ORIGINAL ARTICLE

Which doctors are influenced by a patient's age? A multi-method study of angina treatment in general practice, cardiology and gerontology

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Background: Elderly patients with cardiovascular disease are relatively undertreated and undertested.
Objectives: To investigate whether, and how, individual doctors are influenced by a patient's age in their investigation and treatment of angina.
Design: Process-based judgment analysis using electronic patients, semistructured interviews.
Setting: Primary Care, Care of the Elderly and Cardiology in England.
Participants: Eighty five doctors: 29 cardiologists, 28 care of the elderly specialists and 28 general practitioners (GPs).
Main outcome measures: Testing and treatment decisions on hypothetical patients.
Results: Forty six per cent of GPs and care of the elderly doctors, and 48% of cardiologists treated patients aged 65+ differently to those under 65, independent of comorbidity. This effect was evident on several decisions: elderly patients were less likely to be prescribed a statin given a cholesterol test, referred to a cardiologist, given an exercise tolerance test, angiography and revascularisation; more likely to have their current prescriptions changed and to be given a follow-up appointment. There was no effect of specialty, gender or years of training on influence of patient age. Those doctors who were influenced by age were on average five years older than those who were not. Interviews revealed that some doctors saw old age as a contraindication to treat.
Conclusions: Age, independent of comorbidity, presentation and patients' wishes, directly influenced decision-making about angina investigation and treatment by half of the doctors in the primary and secondary care samples. Doctors explicitly reasoned about the direct influence of age and age-associated influences.

In Europe and the US, elderly people (age 65+) and very elderly people (age 75+) with cardiovascular disease are less likely than younger people to receive a range of potentially beneficial cardiological treatments.[1–3] This evidence has come from registry studies,[4] policy audits,[5] analyses of patients' records[6 7] compilations of anecdotal patient reports,[8 9] population surveys,[10 11] cohort studies[12 13] and qualitative analysis of interviews.[14] Decision-making for these patients could be based on the patient's age directly, or could be influenced by a number of factors that co-vary with age such as comorbidity and patient expectations. Distinguishing between these requires either carefully designed studies, or carefully carried-out analyses. As a group, doctors in the UK and in the US have been seen to be influenced by age in their lifestyle advice, diagnostic testing and treatment decision-making.[15–19] The role of individual doctors' decision-making, the role of different decisions in the decision-making process, and the roles of primary and secondary care in this have yet to be investigated.

AIMS AND METHODS

The aim of this study was to examine whether, and how, a patient's age influences individual doctors' decisions about investigations and treatment of angina, independent of the patient's comorbidity, style of communication or wishes. We studied the behaviour of doctors in three different specialties (cardiology, care of the elderly, general practitioners (GPs)). A multi-method approach was used, using electronic patients for doctors' decision-making (''judgment'') tasks, questionnaires and semistructured interviews. The doctors in the study each made a series of decisions on 72 different electronic patients aged between 45 and 92. The reasoning behind their decisions was elicited in subsequent interviews.

The sample of doctors

Doctors were contacted by mail shot via local health authorities in England, the British Cardiac Society and the British Geriatric Society. More than 250 doctors expressed an interest in the study. We then sifted this sample with the aim of matching cardiologists, care of the elderly specialists and GPs in trios by district. This provided a participating sample of 29 cardiologists, 28 care of the elderly specialists and 28 GPs, out of the 250 who expressed interest. They practised in areas of London, Northamptonshire, Sussex, Nottinghamshire, Leicestershire, Hampshire and Kent (see Results for their characteristics). Doctors participated in this exercise in their usual work setting; on average, the exercises took place over three separate one-hour sessions per doctor. Doctors were given a small honorarium in recognition of the heavy time commitment and were provided with individual feedback about their use of information during the computer-based exercise. It was recognised that given the time burden, and the aim to obtain detailed and insightful information, it would not be possible to aim for a representative sample of doctors.

