Clinical value of microbiological investigations in general practice

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SUMMARY. The clinical value of many laboratory tests has frequently been queried. A short questionnaire was attached to individual microbiology reports issued to general practitioners in Bradford for an eight week period. Of the 2386 questionnaires sent out 1847 (77%) were returned. The general practitioners indicated that 34% of reports gave unexpected findings, 28% resulted in a change of therapy and most of the investigations (83%) were seen as beneficial to the patients. The majority of the specimens (56%) were mid-stream urine samples of which 77% gave negative findings.

This study indicates that conventional microbiology test results are more valuable in general practice than previous hospital based surveys might suggest. Alternative strategies for investigation to reduce the number of tests of low value are discussed.

Keywords: microbiological tests; hospital based diagnostic tests; diagnostic techniques; hospital utilization.

Introduction

THE use of pathology services is currently an area under intensive scrutiny. The number of requests from doctors has continued to grow in recent years despite suggestions that many laboratory investigations are inappropriate.[1-3] The reasons given for requesting laboratory tests are: to detect disease, to confirm or exclude diagnostic hypotheses, to estimate the prognosis and to monitor therapy.[4] The majority of commonly used tests are carried out for monitoring rather than diagnostic purposes.[4] General practitioners vary considerably in the demands they make on local pathology services.[1] It has been suggested that general practitioners 'use the laboratory as a comfort to provide clinical affirmation or as a soother to allay clinical anxieties. Traditional clinical training based on pathological medicine is inappropriate to the problem-based practice of medicine by GPs.'[5]

The clinical value of various microbiological investigations has been questioned by microbiologists.[6,7] Correlations between antibiotic sensitivity tests in the laboratory and clinical outcome are ill-defined for many common infections.[8,9] Hospital doctors often misinterpret microbiology reports and fail to prescribe appropriate antibiotics following the receipt of the results of culture and sensitivity to different antibiotics.[10,11] In one British study, hospital doctors were questioned about microbiology requests; one in five of all tests made no contribution to diagnosis, treatment or management and only 8.5% led to a change in therapy.[12] In addition to the unavoidable delays for the culture of micro-organisms, extra time is needed for the transport of the specimen to the laboratory and returning a written report to the sender.

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The purpose of this study was to estimate the value of written microbiology reports sent to general practitioners served by the laboratory at Bradford Royal Infirmary, one of two laboratories in the district. Requests from general practitioners represent 35% of the total received in the microbiology laboratory. A short questionnaire was attached to reports issued to general practitioners for an eight week period. The intention was to measure how often test results effected a change in patient management and for the general practitioners to estimate the value of the investigations at the time of receipt of the reports. As far as we are aware, no similar survey has been reported.

Method

A short questionnaire (Appendix 1) was attached to microbiology reports sent out to general practitioners by the microbiology laboratory at Bradford Royal Infirmary in the eight week period 13 August 1990 to 5 October 1990. Questionnaires were not attached to reports issued at weekends and to pregnancy test results. Patient details and the specimen category were completed on the questionnaire in the laboratory before the questionnaire was sent out, and each report was also classified as positive (pathogens isolated or identified by microscopy) or negative (no growth, no significant growth, normal flora, and so on). General practitioners were invited to complete the questionnaires and add comments. Batches of questionnaires were returned to the laboratory at the end of each week of the study period in A4 envelopes issued to all practices for this purpose; most practices used the hospital van service. The questionnaires were analysed by A-M S using a software package.

Results

Of 2386 questionnaires issued 1847 (77.4%) were returned. Many of the questionnaires were incomplete but all responses were included in the analysis. Many varied comments were received and sometimes it was indicated that none of the responses to a question was applicable for a particular report. This problem arose most frequently for the question concerning confirmation of diagnosis or an unexpected result.

Of the 13 categories of specimen the most common were mid-stream urine samples (56.4% of the total), vaginal swabs (17.9%) and faeces specimens (14.6%) (Table 1). The general practitioners indicated that 22.8% of the reports were from samples submitted for screening purposes and 76.2% from patients with suspected infections, with 19 reports (1.0%) not allocated to either group. Of the mid-stream urine samples allocated 31.2% were screening samples compared with 15.2% of faeces specimens and 10.9% of vaginal swabs.

Almost one third of the reports issued (31.8%) were classified by the laboratory as positive. Among the three specimen categories with most samples, the percentage of positive reports issued was much higher for vaginal swabs (47.4%) than for mid-stream urine samples (23.2%) or faeces specimens (24.9%). Furthermore, therapy was changed more often following the receipt of vaginal swab reports (39.9% of all reports) compared with those for mid-stream urine samples (22.8%) and faeces specimens (21.6%). However, vaginal swabs were perceived as no more beneficial to patients than investigations on urine or faeces — 83.7% of all reports concerning vaginal swabs were reported as beneficial compared with 82.8% for mid-stream urine

Table 1. Numbers of specimens in each category and responses to the questionnaire.

