The Howie code: is the price of safety too high?

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SUMMARY *The code of practice for the prevention of infection in clinical laboratories and postmortem rooms (the "Howie code")* was produced in order to standardise laboratory safety procedures at a level which would minimise risks to laboratory workers. The costs of implementing this code, which were not given proper consideration when the code was drawn up, are seen to be very high. This paper questions whether the benefits of risk reduction resulting from the code can justify the high cost of its implementation.

Beginning with an examination of the incidence in recent years of laboratory-acquired infections, the paper looks at the perceptions of risk by laboratory workers and the feasibility of low cost alternatives to those of the Howie code. The potential benefits of the code are then viewed against the cost of upgrading the laboratories of two Scottish hospitals to Howie standards.

The fact of high costs relative to benefits reinforces the paper's call for the proper consideration of economic issues to be given at the development rather than the implementation stage of any regulatory codes.

Surveys of safety and health care in British medical laboratories^{1,2} found the incidence of particular infections to be higher among laboratory workers than in the general population, and called for the establishment of regulations for codes of safe practice in clinical laboratories. The well publicised outbreaks of hepatitis in Edinburgh (1969-70) and of smallpox in London (1973) put the Department of Health and Social Security (DHSS) under considerable pressure to produce such a code. The resulting *Code of practice for the prevention of infection in clinical laboratories and postmortem rooms*,³ known as the Howie code, has been subject to considerable criticism since its publication in 1978. This has normally been a form suggesting that the regulations involve costs and inconvenience not commensurate with the risks involved.

The code classifies micro-organisms, viruses and materials into four categories (A, B1, B2, and C) according to different levels of hazard, A being the highest and C lowest, with safety precautions specified for each. Category A pathogens were dealt with in more detail by the Godber Committee;⁴ Howie's main emphasis is on the other three. Materials known to contain hepatitis B virus are placed in

category B1, while those known to contain or suspected of containing hepatitis B surface antigen (HBsAg), including all specimens from "at risk" groups, are placed in category B2. These classifications and the associated safety standards, are considered by many to be unnecessary.⁵⁻¹¹ Soon after the publication of the Howie code, a paper prepared by the Joint Working Party of the Association of Clinical Biochemists, Association of Clinical Pathologists, Institute of Medical Laboratory Sciences, and Royal College of Pathologists, presented a case for downgrading those hepatitis specimens in category B2 to category C.¹² The trade union representing most laboratory workers, the Association of Scientific, Technical and Managerial Staffs (ASTMS), immediately protested against such a move.¹³ The controversy on this issue stands at the forefront of discussions surrounding the Howie report.

The main objective of this paper is to highlight the need for an economic appraisal to be conducted concurrently with the formulation of any code of practice; in other words that economic appraisal should be part of the input involved in determining what that code should be. The incidence of infection among laboratory staff is discussed, followed by an examination of the different perceptions of risk by those who face them directly, and by those who finance the safety measures. A discussion of alterna-

tives to a code of practice is followed by an estimation of the costs which would be incurred at two Scottish hospitals if the Howie code were implemented at its most rigid (and expensive) interpretation.

Incidence

A relevant starting point to this discussion is the fact that the pattern of sickness absence and accidents among clinical laboratory workers is not dissimilar to that of the general working population, and is lower than that for many major employers including the Post Office and London Transport.¹⁴ Clinical laboratories cannot, therefore, be described as particularly "dangerous" places to work, although surveys have shown that the incidence of particular diseases is higher among laboratory staff than in the general population.¹² It is a reduction in the incidence of these which is the aim of the Howie code.

This paper places emphasis on the hepatitis B issue, as this has been the main area of contention surrounding the code. It must be borne in mind, however, that the benefits associated with higher safety standards are not limited to those arising from the reduced risk of infection with hepatitis B. Table 1 shows the 1979 incidence of other infections among laboratory staff, all of which can be reduced through higher safety standards. The incidence of hepatitis B among laboratory staff since 1970 is presented in Table 2. The figures published in the *Communicable Disease Reports*²⁰ are generally in line with these, and confirm the dramatic post-1974 decline.