Methods

For the judgment task, 72 electronic, fictional patients, their computerised records and electronic photographs of their head and shoulders, were presented by DF to doctors via a computerised simulation on a laptop computer. Information was displayed and recorded on the screen by the researcher (DF)

Table 1 Number of doctors with negative and positive age group coefficients indicating reduced and increased propensity to treat elderly patients compared to middle aged patients (number significant in brackets), mean coefficient (standard deviation), and median odds ratio (65+:<65)* across all doctors, per decision

Patient treatment	Aged 65+ LESS likely	Aged 65+ MORE likely	Mean coefficient	Median OR
Referral to a cardiologist	36 (10)	17 (0)	−0.61† (1.00)	0.63
Revascularisation	22 (3)	6 (1)	−0.42† (0.79)	0.65
Angiogram	19 (1)	10 (0)	−0.41† (0.62)	0.63
Prescribe lipid lowering drug	48 (4)	30 (1)	−0.18† (0.65)	0.88
Cholesterol test	26 (1)	16 (0)	−0.24† (0.65)	0.75
Exercise tolerance test	36 (7)	15 (0)	−0.52† (1.09)	0.68
Referral to a GP	2 (0)	2 (0)	0.41 (0.75)	1.30
Referral to care of the elderly doctor	0 (0)	1 (1)	4.52	92.31
Lifestyle advice	2 (2)	4 (0)	−0.05 (0.73)	0.97
Discuss situation with patient	2 (0)	2 (2)	0.28 (0.77)	1.10
Suggest patient returns if worse	1 (0)	2 (0)	0.20 (0.59)	1.62
ACE inhibitors	15 (0)	18 (0)	−0.14 (0.84)	1.07
Aspirin	32 (1)	31 (5)	0.12 (0.94)	0.98
Beta inhibitors	37 (0)	39 (2)	0.07 (0.65)	1.01
Calcium inhibitors	19 (1)	14 (0)	−0.16 (0.76)	0.90
Nitrates	7 (1)	26 (3)	0.43† (0.65)	1.37
Glyceryl trinitrate	18 (0)	25 (3)	0.22 (0.80)	1.20
Change heart drug (any)	27 (1)	44 (3)	0.25† (0.76)	1.22
Change non-heart drug (any)	9 (0)	11 (0)	−0.18 (0.96)	1.07
Give follow up appointment	25 (0)	41 (5)	0.28† (0.86)	1.29

*Controlling for doctors' specialty, age, sex, grade and year in specialty.
†Significantly different from zero ($p<0.05$).

using keyboard shortcuts. The same 72 patient photographs were seen by each doctor in a random order. The photographs were of consenting members of the public (aged 45–92 years), approached by DF in public places, day centres and workplaces. Doctors were asked to collect information about patients, and make decisions about investigation and treatment. They were asked to behave as they would in their usual clinical setting. For each electronic patient, each doctor could access up to 73 pieces of information about them, before they made a series of decisions. The hypothetical patients presented with chest discomfort. Sex, age, occupational status and ethnicity were varied factorially across each set of patients. Severity of cardiological problems was varied randomly independently of age, along a number of dimensions[i] (see Appendix 1). Other clinical information which was available for each case was also varied at random across patients (for example, symptom typicality; risk factors for coronary artery disease; medication; comorbidity; family history; investigations). A typical electronic scenario included a visual image of the patient, with their details. For example, a 61-year-old Afro-Caribbean man presented with a burning feeling that lasted a few minutes. The doctor would probe for the extent, site and duration of the pain, and had the option of clicking on windows to display further information about the patient (for example, history, risk factors, investigations, results if available). Test result options opened up a visual image (for example, of a chest *x* ray and report, or a blank screen indicating not available). Doctors' decisions were compared with tight, internationally agreed criteria for clinical interventions used in one of the author's (AB) previous research,[6 7] and analysed by the doctors' and patients' characteristics. Test results and images[ii] were based on anonymised samples obtained from local hospitals. They were selected to cover normal to severe test results.

Background information on doctors' sex, ethnic group, age, years since training, specialities, and caseload information was collected in a questionnaire, in person, via the web or via telephone. During a semistructured follow up interview, doctors were asked open-ended questions about factors affecting their decisions in the computer-based task and real life clinical settings. The interviews were audio-recorded, transcribed, coded using a thematic approach derived from the data and analysed. AB read all the transcripts several times and identified the themes to be categorised. The process was checked independently by CH and NH. The themes were analysed using SPSS.[12] It should be cautioned that the interviews were semistructured and appropriate for undergoing basic statistical analyses, and not to be confused with qualitative, in-depth interviews.