	Number of reports										
		Type of specimen		Type of report		Positive response to question					
Specimen category	Total	Routine/ screening samples	Suspected infection	Positive	Negative	Confirmed diagnosis	Unexpected result	No further action	Change in therapy[a]	Benefit to patient	No help to patient
MSU	1041	325	709	241	800	567	357	528	237	862	66
Vaginal swab	331	36	294	157	174	190	125	116	132	277	19
Faeces sample	269	41	221	67	202	142	78	131	58	226	13
Throat swab	33	6	27	11	22	19	11	21	5	29	1
Ear swab	32	1	31	29	3	24	7	8	21	28	2
Fungal culture	19	0	19	7	12	10	7	5	8	17	1
Wound swab	17	0	17	12	5	11	5	5	8	12	3
Ulcer swab	16	0	16	15	1	9	6	2	9	13	1
CSU	14	5	9	7	7	8	5	8	4	13	1
Eye swab	13	1	12	11	2	10	3	2	6	9	3
Cervical swab	10	1	9	3	7	2	4	9	1	7	2
Sputum sample	9	0	9	2	7	1	8	2	3	7	2
Other	43	5	34	25	18	26	13	17	16	37	2
All	1847	421	1407	587	1260	1019	629	854	508	1537	116

MSU = mid-stream specimen of urine. CSU = catheter specimen of urine. [a]Treatment was stopped, started or changed (total of positive responses to question 3b–d).

samples and 84.0% for faeces specimens.

Overall, 34.0% of the 1847 reports gave an unexpected result, 27.5% led to a change in therapy and 82.9% of the investigations were perceived as of some benefit to the patient.

The majority of catheter specimens of urine, ulcer swabs and wound swabs were seen by respondents as beneficial to the patient. Therapy was changed following the receipt of nine of the ulcer swab reports (therapy was started in seven cases and changed in two).

Unfortunately, the number of investigations for most of the specimen categories was too small for meaningful analysis of the responses observed, but the preponderance of sputum cultures giving unexpected results and the many ear swabs and few throat swabs leading to changes in therapy are results of interest.

In Table 2 the responses to the questionnaire are analysed first according to whether the specimen was obtained for screening purposes or from a patient with a suspected infection, and secondly comparing responses for positive and negative reports. Screening samples provided fewer unexpected results, fewer changes in therapy and were seen as less beneficial than specimens from patients with suspected infections. Not surprisingly, positive reports confirmed the diagnosis more often, resulted in more changes of therapy and were perceived as more beneficial than negative reports.

Discussion

In a Chicago hospital in the early 1970s positive results were obtained from 24.5% of specimens submitted for bacteriological culture and in 7% of cases a change in therapy followed the receipt of the report.[13] In a British study in five hospitals, 23% of reports were considered positive (and a further 10% equivocal) and 8.5% of reports contributed towards a change in therapy.[12] In this study 32% of reports were classified as positive and the general practitioners stated that 28% contributed towards a change in therapy, the most stringent criterion for the necessity of a test.[3] Screening samples were relatively uncommon (23%) compared with the British hospital survey where 35% were screening samples and a further 8% from patients with no obvious infection.[12] This suggests that general practitioners are more efficient users of microbiology services than hospital doctors. This is not unexpected as inexperienced physicians are more likely to over-utilize the laboratory for a variety of reasons.[4]

The vast majority of the screening or routine samples (95%) were mid-stream urine samples, faeces specimens or vaginal swabs. The reports were negative for 77% of all mid-stream urine samples and 75% of faeces specimens but for only 53% of tests on vaginal swabs. Screening samples and samples resulting in negative reports resulted in fewer changes in management and were perceived by general practitioners as less beneficial to the patients than samples from patients with suspected infections and those resulting in positive reports. Perhaps it would be possible for general practitioners to submit fewer of these lower value investigations to the laboratory.

Simple tests have been advocated for the diagnosis of urinary tract infection in general practice, without recourse to microscopy and culture performed in a laboratory. The methods include simple microscopy for pyuria and inspection of urine for turbidity combined with reagent strip testing.[14,15] Unfortunately, many of the studies comparing reagent strip testing with culture results have used the standard of 10^5 or more colonies of bacteria per ml to indicate infection and it is now recognized that lower numbers of bacteria may often be clinically significant.[15,16]

Table 2. Positive responses to questionnaire, according to type of sample and type of report.

Question	% of positive responses to question[a]			
	Routine/screening sample (n = 421)	Suspected infection (n = 1407)	Positive report (n = 587)	Negative report (n = 1260)
Confirmed diagnosis	*67.9*	*51.9*	*76.5*	*45.0*
Unexpected result	*11.9*	*41.1*	*20.8*	*40.2*
No further action	*58.2*	*44.1*	*23.2*	*57.9*
Treatment stopped	*2.6*	*5.0*	*1.9*	*5.6*
Treatment started	*8.6*	*18.8*	*46.3*	*2.3*
Treatment changed	*1.7*	*8.4*	*11.6*	*4.5*
Benefit to patient	*78.1*	*85.5*	*89.9*	*79.7*
No help to patient	*7.1*	*6.1*	*2.4*	*8.1*

n = total number of specimens. [a]Percentages do not total 100% as not all respondents selected the options on the questionnaire.

