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A health promotion audit methodology based on repeated assessments of absolute risk

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ABSTRACT

The standard methodology for auditing cardiovascular health promotion activities in general practice documents changes in the proportion of patients for whom risk factor status is recorded. These risk factors data also provide a measure of absolute risk.

This study piloted an audit methodology that assesses the effect of cardiovascular health promotion on the cumulated absolute risk of a general practice population. It was a retrospective cohort study that involved inspection of general practice records to determine the recorded cardiovascular risk factors of male patients aged 46-57 at six three-monthly intervals from 31 January 1997 to 30 April 1998.

Over the study period there was a marked improvement in the recording of risk factors, but no change in the number of coronary heart disease deaths expected to occur in the study cohort.

INTRODUCTION

This research project arose from the dissatisfaction of one of us (RMC) with the rising dogma that, in the course of a normal consultation, a “good” GP has time to: deal with the presenting complaint; stop patients smoking; start them exercising; change their diet; teach methods of coping with stress; modify their alcohol intake; screen them for gambling addiction and for cervical, breast, bowel, skin and prostate cancers; and manage the Government’s spending on health.

McWhinney1 reinforces this when he states: “The family physician sees every contact with his patients as an opportunity for prevention or health education.” There is truth in this claim, but perhaps it should be qualified by adding “as long as these benefit the patient”. This invites the question, “do patients benefit by health promotion activities in general practice?”

The Royal Australian College of General Practitioners has produced its "green book".2 This is based on the notion that health promotion and disease prevention are worthwhile practice activities.

Yet, in the case of coronary heart disease (CHD), there is no consensus as to the role, if any, of GPs in primary and secondary prevention. There are at least three evidence-based positions corresponding to an emphasis on primary, secondary or tertiary prevention. One, supported by computer modelling,3 asserts that most of the decline in CHD from 1980 -1990 occurred in people with established disease. The inference is that primary and secondary prevention are of less importance.

Another approach4 is to focus on high risk individuals. The third recommends education and risk factor modification across a wide range of ages and risk factor levels, eg, a New England Journal of Medicine editorial5 argued that, as atherosclerotic changes are seen at autopsy in adolescents, high risk young adults should be targeted.
Coexisting with the argument about which of primary, secondary, or tertiary prevention is most important is another dispute, also based on evidence, as to whether prevention is better achieved by face to face methods or by public health initiatives that attempt, eg, to reduce dietary salt and fat intake or to reduce the incidence of smoking by legislative and fiscal measures.

The systematic review by Ebrahim and Davey Smith6 concluded that counselling and education were more effective in high risk, hypertensive populations. In the general population "health protection through fiscal measures may be more effective".

In the area of CHD prevention, standard audit methodology does not measure the benefits to patients of health promotion activities undertaken in general practice. Rather, it measures whether or not data are recorded. This is an audit of process and there is an implicit acceptance that GPs who measure blood pressure or cholesterol levels or who ask about smoking are more likely to reduce these risk factors in their patients. This claim, although intuitively appealing, is untested.

Decision making at general practice level about the level of resources to devote to health promotion and cardiovascular disease prevention would be enhanced if there were a reliable, valid method to evaluate the outcome, at the level of a single practice, of such endeavours.

This paper introduces an audit methodology that may be useful in measuring outcomes (based on absolute risk) at the single practice level. A point estimate of this, together with upper and lower bounds, is made from a table of absolute risks. These three measures are each summed over the patients in the sample. This process is repeated at regular intervals and the sums plotted on a control chart or charts.

Control charts are the key tool of statistical process control. The techniques for their construction and analysis were first developed by Shewhart.7 He was concerned with controlling the variation in manufacturing processes. They can be used to detect a change in the mean of a process. Joiner,8 in a modern treatment of control charts, sets five successive increases or decreases as statistically significant evidence of change.

METHOD

A retrospective cohort study design was used for this project. Subjects were identified using the computerised age-sex register of a single general practice to generate a list of regular male patients who were aged 46-57 for the entire period 31/1/97 to 30/4/98. Their birth dates were from 1/5/40 to 31/1/51. This printout also recorded the date the patient had last been seen. Patients who had not been seen since 30/4/96 were excluded as there had been no opportunity to record risk factors during the study period so measurements of blood pressure and smoking status that "expired" during the study period could not have been repeated.

