Cholesterol screening and life assurance

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Abstract

Objectives—To examine how insurance companies assess proposals for life assurance from applicants with raised cholesterol concentrations and to determine the excess mortality rating applied.

Design—Survey of 49 companies underwriting term life assurance.

Setting—United Kingdom.

Subjects—Four fictional men aged 30 seeking 20 year term policies paying benefit only on death. Two had total cholesterol concentrations of 6·4 and 8·1 mmol/l but no other cardiovascular risk factors; one was overweight, hypertensive, smoked 20 cigarettes daily, and had a total cholesterol concentration of 8·1 mmol/l; and one had possible familial hypercholesterolaemia and a total cholesterol concentration of 10·7 mmol/l after treatment.

Main outcome measure—Percentage excess mortality rating.

Results—All companies used explicit criteria to assess the mortality risk associated with hyperlipidaemias, and 47 companies applied the same criteria to men and women. No excess mortality rating was imposed on an applicant with a total cholesterol concentration of 6·4 mmol/l, but a small excess was applied to an applicant with a concentration of 8·1 mmol/l (median excess 50%, range 0-75%). When multiple cardiovascular risk factors were present the same concentration of 8·1 mmol/l resulted in a substantial excess (median 135%, range 50-200%). A smaller but more variable excess was applied to an applicant with possible familial hypercholesterolaemia (median 75%, range 0-200%).

Conclusions—Despite considerable differences among companies in the excess mortality ratings applied, increases in term life assurance premiums are likely to be restricted to patients with severe hypercholesterolaemia, in particular those with familial hypercholesterolaemia. In the absence of other cardiovascular risk factors milder hypercholesterolaemia is unlikely to result in higher premiums.

Introduction

Screening programmes have costs as well as benefits. The psychological costs of screening have recently been reviewed,[1-2] but the potential financial costs to the patient should not be forgotten. Finding a raised cholesterol concentration may result in a less favourable life assurance risk rating and a correspondingly higher premium. Although it is widely appreciated that risk factors for coronary heart disease, such as smoking and high blood pressure, may result in higher premiums, the corresponding implications for cholesterol screening seem to be less clearly understood both by patients and by their doctors. This may be partly explained by inconsistencies among insurance companies in their assessment of the excess mortality risk associated with hypercholesterolaemia.

The normal premium rates charged by life assurance companies are based on the past mortality experience of policy holders who have been accepted at standard rates. The usual practice in underwriting applications for life assurance is to use a numerical rating system to estimate the effect of various risk factors on this assumed rate of mortality. For example, smoking or hypertension would be regarded as a risk factor. An increase in the assumed rate of mortality would be expressed in percentage terms—for example, 50% above normal mortality, which would reduce the expectation of life for a 30 year old man from 44·9 to 41·0 years. If the increase is significant in monetary terms the policy premium would be increased.

We report a survey of 49 insurance companies, which examined how companies assess proposals from applicants with hypercholesterolaemia and what level of excess mortality rating was applied.

Methods

A list of around 90 insurance companies thought to underwrite life assurance policies was compiled from several sources, including the Oxford University appeals office. A personal letter was sent to the managing director of each company explaining the survey. It inquired specifically whether applicants were required to disclose the results of cholesterol measurements, how the company assessed proposals from applicants with raised values, and whether different policies were applied to men and women. The results of the preliminary survey allowed us to exclude companies that did not underwrite life assurance or were subsidiaries of larger groups and to identify companies engaged in reassurance (a method of spreading a risk among companies because of its size or nature). We then sent a second, more detailed questionnaire to the remaining companies. They were asked to assess the excess mortality rating which would be applied to proposals from four fictional male applicants, each aged 30, seeking a 20 year term policy paying benefit only on death. The excess mortality rating was defined as the percentage increase over the assumed rate of mortality. Table I gives the details of each proposal. Subjects 1 and 2 had differing concentrations of total cholesterol but no other risk factors for coronary heart disease. Subject 3 had a total cholesterol concentration of 8·1 mmol/l, was overweight and mildly hypertensive, and smoked 20 cigarettes a day. Subject 4 had a family history of premature coronary heart disease and (in the absence of documented tendon xanthomas) a presumptive diagnosis of possible familial hypercholesterolaemia.[3] (One company declined to estimate the excess mortality risk for this proposal because the application would have been referred to reassurers.)

