heart failure.[26] Although the central haemodynamics remained unchanged, the training improved exercise performance, systemic arteriovenous oxygen difference, and leg blood flow on exercise, and resulted in reduced arterial and femoral venous lactate concentrations. Thus exercise training may delay the onset of anaerobic metabolism and facilitate more efficient peripheral oxygen extraction.

Nevertheless, the only longer term solution for most patients with cardiac cachexia remains transplantation, after which the tissue wasting and abnormal protein turnover can be reversed.[27] Reversal occurs through correcting peripheral oxygenation as a result of correcting systemic hypoxaemia, increased activity and exercise, and improved substrate availability with an improved diet and assimilation of nutrients. The results of further research, however, into the mechanisms of cardiac cachexia and their reversal with treatment are awaited.

W L MORRISON
Senior Registrar in Cardiology

R H T EDWARDS
Professor of Medicine

Cardiothoracic Centre,
Broadgreen Hospital,
Liverpool L14 3LB

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Good surveys guide

Go for small random samples with high response rates

Most surveys are cross sectional studies that set out to ascertain the prevalence of a condition or look for associations. Their design and analysis may be complex, requiring professional help, but there are some general principles that should be understood by everyone using surveys, whether as originator or consumer of results.

In any research the two enemies of sound conclusions are imprecision and bias. In surveys imprecision may result from not asking precise enough questions but usually results from taking too small a sample from the population of interest. The uncertainty in estimates of prevalence depends on the number studied rather than the proportion of the population from which the sample comes. For example, if a prevalence of 20% is found with a sample of 50 then the uncertainty (95% confidence interval) for the prevalence is about 10% to 34%. With a sample of 100 the interval is 13% to 29%, and with a sample of 1000 it is 17·5% to 22·5%. Obtaining as large a sample as possible is therefore desirable, though the cost and benefit of this will need to be examined carefully.

The two main sources of bias in surveys arise from selection of the sample and non-response. The only way to eliminate bias from selection of samples is to take a random sample in which every individual in the survey has the same chance of inclusion as every other. This is the technical meaning of "random," which is not the same as "haphazard." The only way to ensure that a response is unbiased is to obtain a 100% response rate, but this is impossible in practice.

Non-response can destroy the advantages of a random sample. Suppose that 50% of the total "population" of 2000 surgeons like the new format of a journal. A survey that attempts to obtain answers from all of them has a 30% response rate from the half in favour and a 40% response rate from those who dislike it. (Such a disparity is less than might occur in practice.) The apparent result is that 300 of the 700 (43%) approve (95% confidence interval 39·0% to 46·6%). The true prevalence of approval is not only underestimated but also lies outside the apparent confidence interval. Had a random sample of 400 of the surgeons been studied intensively to improve the total response rate to 95%, the approval rate would then be estimated as say 180 out of 380 (47%; with 95% confidence interval 42% to 52%). Even if the 5% who did not reply were all of one opinion, this approach would lead to a more nearly "correct" answer. The confidence interval is wider but more reliable.

A special problem of association may occur in a survey of a selected subgroup that is unrepresentative of the population, such as patients in hospital. This may result in a spurious association known as "Berkson's fallacy."[1] For example, based on necropsy findings a negative relation was reported between tuberculosis and cancer, which led to patients with cancer being treated with active tuberculosis. This came about because hospital patients on whom necropsies had been performed were unrepresentative of the population. Statistical significance in such circumstances will be nonsense; sample size cannot compensate for bias.

One way of assessing the sensitivity of a study to possible bias from non-responders is to assume very extreme responses from them (in more than one direction), which indicates the uncertainty in the estimate of prevalence caused by a response of less than 100%. This estimation of bias is much more difficult to justify when examining relations between two or more variables. The need for obtaining high (>80%) response rates is therefore obvious.

Sometimes samples with low response rates are valuable. When the result shows, for example, the existence of a problem such as violence in general practice (p 329),[2] this may of itself be important and the possibility of bias cannot remove the impact of the actual numbers found. Indeed, Hobbs was able to put a lower bound on the prevalence of violence by assuming an extreme bias among the non-responders, but even this lower bound pointed to the problem being real. Similarly, a non-random sample need not totally invalidate a survey, but such studies should not then be used to estimate prevalence or to examine associations between variables.

