor progress on the goals. Thus, the workshop concluded that laboratorians and manufacturers approach goals in entirely different ways.

A third group with a special role in analytical goal setting is the clinician group. Some in the workshop commented that clinicians don't actually set analytical goals and have not been as involved with others in setting them as is desirable.

How should analytical goals be established and evaluated? Again, laboratorians and instrument manufacturers do it two different ways. Laboratorians believe that analytical goals based on biology is best. For example, a CV, which is expressed in some fraction such as .5 of the biological CV, was described as an appropriate analytical goal for some scientists. Current consensus was that biology-based goals should be used by all. Some participants also pointed out that this consensus might, in fact, be geographic; that is, clearly in Europe a consensus exists, but in the United States we continue to refine goals that we've had.

Some laboratorians also mentioned that clinical goals should precede analytical goals--and that analytical goals should take into consideration other sources of data such as **quality** assurance, proficiency, and training. Pursuant to this point was some discussion about the merits of performing daily quality control when testing is conducted in non-traditional sites and when single use devices are employed. One person noted that in some of these situations, individuals performing quality control always obtained the same results. In those circumstances, continuing education about the importance of achieving the analytical goals may be helpful. One idea that emerged is that editors of Clinical Chemistry and similar journals, which provide reviews of emerging technology, should begin to require use of the analytical goal as part of their evaluation of new technology and either include this as part of the acceptance process.

Having manufacturers jointly establish their goals with laboratorians was an important theme emphasized not only by the manufacturers but also by the laboratorians. Manufacturers' goals should also be based on consideration of the total testing process and the implications of the errors throughout the total testing process--for instance, the use of bar coding may, in fact, address one of the major problems in defining a result from a laboratory test. An error in the bar coding step, the specimen identification step, certainly may be far greater than the error in the measurement step itself Additionally, clinical goals should be considered when manufacturers establish analytical goals.

Participants also stressed that the analytical goal should be included as part of the information management system and that (a) laboratorians evaluate the information and (b) present the information for clinicians incorporating the analytical goal within the

presentation.

The workshop participants suggested strategies and methods for developing and establishing analytical goals. One part of the discussion was the sense of urgency for having some carefully constructed research protocols. The remainder of the discussion centered more on a strategy for choosing analytical goals. For example, if goals based on biological variability are selected then there are some potential problems--in reviewing the literature some goals are too strict, others are insufficiently so. The need for a fall-back position for each and every procedure, that is, an alternative goal which could be used if a primary goal does not meet the required specifications, was suggested.

The analytical goals that are in place today are nearly entirely for quantitative tests. The workshop was essentially unanimous in believing that developing methods for determining analytical goals for non-numeric (qualitative) tests should be a very high priority. Examples of these situations are molecular biology testing where test results are reported as a "plus or a minus"-positive or negative--and for microbiology. One suggestion was that the measurable goal in these cases could be based on efficacy, but others expressed that clearly much more thinking on this needs to be done.

Two other issues that were raised within the workshop dealt with the roles of information systems and of quality management schemes in analytical goal development. A need for some demonstration projects indicating how systems might be developed to transfer information from peer to peer was suggested. With regard to quality management systems there was some discussion of quality management and how analytical goals fit into the quality management scheme, but no clear agreement about how to establish and measure quality management goals. Again, much more needs to be done in this arena.

There was a discussion that perhaps we needed some other alternative metrics on how to describe analytical goals. As an example, one manufacturer indicated using a metric called “capability indexes” in developing his goal within his company.

The workshop participants sought a definition of quality management for non-traditional testing, for example, point-of-care testing. What should the goals be" Should they be different from what they are in the clinical laboratory? Should they be tied to patient care? And how does one decide at those locations when enough is enough? Again, participants believed that practical clinical goals should be established for new technologies. There was a discussion about the interpretation of tests in relationship to clinical goals and a suggestion that diagnostic algorithms might be useful. A model suggested was measuring cardiac enzymes for acute myocardial infarction and evaluating the usefulness of analytical goals on a diagnostic algorithm.