To see whether there were differences in the risk assessment between larger and smaller companies we identified those companies that appeared among the top 25, as ranked by their percentage of the United Kingdom life premium market share for 1987, using a

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TABLE I—*Characteristics of life assurance applicants*

	Subject 1 (serum cholesterol 6·4 mmol/l)	Subject 2 (serum cholesterol 8·1 mmol/l)	Subject 3 (multiple risk factors)	Subject 4 (possible familial hypercholesterolaemia)
Age (years)	30	30	30	30
Blood pressure (mm Hg)	120/80	120/80	140/98	120/80
Weight (kg)	69·9	69·9	96·1	69·9
Height (cm)	178	178	178	178
Cigarette smoking	No	No	20/day	No
Family history of coronary heart disease	Nil	Nil	Nil	Father, myocardial infarction at age 45
Other medical history	Nil	Nil	Nil	Nil
Total serum cholesterol (mmol/l)	6·4*	8·1†	8·1†	10·7‡
High density lipoprotein cholesterol (mmol/l)		1·5*	1·5*	1·7*
Fasting triglycerides (mmol/l)		1·7	1·7	1·3
Resting electrocardiogram				Normal

*Mean of two readings. †After dietary advice. ‡On cholestyramine.

list provided by a reputable City institution. We then compared the excess mortality rating ascribed by the two groups of companies, which, except for two companies, was stated to the nearest 25%; the remaining two companies supplied exact percentage increases. The median value was calculated for each of the proposals. Differences between groups were compared by the Mann-Whitney U test.

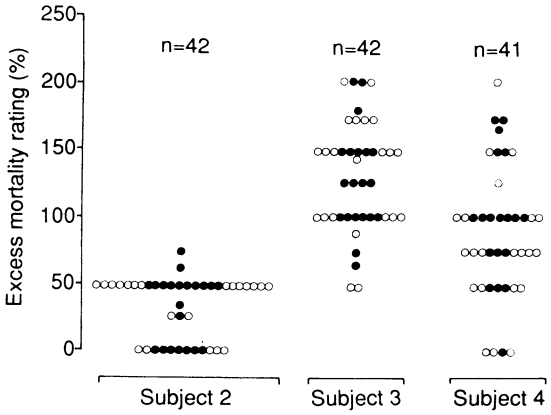
Results

Our initial survey identified 53 life insurance companies. One company which did not underwrite term assurance and a further three companies engaged in reassurance were excluded from the analysis. Forty two (86%) of the 49 companies underwriting term policies responded to our second, more detailed questionnaire. This sample included 22 of the top 25 companies as ranked by United Kingdom market share (these 22 companies together accounted for 58% of the 1987 United Kingdom premium market).

None of the companies included a specific question about lipid measurements in their proposal form. Nevertheless, most emphasised that applicants were obliged to disclose any information which was relevant to the risk proposed. Two companies said that they did not expect information about mass screening to be reported unless the applicant had been notified of an abnormal result which needed advice or follow up. A further company restricted its inquiries to investigations within three years of the proposal unless previous investigations had resulted in medical advice or treatment. Two companies said they did not expect applicants to be able to inform them about the results of a specific laboratory test.

Forty seven of the 49 companies stated that they applied the same criteria to both men and women when assessing proposals. Several pointed out that the basic premium already reflected the lower aggregate risk in women. Two companies, however, apparently made a distinction between men and women, one accepting a higher proportion of applications from women without further investigation and the other taking "a more lenient view of a raised cholesterol level in women, particularly if the assurance to be effected was for a limited term."

There was complete agreement that an applicant with a borderline cholesterol concentration of 6·4 mmol/l and no other cardiovascular risk factors (subject 1; table I) should incur no excess mortality rating. The figure shows the responses to the proposals for subjects 2-4. For subject 2, whose mean total cholesterol concentration was 8·1 mmol/l, the distribution of excess mortality rating was fairly narrow (median 50%, range 0-75%), and 40 companies (95%) applied an excess of 50% or less. Most companies imposed a substantial excess on subject 3 (median 135%, range 50-200%). A smaller but more variable excess was applied to subject 4 (median 75%, range 0-200%). Although there was a wide variance in the distribution of excess for proposals for subjects 3 and 4, there were no significant differences between larger and smaller companies. Eighty six per cent of all companies responding to the survey (36/42) referred to reassurance company manuals when determining the excess mortality rating.



Percentage excess mortality risk ratings for subjects 2-4. (● "Larger" insurance companies. ○ "Smaller" insurance companies)

Discussion

Our results have several implications for cholesterol screening. Although companies do not include a question about cholesterol measurement in their proposal forms, applicants would be expected to disclose information about any investigation that had resulted in medical advice or treatment. About a quarter of a screened adult population aged 25-59 might therefore have to declare for insurance purposes that they had received medical advice for a raised cholesterol concentration,[4] as current guidelines for the management of hyperlipidaemias recommend that patients with a total cholesterol concentration exceeding 6·4 mmol/l should initially receive lipid lowering dietary advice.[5,6] In the absence of other cardiovascular risk factors, however, our results suggest that cholesterol screening would not result in any increase in life term assurance premiums for at least 95% of an adult population.