Several criticisms can be made of the figures of Table 2, which were determined by responses to a questionnaire sent to members of the Association of Clinical Pathologists (ACP). As there may be laboratories with no ACP staff members it is possible that some were omitted.²¹ Moreover, the accuracy of surveys by postal questionnaire has been strongly challenged.²² Though under-reporting is considered unlikely, partly because hepatitis B is a prescribed industrial disease⁵ and more generally because of the "positive interest of members in the survey and its trend,"²¹ ASTMS have argued that the figures are "misleading" as they include only cases confirmed by antibody tests, which in some years were not fully carried out.¹³

Recent work has shown that many infections could not be attributed to exposure at work¹⁹ and it has been suggested that laboratory staff are probably at greater risk of infection in the hospital canteen²³ or the holiday resort⁵ than they are in the laboratory. The figures of Table 2 must therefore be interpreted as "incidence" and *not* as laboratory-acquired infection.

A problem can only be said to exist if the laboratory rates are shown to be higher than those of the general population. Both Harrington and Shannon² and Grist¹⁹ have warned against comparison of their results with any figures for the general population owing to the severe under-reporting expected for the latter. However, the attack rate for bench workers was consistently higher than that for other laboratory staff who are included in the "at risk" figures but who do not regularly come in direct contact with specimens or patients.²¹

Table 1 Cases and attack rates of various infections in laboratory staff, 1979¹⁵

Population*	No of infections reported (attack rates† in parentheses)				
	Hepatitis A	Tuberculosis	Chicken pox	Salmonellosis and shigellosis	Malaria
11 974	1 (8)	5 (42)	4 (33)	4 (33)	1 (8)

*Includes porters, domestic, office and ancillary staff.

†Per 100 000 person years. Person year = $\frac{2}{3} \Sigma$ (full time + part time/2)

Table 2 Incidence of hepatitis B infection among laboratory staff¹⁵⁻¹⁹

Year	Cases	Est No at risk*	Attack rate per 100 000 person-years
70-72	17	36 893	46
73-74	14	22 243	63
75-76	3	23 142	13
77-78	6	27 175	22
79	0	11 974	0

*Person year = $\frac{2}{3} \Sigma$ (full time + part time/2). Prior to 1973 part-time staff not distinguished from full-time staff.

The first period covers three years, the second to fifth periods cover two years each, and the final period covers one year.

It is difficult from this discussion to draw firm conclusions about the risks of hepatitis B infection faced by laboratory staff. Laboratory bench workers appear to face increased risks. Despite the current zero incidence it would be wrong to disregard these risks. Nevertheless, there is clearly a need to keep the size of the problem in perspective.

Value of risk reduction

Risk levels can be determined objectively from incidence rates. The *values* attached to any reductions in risk levels, however, will always be subjective and will vary depending on the circumstances surrounding the individuals who consider them. These values are not directly proportional to the associated probabilities, and have been shown to depend on several recognised factors,²⁴ including the degree of freedom afforded an individual in choosing to accept the risk. It has been estimated that people will accept voluntary risks 1000 times greater than risks imposed on them.²⁵ While laboratory workers are, of course, free to change their occupation, or demand a risk premium,²⁶ reality tends to make the occupational risk levels faced feel "imposed." It is not surprising, therefore, that "there will always be an irreconcilable difference between the perceptions of what is an acceptable risk by those who are exposed directly to the danger and those who are not."²⁷ The question then becomes: *whose* values ought to determine safety policy?

