Table 2 *Tests for* Helicobacter pylori

Test	*Sensitivity (%)*	*Specificity (%)*	*NND*
Chronic inflamation	100	66.3	1.51
Acute inflamation	86.7	93.7	1.24
Staining *H pylori*	93.1	99.4	1.08
CLO test	89.6	100	1.12
Urea breath test	90.2	95.3	1.16
Serum IgG antibodies	91.3	91.6	1.21
Serum IgA antibodies	71.1	89.8	1.64

presence of disease and gives a ready comparison between tests (table 2).

However, if cost data are available it is possible to ask questions about the value of biopsy and CLO test at, say, £170 versus an antibody test at £7 when the difference in NND is only 0.09. From this it may be calculated each positive diagnosis costs £190.40 with the former test and £8.50 with the latter. Where there are large differences in costs, the option of using the cheaper as a front line test and the more expensive as the back up may be considered. It is also possible to allow for other "quality" factors such as waiting times and patient acceptability,[10] both of which favour the non-invasive test with the only advantage of the invasive route being that Koch's postulates are more closely met and the possibility that "classic" peptic ulcer symptoms might mask an operable malignancy in a younger person.

Concluding comments

The concepts of evidence based practice are a stimulus to pathologists to:

- use criteria based on research evidence in their diagnostic work;
- apply research evidence in interpretation of laboratory data;
- find new ways of presenting findings to assist their fuller interpretation;
- use cost and NND to help develop rational approaches to testing strategies; and
- help clinical colleagues use research evidence with pathology diagnostic findings more effectively.

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Benefits and limitations of computerised laboratory data

Computers have been an integral part of laboratory life for many years. Their value is self evident—without them many laboratory functions could simply not be done.

Computer functions are not always completely understood by those who operate them, and errors may not be evident or easily detectable. In medical laboratory diagnosis this places a burden on those "in charge" that has service, legal, and ethical consequences. Errors may extend from the quality and accuracy of data, through the adequacy of data storage and processing, and the form of their presentation to peripheral users, to ensuring the availability of reports to those who need them,[1] as well as ensuring that they are not available to unauthorised users.

Direct benefits

Direct benefits encompass administrative elements such as accounting and ordering of material and equipment, as well as professional elements such as quality and extent of service. Much depends on the interests and imagination of the users and developers of the system. The integration of information systems at the Hadassah-University Hospitals in Jerusalem is a good example of microbiology, biochemistry, haematology, and pharmacy data being deployed together to provide relevant data for infectious disease consultants reviewing antimicrobial treatment in individual cases and tracking patients' movements between wards. Similar systems have been developed and applied elsewhere.[2–4] Many would agree that selective reporting of antibiotic sensitivity results,[5] easily achieved in a reasonable computerised system, has a contribution to make in promoting good treatment. "Flagging" selected pathogenic or drug resistant organisms[5] allows the timely alert of clinicians and other professionals, such as infection control personnel. Built-in checks for inconsistencies in data can go a long way towards reducing the task of those scrutinising results before their issue. The internet and world wide web are also being explored for their potential in conformity of reporting practices[6] and in developing more comprehensive clinical laboratory information systems.[7]

Indirect benefits

Indirect benefits may be no less important including monitoring trends of clinical or epidemiological problems, or even appropriateness and extent of laboratory use.[8] A good system would expedite notification of communicable diseases to health authorities.[9] Good in-house or commercially available systems will incorporate these capabilities, and more.

Limitations

LIMITATIONS INHERENTLY DETERMINED BY THE TYPE OF LABORATORY

While data captured on-line from automated tests can be stored and entered into patient records without any manual or subjective input from laboratory personnel, the situation in less automated settings, such as pathology or clinical

microbiology laboratories, is vastly different. Here, systems have to deal with a lot of verbiage and subjectiveness that may be saved and retrieved in the form of coded comments, which are relatively easy to handle and exploit. Free text, which is often used, is the bane of anyone using the database for assessing laboratory operations or for clinical research. Even "simple" data can pose significant problems for analysis—anyone who has tried to estimate antibiotic resistance rates will have had to contend with the issue of excluding identical isolates from individual patients. Do we exclude identical isolates from any anatomical site, or only those from the same site? Is "identical" defined by antibiograms, biotypes, or molecular characterisation?

LIMITATIONS INTRINSIC TO THE DESIGN AND CAPABILITIES OF THE COMPUTER SYSTEM

If a clinical microbiology computer system does not provide refinements such as selective reporting of antibiotic sensitivities or periodic reports allowing monitoring of sensitivity patterns, the limitations are evident, but will not dramatically affect patient care. If, however, the absence of a system of data quality assurance, such as logical checks, allows inaccurate information to enter reports, the potential for negative effects on patient care might be significant.

LIMITATIONS DETERMINED BY THE SOURCE AND NATURE OF THE DATA

Any system involving manual data input will be susceptible to errors that are essentially undetectable. If an S (sensitive) were entered erroneously instead of an R (resistant) on a microbiology worksheet, the error could only be identified by a computerised check if a definable inconsistency arises—for example, proteus sensitive to colistin. In many other cases, the S or R might be equally acceptable, so the computer and the scrutineer, who must approve the report, will be unable to detect the error.

Teamwork

A multidisciplinary team approach to developing in-house systems or evaluating commercial systems for purchase is required if all potential drawbacks and inadequacies are to be minimised and all potential benefits realised. This team is equally important in assessing the performance of a computerised information system after its introduction. No single professional will be able to deal with all aspects, especially where there is integration with other clinical and administrative systems.

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