Explicit criteria were used to assess the mortality risk associated with hyperlipidaemias. Most underwriters stated that they referred to reassurance company manuals. Not surprisingly, there were differences among manuals in the excess mortality ratings quoted, which may explain some of the variability in risk estimates observed in our survey. The guidelines provided by reassurance companies, however, recognise that the risk of coronary heart disease increases continuously as cholesterol concentration rises and that the relative risk is attenuated with increasing age. This is illustrated by a table from a standard text on risk assessment[7] (table II). It makes an additional allowance for high density lipoprotein cholesterol on the basis of either the concentration of high density

lipoprotein or the ratio of total to high density lipoprotein cholesterol. Some reduction in risk rating may also be allowed for a response to treatment and for the absence of other cardiovascular risk factors. The excess mortality rating applied to raised triglyceride concentrations varies. Some reassurance manuals disregard triglyceride concentrations unless they exceed 20 mmol/l and base their estimate of the excess mortality on the underlying cause of hypertriglyceridaemia whereas others impose an excess for concentrations exceeding 4·0 mmol/l. In calculating the excess rating an additive rather than multiplicative model is usually used to allow for the effect of other risk factors such as smoking or hypertension.

TABLE II—*Rating as percentage extra mortality in relation to total serum cholesterol concentration (from Brackenridge[7])*

Age at entry (years)	Serum cholesterol (mmol/l)				
	<6·0	6·0-	7·2-	9·1-	≥11·7
<30	0	25	75	100	150
30-49	0	0	50	75	100
50-59	0	0	25	50	75
≥60	0	0	0	25	50

The various criteria used by different companies resulted in considerable variability in the excess mortality risk applied to proposals from applicants with clearly raised cholesterol concentrations. No excess was applied to a proposal from a 30 year old applicant with a total cholesterol concentration of 6·4 mmol/l, which is about 0·5 mmol/l higher than the mean reported in a recent population survey in Britain.[4] By contrast, when the total cholesterol concentration was 8·1 mmol/l but no other cardiovascular risk factors were present a small but variable excess was applied. In this instance, the proposal would probably be accepted at normal rates because the extra premium resulting from the small excess mortality rating of 50% or less applied by most companies would be too little to be worth imposing. The limited available evidence suggests that a cholesterol concentration of this level confers a 2½-fold to threefold higher risk of fatal coronary heart disease for men than does a concentration equal to the population mean[8,9] and an excess mortality rating of 75% might therefore be more appropriate (an additional 25% should be added to the excess ratings shown in table II for men aged 30 or more and 50% for younger men (R D C Brackenridge, personal communication)). When multiple cardiovascular risk factors were present the same cholesterol concentration of 8·1 mmol/l attracted a much higher but variable excess mortality risk in an overweight hypertensive male smoker. The large variation in excess mortality applied may partly be explained by individual differences in the excess applied for each cardiovascular risk factor by different companies. There was also a wide variation in the excess mortality applied to a proposal from an applicant with severe hypercholesterolaemia in whom the presumptive diagnosis was possible familial hypercholesterolaemia. It was surprising that some companies applied either no excess or only a small excess as epidemiological data suggest that the cumulative probability of fatal or non-fatal coronary heart disease is at least a third by the age of 50 in men with familial hypercholesterolaemia.[10,11]

The results of the survey should be interpreted with care. The excess mortality rating applied to a proposal from an applicant with a raised cholesterol concentration depends on the type and term of policy and whether other cardiovascular risk factors are present. An excess risk rating is much less likely to increase the premium for an investment type contract than for a term contract because life cover constitutes only a small proportion of the premium for an investment contract such as an endowment policy. A similar excess is more likely to increase the premium for term assurance because the policy has no investment component and the assigned sum is payable only at death within the term of the policy. Examining the excess rating applied to other conditions may provide a clearer idea of the relative importance attached to hypercholesterolaemia by life assurance companies. For example, a 30 year old male applicant with a history of uncomplicated, well controlled insulin dependent diabetes for less than 10 years would attract an excess mortality rating of 100%,[7] which compares with a median excess of 75% for possible familial hypercholesterolaemia in our survey. Similarly, the excess for a 30 year old applicant with a blood pressure of 140/100 mm Hg would be 55% and for a 30 year old applicant with a blood pressure of 170/120 mm Hg 285%.[7]

In conclusion, although explicit criteria are used by insurance companies to assess the excess mortality associated with raised cholesterol concentrations, we found considerable variation in the excess rating applied. The limitations of the data on which ratings are based make an exact assessment of the risk associated with moderately increased cholesterol concentrations difficult. It was, however, surprising to find that some companies applied little or no excess mortality to applicants with possible familial hypercholesterolaemia as there is a high cumulative probability of premature coronary heart disease associated with this condition. The implications of our findings are largely restricted to patients with severe hypercholesterolaemia and, in particular, to those with familial hypercholesterolaemia, which affects about 0·2% of the population. Higher term life assurance premiums are likely to be applied by many companies to proposals from these patients. In the absence of other cardiovascular risk factors more mild hypercholesterolaemia is unlikely to result in increased term assurance premiums at present.

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