Analyses

The characteristics of the participating doctors in each specialty were compared to those of the specialist population[iii] (χ^2 tests). Patient case characteristics were assessed for variation across sex, ethnic group and age group (<65 years, 65+ years) (general linear models, phi correlations) for each doctor. It should be noted that we also examined patients in older age groups (<75 compared with 75+), and these were in the same direction as those for patients aged 65+. The lower age cut-off was used in the analyses, because of the smaller number of older patients, and potential for confounding.

[i]Where appropriate, information was tailored: alcohol consumption and specifics of blood tests were related to patient sex, town of birth to ethnic origin, retirement to age, and, where a patient's notes suggested they were allergic to aspirin, clopidogrel was listed as the antiplatelet medication.

[ii]Angiogram levels, 12 lead electrocardiogram (ECG) levels, thallium scan levels, exercise tolerance test (ETT) levels, echocardiogram, chest *x* ray (male and female different), abdominal ultrasound (male and female different), barium swallow (one, normal), and computed tomography (CT) scan (one, normal).

[iii]Department of Health statistics on sex and age group only were obtained from the RCGP website[20] and on sex, age and ethnic group from the Department of Health Medical and Dental Workforce Census. To avoid low cell counts, age was categorised as <40 years and 40+ years.

[iv]Two other doctors (n = 87) also participated in the study but their data files became corrupted and their responses on the Clinical Judgment Analysis (CJA) exercise are not included in our analyses. Two cardiologists, and three care of the elderly doctors completed all but 4, 7, 4, 7 and 5 cases respectively on the CJA task. The rest of their data are included in the analyses.

Variables which were statistically significant at least at the 0.05 level were included along with age group in multiple logistic regressions on each doctor's decisions (see left hand column of table 1). The influence of age on each decision was assessed across doctors (median log odds, one sample *t* test on coefficients). Doctors who were influenced by patient age on at least one decision, and who were not, were compared in terms of specialty, sex, specialist grades, age, years in specialty (χ^2 tests, *t* tests). Patterns across decisions were analysed for each specialty (Pearson's correlations between decision coefficients). The semistructured interviews were coded using a thematic approach derived from the data, and analysed by theme. Here we present analysis of the theme ''patient age''. Analyses were conducted using MINITAB.

RESULTS

The clinical judgment tasks

Eighty five doctors (29 cardiologists, 28 care of the elderly physicians and 28 general practitioners) completed the electronic, clinical judgement analysis exercises[iv]. Full questionnaire data were available for 79 doctors; 70 completed the semi-structured follow-up interview. The doctors were from several sites: London (in six hospital trusts and primary care areas), Northamptonshire, Sussex, Nottinghamshire, Leicestershire, Hampshire and Kent.

Four of the cardiologists, 11 care of the elderly specialists and 17 GPs were female. Sixty five of the doctors were white, 10 were Asian or Asian British, 10 were in ''other'' ethnic groups and their mean age was 39 years (range 28–65 years). The average number of years of working within their current speciality was nine years (ranges 6 months to 31 years). Ten of the cardiologists were consultants, and 17 of the care of the elderly doctors were consultants. The remaining secondary care doctors were specialist registrars.

The proportion of cardiologists and care of the elderly doctors did not differ significantly from the national population of doctors in these specialties by sex or age. However, female GPs were overrepresented ($\chi^2(1) = 6.7$, $p<0.05$) and older GPs underrepresented ($\chi^2(1) = 14.74$, $p<0.01$) in the sample.

The median odds ratios in table 1 show that older patients were two thirds as likely to be referred to a cardiologist, to be given revascularisation, angiogram or an exercise tolerance test as middle aged patients were. They were two fifths more likely to have their heart medication changed and three tenths more likely to be told to come back at a later date than middle aged patients were.

Doctors were significantly negatively influenced by old age on decisions to refer to a cardiologist ($t(52) = 4.45$, $p<0.001$), revascularise ($t(27) = 2.81$, $p<0.01$), order an angiogram ($t(28) = 3.51$, $p<0.005$), order an exercise tolerance test ($t(50) = 3.40$, $p<0.005$), prescribe a statin ($t(77) = 2.46$, $p<0.05$) and order a cholesterol test ($t(41) = 2.40$, $p<0.05$). They were significantly positively influenced by old age on decisions to change prescriptions for ischaemic heart disease ($t(70) = 2.83$, $p<0.01$), in particular nitrates ($t(33) = 3.80$, $p<0.05$) and to suggest a follow-up appointment ($t(65) = 2.68$, $p<0.01$).