There were 47 patients fitting these criteria. Two were excluded because they had not been seen at the practice before the beginning of the study period (31 Jan 1997) and five because they had a confirmed diagnosis of coronary heart disease (pain plus enzyme, ECG or angiogram evidence). These five were excluded because the MRFIT study9 (Multiple Risk Factor Intervention Trial) excluded them.

The sample frame for this study comprised 40 regular patients born between 1 May 1940 and 31 Jan 1951 who were first seen at the practice before 31 Jan 1997 and last seen after 30/4/96 and who did not have a confirmed diagnosis of coronary heart disease by 30/4/98.

TABLE 1: NUMBER OF THE SAMPLE WITH INDIVIDUAL RISK FACTOR DATA RECORDED

Audit date	BP	Smoking	Cholesterol
31 Jan 1997	16	4	14
30 April 1997	16	4	15
31 July 1997	17	5	16
31 Oct 1997	18	5	16
31 Jan 1998	23	13	22
30 April 1998	25	16	23

The sample of 30 was randomly selected from these 40 without replacement by use of a random number generator. The sample size had been chosen before data collection commenced. A solo GP can expect to have 30 male patients aged 46-57 without a diagnosis of coronary heart disease.

The notes of these men were inspected in May 1998 and all records of blood pressure and smoking status from 31/1/95 were entered onto a data collection sheet as were all serum cholesterol measurements from 31 Jan 1993. This was done by one of us (RMC) and the records were not examined independently. This data collection sheet was used as the basis of six retrospective “audits”, imagined to have taken place on 31/1/97, 30/4/97, 31/7/97, 31/10/97, 31/1/98 and 30/4/98. Risk factor measurements were used if they had been made within the previous two years for smoking and blood pressure (five years for serum cholesterol).

The number (percentage) of patients with each risk factor and risk factor combination at each of the dates was tabulated.

A spreadsheet programme (Excel) was used to enter, for each subject, his six-year absolute risk of CHD death, using MRFIT data for participiants aged 46-57.9 Missing risk factor data were used to generate maximum and minimum estimates of this risk.

The MRFIT mortality data for those being screened provide 50 risk factor combination categories. Five rows each correspond to a serum cholesterol range. Five columns each correspond to a range of diastolic blood pressure. Within each of these 25 cells are two risk factor values, for smokers and non-smokers. When data were missing the estimate of absolute risk was the row or column average for the known risk factors. The “maximum” was the maximum possible risk consistent with the known risk factors. The “minimum” was the minimum risk consistent with the known risk factors.

The expected number of CHD deaths in the next six years in members of the sample cohort was calculated retrospectively six times, corresponding to the information in the subject’s notes on 31/1/97, 30/4/97, 31/7/97, 31/10/97, 31/1/98 and 30/4/98.

The expected number, and upper and lower bounds of this estimate, were calculated by summing the absolute risk and maximum and minimum estimates obtained for each member of the cohort.

RESULTS

Figure 1 records the results of the six “absolute risk” audits performed retrospectively and simultaneously in May 1998. The first of these used data recorded in the patients’ notes at 31 Jan 1997. Subsequent audit dates were three months apart. The sixth and final audit date was 30 April 1998.
The average “sum of risks” for the six audits was 0.366.

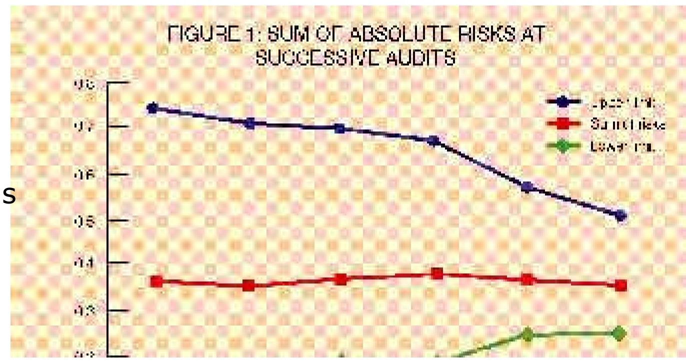
FIGURE 1: SUM OF ABSOLUTE RISKS AT SUCCESSIVE AUDITS

There was some vacillation around this mean. The six sums were 0.366, 0.357, 0.374, 0.379, 0.368, and 0.355 There is no evidence of any change in the sum of the individual risks (the expected number of CHD deaths within six years in the sample) in the 15 months from 31 Jan 1997.