It may be preferable to use the best diagnostic methods, that is laboratory tests, on a smaller number of specimens following careful clinical assessment.[16–18] Many authorities now recommend a therapeutic trial of a short course of antibiotics for simple, uncomplicated urinary tract infection in women.[16,17] This obviates the requirement for any form of urine testing in the majority of cases. Full investigations may then be carried out on those patients who do not respond to treatment and those with 'complicated' infections, and reagent stick tests can be reserved for screening samples from asymptomatic individuals.[16,17,19]

The microbiological investigation of diarrhoea may not be considered justifiable in most individuals who will quickly recover without specific treatment and who do not pose a risk of infection to others.[20] Protocols for the selection of cases requiring investigation have been proposed.[20,21] However, the value to the community of the collection of data on intestinal pathogens for local and national epidemiological studies should not be underestimated.[1,20] For example, there is no specific treatment for cryptosporidiosis but recognition of water-borne outbreaks should occur more quickly when specimens from general practice are routinely examined for this parasite.[22] Laboratory reporting of intestinal pathogens supports the formal notification of food poisoning and it has been proposed that laboratories should notify the isolation of specific organisms.[23] Whether fundholding general practitioners will submit fewer 'non-essential' specimens, such as faeces, or be keener to define the cause of their patients' illness remains to be seen.

Specimens taken from a site normally colonized by a variety of bacterial species present difficulties for the laboratory staff.[6] Evaluation of the clinical significance of isolates is often impossible and it is surprising that the general practitioners in this study found the reports on catheter specimens of urine, ulcer swabs and wound swabs to be so valuable.

Simple, rapid tests are available which could enable the aetiology of vaginal discharge to be determined in the surgery, and appropriate treatment prescribed. Latex agglutination tests have been developed to detect *Candida* and *Trichomonas vaginalis* in vaginal swabs, with performance characteristics as good as existing diagnostic techniques.[24,25] Vaginal fluid with a raised pH (greater than five) is indicative of trichomoniasis or bacterial vaginosis and other simple tests aid the diagnosis of the latter condition.[26–28] However, most laboratories routinely examine all vaginal swabs for *Neisseria gonorrhoeae*, so a small number of cases of gonorrhoea would be missed if general practitioners relied on the above rapid tests carried out in the surgery.

In the past laboratory performance (workload statistics) has been based on the total number of investigations performed, whether simple and cheap or complicated and expensive, and microbiologists have been reluctant to discourage non-essential tests which often require less of the laboratory's limited resources. With the purchaser–provider split comes the promise of payment per item of costed service. Therefore, the financial disincentive on microbiologists to discourage non-essential requests should be removed, although small laboratories with decreasing numbers of requests may be closed as pathology services are rationalized.[1] Audit and fear of competition have now motivated laboratory managers to become aware of measures of quality of service such as turnaround times, and general practitioners should now be served by a more responsive local laboratory.[29]

Ideally, full cost–benefit analyses should be carried out before general practitioners decide to switch from conventional microbiology laboratory investigations to near patient testing procedures.[30] A more practical approach would involve general practitioners and their local microbiologists in joint discussions to establish the most appropriate arrangements for their particular area, taking into consideration laboratory practices, transport, computer facilities and so on.[31] Protocols may be developed and the laboratory should offer support for near patient testing with staff training and advice on quality control and safety, including procedures which involve handling infected material.[1,31,32]

The results of this study indicate that general practitioners are more efficient users of microbiology services than hospital doctors in other surveys, and that they considered that the microbiology investigations they had requested were beneficial to patients in most cases. With new technology general practitioners may be able to have the results of tests before starting treatment with antimicrobial agents and this should lead to improvements in patient care.[30] The provision of an efficient, local, culture and sensitivity service will still be required: for many infections no near patient tests are available, culture is often needed to identify a specific organism and/or confirm the results of a near patient test, and culture is required to enable antibiotic sensitivities to be carried out. No new technology is likely to circumvent this requirement in the near future. This study indicates that general practitioners are justified in continuing to make use of such a service. However, it should be possible to reduce the large number of lower-value negative tests by a combination of clinical judgement, protocols and the selective use of near patient tests.

Appendix 1. Questionnaire attached to microbiology reports.

1. Was the reason for this investigation:
a) Routine/screening sample?
b) Suspected infection?

2. From the report, did you get:
a) Confirmation of diagnosis?
b) An unexpected result?

3. Consequently:
a) No further action was taken or patient was not seen again.
Or because of the report, treatment was.
b) Stopped.
c) Started.
d) Changed.

4. In retrospect, was this investigation:
a) Of some benefit to the patient?
b) Of no help to the patient?

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