The ASTMS have argued that though the costs of safety cannot be ignored, it is "unacceptable" to expose laboratory staff to the risks of hepatitis when there are means available to reduce them.¹³ Despite the lip service paid to costs, the clear implication is that standards ought to be set independently of resource considerations. With a growing awareness of the scarcity of resources relative to the claims made on them, it is perhaps surprising that the ASTMS view was precisely the one adopted by the working party that produced the Howie code. "No one said to the Howie working party . . . that recommendations or procedures that might cost money should be omitted. Therefore, the authors . . . should not be blamed if they ignored 'resource allocation.'"²⁸

Resource allocation, however, is not something that can be ignored. While resources are finite, the demands on them are apparently infinite. The allocation of limited resources among competing claims should be based on some rational judgement of where they are likely to produce the greatest benefit. This is particularly relevant to the present discussion, as there is to be no additional central funding for improvements of laboratories to Howie stan-

dards. All expenditure must therefore come from existing budgets. If the persistent pleas of economists at least to view the problem in a cost-benefit framework are ignored, then the most efficient use of resources will not be possible.

Alternatives to a code of practice

While cost-benefit analysis can determine whether a course of action is economically justified, there is another method of economic appraisal, called cost-effectiveness analysis, which can find the economically preferred alternative to achieving a particular end, given an *a priori* decision that the end is worth pursuing. One major alternative to a code of practice is the provision of information aimed at increasing the use of "common sense" safety precautions such as avoiding use of mouth pipettes or not eating lunch at the work bench.

There is a belief that the greater the awareness by laboratory staff of the hazardous nature of the materials they handle, the greater will be the degree of diligence applied to "common sense" precautions, and as a result, the lower will be the number of laboratory-acquired infections.^{5 9 11 12} This belief arises because of the dramatic fall in laboratory infections in the mid-1970s which, it is thought, resulted from increased awareness of risk after the London smallpox and Edinburgh hepatitis incidents.^{5 10 11} aided by increased provision of literature on procedures which minimise the dangers of infection.^{27 29 30} These procedures can be so effective that two members of the working party which produced the Howie code believe that the 1974 Public Health report²⁹ showed how "simple but effective precautions could almost entirely remove the hepatitis risk."¹¹ It seems likely therefore, that education, perhaps coupled with more strictly enforced regulations by safety officers, may prove to be an effective method of risk reduction at a far lower cost than the Howie code.^{7 28 31}

Another alternative to a code of practice is a concentration of effort and resources to "raising the standards of technique and accommodation in those places where it is at low ebb."⁵ Such an approach can be justified on equity grounds as it will result in a more equal distribution of risks. It may also prove to be an economically *efficient* method of resource allocation, if it can be shown that the effectiveness, in terms of reducing the risk for higher risk laboratories, is greater and/or because the value attached to reducing higher risks is greater.

A code of practice may also be justified on equity grounds; but many laboratories which are low-risk due to staff diligence and common sense will be required by the code to undertake expensive

improvements which may only have a very small, if any, effect on their risk levels.

Costs of implementing the Howie recommendations

This section estimates the costs of bringing the clinical laboratories of two Aberdeen hospitals to full Howie standards. While these estimates are crude, they allow a comparison of numerical cost value with the benefit of Howie, however perceived.

It is not yet known how representative these costs are of laboratories in the UK generally. It is essen-

tial to emphasise, however, that the existing risk levels in Aberdeen hospital laboratories are *not* the determining factor of these costs. Rather, they are based solely on the difference between the code's specification and the current situation regarding layout and equipment. The estimates are crude for the following reasons:

- 1 The Howie code will, in many instances, act as the catalyst to improvements which were planned or designed anyway. In these cases, though the improvements may not have been realised without the code, it is misleading to label these