There is a narrowing of the range (maximum – minimum) of the absolute risks with five successive reductions in the maximum.

In Table 1 the proportion of patients in whom each risk factor had been measured and noted is recorded.
Table 2 records the proportion of patients in whom all three risk factors were noted, or only two, just one, or none at all.

Tables 1 and 2 demonstrate a marked improvement in the measurement and recording of these cardiovascular risk factors over the 15 months.

DISCUSSION

TABLE 2: NUMBER OF THE SAMPLE WITH MULTIPLE RISK FACTORS RECORDED

Audit date	All three	Only two	Only one	None
31 JAN 1997	1	12	6	11
30 APRIL 1997	1	13	5	11
31 JULY 1997	2	13	6	9
31 OCT 1997	2	13	7	8
31 JAN 1998	10	12	4	4
30 APRIL 1998	13	11	5	1

During the study period all doctors in the subject practice became aware of a need to improve the quality of their medical records. Practice and College accreditation required that cardiovascular risk factors be recorded more frequently in the notes.

Process audit methodology (Tables 1 and 2) confirms an improvement that is also captured by the use of repeated absolute risk assessments. In the "repeated assessment of absolute risk" technique introduced in this paper the improvement is observed as a progressive reduction in the sum of the maximum of the individual absolute risks. This narrowing of the range is interpreted as an improvement in the recording of the three risk factors (blood pressure, smoking status and serum cholesterol) over the study period.

In this project a measurement interval of three months was chosen. In principle, shorter measurement intervals (monthly or bimonthly) would reduce the time from implementing a change until its effects became apparent. It would also be possible to calculate upper and lower bounds for the process more quickly. This would mean that special causes of variation, such as a successful change to practice, might be detected shortly after they occur.
The "repeated assessment of absolute risk" methodology might, potentially, provide evidence that health promotion in general practice can reduce the expected future incidence of CHD deaths in some age groups. It might also be used to compare the effectiveness of different health promotion strategies.

A randomised controlled trial within a practice that showed a significant reduction in the expected number of six-year (or other time interval) CHD deaths in the treatment group compared to the controls would provide evidence that disease prevention in general practice is effective. The repeated assessment of absolute risk methodology might be powerful enough to capture small changes in the sum of absolute risks. With a small sample of 30 (and even a solo GP would be expected to have 30 male patients aged 46-57), the variability around the mean after six observations is ± 3-4 per cent. This is sufficiently constant that one would expect a 10 per cent reduction in the sum of the absolute risks (the expected number of CHD deaths within six years) to be apparent within a few audit periods.

This repeated assessment of absolute risk methodology can be used as an audit tool in general practice. Successive reduction in the sum of the maximum absolute risks provides evidence that the recording of risk factors has improved. Five successive reductions in this maximum may be regarded as statistically significant. If greater specificity were required then six or even seven successive reductions could be set as the critical value. The cost of this would be a loss of sensitivity.

In this study the MRFIT screening data were used. Other measures of absolute risk exist as do end points other than CHD death within six years. There is room for considerable discussion as to which is better. The MRFIT data are obviously limited by their applicability to only two decades of life (35-57) and those in males. However, regression equations may be based on small numbers of events in some age-sex ranges.
In principle the repeated assessment of risk methodology could be used with relative risk data, although it may be difficult to give a physical interpretation to a sum of relative risks. A sum of absolute risks corresponds more directly to an expected number of end points.

In summary, audit of disease prevention activities in general practice can be performed using absolute risk data as an outcome measure. This pilot study produced significant results with a sample of size 30. The repeated assessment of absolute risk methodology can detect improvements in the recording of risk factors (process) and may also be able to demonstrate reductions in the expected number of disease events. A randomised controlled trial is required to test this possibility.

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