Using available resources to take a random sample and then pursuing these chosen subjects intensively with repeat letters, telephone calls, and so on to obtain a high response rate is preferable to dissipating resources in mass mailings. When this is impossible the estimation of bias should be made pessimistically, so that misleading conclusions are not drawn. Small random samples with high response rates are more valuable than large non-random samples or those with low response rates.

S J W EVANS

Professor of Medical Statistics,
London Hospital Medical College,
Queen Mary and Westfield College Campus,
London E1 4NS

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Laparoscopic cholecystectomy

Better for patients and the health service

Laparoscopic cholecystectomy is less painful, has a better cosmetic result, and is no more risky than open operation. Moreover, patients need stay in hospital for only one or two days. These are the claims: Are they justified?

The procedure is carried out with the laparoscope fitted with a colour television camera, which provides a colour picture on two monitors with resolution down to 1-2 mm. The gall bladder is held and dissected with grasping forceps introduced through the right flank and a diathermy probe inserted through the epigastrium just by the side of the xiphisternum. The cystic duct and artery are secured with titanium clips and the gall bladder removed through the umbilical incision. The three (or sometimes four) small punctures in the abdomen are then closed with adhesive strips—without skin sutures. The procedure is much less painful than when an incision is employed with the open operation. Two weeks later it is difficult to see that an operation has been done at all.

In 1977 the average length of stay for "operations on the gall bladder" was 14·5 days.[1] By 1990 this had fallen to 4·9 days in the United States (K S Fisher *et al*, poster at clinical congress of the American College of Surgeons, 1990), and is similar in Britain though there is a wide variation among hospitals.[2] The average length of stay after endoscopic cholecystectomy in more than 1000 procedures was 1·9 days (K S Fisher *et al*, poster at clinical congress of the American College of Surgeons, 1990).

Evidence on the risks and morbidity is anecdotal. Certainly there have been instances of haemorrhage that have required open laparotomy to control. The common bile duct has been damaged and even the portal vein entered. The closure of the cystic duct has given way and biliary peritonitis has occurred. Clearly there will be a learning curve during which complications are bound to occur, as there is for surgeons learning the open procedure. Because the modern television monitor systems are so good it has been argued that the dissection required is more accurate and therefore capable of yielding better results.

In most centres the open operation is accompanied by cholangiography; although some carry this out with the laparoscopic method, most do not. Preoperative ultrasonographic assessment of hepatic duct dilatation is therefore important, and ready availability of endoscopic retrograde cholangiopancreatography and sphincterotomy for the stone lodged in the common bile duct is essential.

Experience with laparoscopy, long an essential component of the training of abdominal surgeons, is an advantage, but the basic techniques are not difficult to acquire, and training courses are being set up all over the Western world. Although skill with laparoscopy is useful, experience of biliary surgery and open cholecystectomy is probably more important. As with any new technique, different methods are being described.[3] For example, should diathermy alone be used or should it be combined with the laser? Diathermy is cheaper and universally available, but the laser may be quicker for removing the gall bladder from its bed.

An indication of the interest in this technique is the difficulty of acquiring some of the instruments because those available have been snapped up, and there may be a three to six month wait for supplies. Scenting the demand, the surgical instrument industry is responding, and, with characteristic flair, American Autosuture has produced a totally disposable kit—at a price.

There are, of course, dangers, and one is that the procedure will be taken up by enthusiastic surgeons who may cause severe biliary damage through lack of training. Also, this is a procedure that probably should be carried out in hospitals where adequate facilities, such as endoscopic retrograde cholangiopancreatography, are available. There is a more subtle danger, however, that as the operation is much less disturbing to the patient the mere finding of gall stones may become regarded as an indication for operation. In many if not most cases stones are not and never will be associated with complications, and therefore too many patients may be persuaded to part with their gall bladders.

Because of the scale of the problem represented by gall stones it is natural that other methods of treatment should have been developed. For example, gall stones have been dissolved with chenodeoxycholic acid or ursodeoxycholic acid or with other solvents introduced directly into the gall