While there is often concern about inability to meet analytical goals, there are tests and testing laboratories which find that they can exceed the goals, far surpassing the medical need. These are important opportunities for reducing costs in terms of reducing the frequency of quality control. Workshop participants recognized that decreasing the regulatory personnel standards introduced the potential for reducing testing quality. In some cases, laboratories which once met analytical goals now may no longer be able to achieve the

analytical goals if poorly trained and educated laboratorians are employed. Within the framework of the discussion about personnel concerns, one instrument manufacturer revealed that in the last few years they have found laboratory supervisors and directors unwilling or unable to send laboratory technologists for training on new equipment. In fact, there was great concern raised by instrument manufacturers and laboratorians that the changing quality of personnel might inadvertently influence the analytical goals that were established in the past. These goals may be remarkably different in the future.

The last segment of the workshop was spent addressing funding mechanisms, untapped data and information resources, and future collaborations. In seeking to identify who could be responsible for funding analytical goal research initiatives there were no new ideas. There was agreement, however, that new non-traditional sources of research funding are essential because of decreased resources among traditional providers and because of the need to include segments of the health care system (for example, managed care payers) who are buyers of laboratory services.

Data already collected on analytical performance by instrument manufacturers and by laboratorians appear to be rich ground for assessing the state of analytical goals and where the gaps exist. There were suggestions that scientific community should begin using the information, that manufacturers should start sharing this information with each other, and that large data bases could be assembled and shared not only among manufacturers but also among laboratorians and others involved in the collection of this data. Because much of the manufacturers' data are from clinical trials, it was felt that consensus should be sought on how to design and conduct clinical trials so that information was obtainable and analyzable in some fairly if uniform ways. Marked differences among how manufacturers currently approach clinical trials makes the linking of analytical goals to such things as receiver/operator curves almost impossible today.

In a discussion about what laboratorians should do in developing, implementing, and assessing analytical goals, some manufacturers felt that laboratorians haven't done their fair share. Moreover, instead of directing all of their attention to what else needs to be done, laboratory scientists need to begin to examine what is of little merit or value, that is, provides no benefit. In particular the laboratory community has been barraged with a large variety of different regulatory processes--some of questionable value. These must be re-evaluated and, if are found to have no value, we should to abandon them. Laboratory scientists, manufacturers, and users and purchasers of laboratory services should make their voice known so those responsible for developing regulations can hear the collective voice and can take appropriate action.

One important difference that was raised in the workshop was the markedly different approach that academicians and laboratorians used for establishing goals versus instrument manufacturers' approach of relying on market driven goals. There was some discussion that medically driven goals should replace market drive goals. Instrument manufacturers should no longer be looking at improving their penetration into a market by offering technologies that far exceed analytical goals as a way to give them a “leg up” on the competition, and laboratorians, as part of this process, should

say "enough is enough. We have enough precision, we have enough accuracy, and we are wil1ing to pay for the additional accuracy and precision."

A fair question to ask is "who cares about analytical goals?" After long discussion, workshop participants concluded that we all must care ... sometimes. Limiting focus to analytical goals may be directing attention to the wrong component of quality. Analytical goals should be based on other performance characteristics. So, the reason we must all care "sometimes" is that there are situations in which the analytical goals far exceed what is needed clinically. If a major error occurs in another process in the pre-analytical or post-analytical phase, then we should not be concerned about the analytical goal, but about the errors. Also, if tests are being performed that have little or no value in patient care, then analytical goals for those procedures are of limited value.

In closing, despite the lack of a consensus about analytical goals for laboratory procedures there was a sense that useful information was being provided. A slide which a manufacturer presented illustrating one way the industry established goals for its customers--laboratorians--stimulated thoughts about a paradigm for the future. Manufacturers give laboratorians choices. Among the choices are cost, sample volume, and precision (that is, the analytical goal). In a focus group format, laboratorians are then asked to choose which of the two they want. In the future, as the way laboratory medicine is practiced, as the way health care is delivered, and as health care reimbursement schemes evolve the laboratory community will be called upon to make more choices. In making good choices laboratory scientists should incorporate their unique expertise and knowledge about the components of quality in the testing system to derive reasonable, health- effective analytical goals.

In conclusion, another important discussion point raised was that despite having long analytical goals, we still can get the right answer. Again, I thank the participants and panelists who devoted exceedingly large amounts of their time to this topic.