Table 3 *Costs of raising laboratories to Howie standards (at 1979 prices)*

<i>Aberdeen Royal Infirmary</i>			£
<i>Non-equipment costs</i>			
Bacteriology	building alterations (BA)		14 575
	work associated with biological cabinets (WBC)		44 920
Pathology	BA		12 195
	WBC		31 880
Chemical Pathology	BA		13 400
	WBC		19 970
Shared costs	heating installation, etc		14 950
	autoclave facilities		2000
Total, approximately			170 000
<i>Equipment costs</i>			
Bacteriology	cabinets		14 910
	centrifuges		8000
	miscellaneous		10 000
Pathology	cabinets		10 650
	centrifuges		3400
	miscellaneous		10 000
Chemical Pathology	cabinets		8520
	centrifuges		7300
Shared costs	miscellaneous		14 500
	autoclave		40 000
Total, approximately			130 000
Total approximate cost of upgrading Aberdeen Royal Infirmary's laboratories = £300 000			
<i>City Hospital</i>			£
<i>Non-equipment costs</i>			
Main laboratory	building alterations (BA)		60 300
	electrical installation (EI)		12 600
	heating and ventilation installation (HV)		27 900
Biochemistry	BA		5000
	EI		1500
	HV		8500
Shared costs	furniture and fees		15 000
	toilets and changing space		3000
Total, approximately			135 000
<i>Equipment costs</i>			
Main laboratory	cabinets		5400
	centrifuges		10 200
	autoclaves		20 200
Biochemistry	cabinets		4400
	centrifuges		5800
	miscellaneous		4500
Total, approximately			50 000
Total approximate cost of upgrading City Hospital's laboratories = £185 000			

costs as "costs of Howie."

- 2 Since the Howie code is not specific in the application of many recommendations, different interpretations can change cost estimates dramatically. The figures of Table 3 always assume the most rigorous interpretation and *must therefore be regarded as maxima*.
- 3 The status of hepatitis B has not yet been finalised. Table 3 shows the costs with hepatitis B as a category B pathogen, as is currently specified in the code. It is estimated that these figures will be halved if hepatitis B is placed in category C. This highlights the need for economic considerations at the development stage of any code.

Given the above, the following cost estimates are presented for two Aberdeen hospitals. All figures are in 1979 prices (excluding VAT). Total figures do not include such running costs as higher electricity costs from operating new equipment, or disposable specimen bags. Additionally it is assumed here, for simplicity, that all equipment life is equal to the life of the laboratory, again resulting in an underestimate of the costs. However, the figures of Table 3 are more than adequate to give examples of the cost of Howie in two situations.

Conclusions

The upgrading of all clinical laboratories to Howie standards would undoubtedly reduce the risks of infection to laboratory workers. This, however, is insufficient reason in itself to implement the code. The relevant questions which must first be answered are:

- 1 what are the existing risks facing laboratory workers?
- 2 what would be the benefits of reducing these risks?
- 3 what is the cost of achieving this reduction by this particular recommendation?
- 4 are there alternative methods of achieving an equal risk reduction at lesser expenditure?

This paper has shown that (i) recent incidence of laboratory-acquired hepatitis B infection has been very low, implying that existing standards can reasonably deal with existing risks. This is not to suggest that improved safety standards should be discouraged but that the rewards to any expenditure on safety must be viewed relative to the costs; (ii) the benefits of reducing the risk of hepatitis B infection will be small, given the low incidence level. To this, must be added the benefits of reducing the risk of other laboratory infections; (iii) the cost of implementing this code will vary between laboratories, but could be prohibitive for some. The total for two Aberdeen hospitals alone could be as

high as half a million pounds; (iv) there are known alternative measures of safety which could reduce risk at very little cost.

Though this paper does not attempt to present a comprehensive cost-benefit analysis there are clear indications that the Howie code cannot be vindicated on economic grounds. It is not known how the code would have fared in such an analysis if the hepatitis issue (and particularly HBsAg) were treated as a separate item. The conclusions above would certainly not have been as clear.

The controversy which surrounds this code would have been reduced markedly had economic considerations been adequately examined at the planning stages of the code. Resources are finite and, given the alternative uses to which the resources tied up in implementing Howie might be put, it is clear that the optimum level of risk is not zero. The level of safety chosen ought to be decided on the basis of weighing costs against benefits. This Howie failed to do.

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Any errors are my own as are the opinions expressed which do not necessarily reflect those of Aberdeen University or Grampian Health Board.

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