Approximately half of the doctors in each specialist group treated older patients (65+) differently from middle-aged patients (45–64) (14 cardiologists, 13 care of the elderly doctors and 13 GPs). Doctors who were influenced by age did not vary from those who were not by specialty ($\chi^2(2) = 0.03$, NS), doctor gender ($\chi^2(2) = 0.18$, NS), grade ($\chi^2(2) = 0.03$, NS), and number of years in a specialty ($t(39) = 1.65$, NS). However, doctors who were influenced by age were on average five years older than those who were not ($t(51) = 2.30$, $p<0.05$).

Box 1 Reasoning behind the influence of age and its covariates

1. Direct influence of age, n = 45 (including listing age as a risk factor)

''Age does come into it so only the oldest old are excluded. We would manage those ourselves.'' (CE136)

''If someone's had two bypasses, they're 95, they're completely asymptomatic—sure they've got heart disease but I'm not going to do anything.'' (CA146)

''If they are in their 90s with chest pain and angina, I might be less likely to refer'' (CE110)

''Age. I would be less likely to prescribe for an older patient.'' (GP105)

''I agree with the policies, like try to avoid angiography over age of 75 and when the policy came in we thought about 1 in 3 would get angiography but it was 1 in 2.'' (CA110)

''No age related policies here…one occasionally comes across unwritten practice which may be construed as ageist'' (CE105)

2. Indirect influence of age: comorbidity, patients' demands, quality of life, n = 19

''Age has a definite influence. I'd be more likely to refer a 65 than a 95 year old because they probably wouldn't survive surgery at that age.'' (CE110)

''…once you start hitting 75, 80, 85 mark you then start getting put off because you worry about complications'' (CA106)

''They wouldn't want an angiogram if they were over 70'' (CA110)

''I like to think that I would treat the individual. I think generally you have to try and identify from an individual what is in their best interests. I don't think bypass surgery in an 87 year old is in their interests.'' (CA192)

''Not always young people, but people who you feel that the severity of their chest pains is making their quality of life worse. Whereas if someone is elderly and sedentary then sadly, you have to sometimes forget these people.'' (CE167

3. Deliberate dissociation of covariates of age: quality of life, n = 2

''Age related is not important. Quality of life is quality of life. If you are in your 80s and your chest pain stops you going to the post office then it is just as disabling in terms of what your life is all about as in a young person's case.'' (GP125)

''Some people might say to me I'm 80, I'm happy to have occasional angina on medical therapy and a man of 50 might very well say I'm interested in leading a very active life and I want everything done so the symptom level is crucial and that varies from person to person …'' (CA102)

4. General discussion of the influence of age, n = 5

''There is no doubt that there is a bias against ethnic minorities, elderly patients, but I would hope that would not influence me.'' (Ca109)

''Diabetics do better with CABG. Some people argue in a younger patient it might be better to avoid surgery and if they can have a couple of angioplasties for a few years it's better. Not sure I agree. Equally some people say in an older patient it might be nicer to do a definitive revascularisation with a CABG and then that's it. I've always found those arguments a little hard to swallow actually. Doing nothing is another option.'' (Ca146)

''My experience is that if you know they are going to say no to an older patient you wouldn't choose them but I've never had that experience. If I did work with people who were ageist then I'd have to say that would affect my choice of surgeon.'' (Ce117)

Twenty three doctors were significantly influenced by age group on only one decision, 16 on two and one on three decisions. Those GPs and care of the elderly physicians who were less likely to refer older people to a cardiologist tended to be more likely to give them a follow-up appointment ($r = -0.75$ and -0.83 respectively, $p<0.05$). Those GPs who were more likely to give a follow-up appointment to older patients were more likely to prescribe non-heart medications ($r = 0.81$, $p<0.05$; in particular antacids ($r = 0.91$, $p<0.05$)) for them. Those care of the elderly doctors who were less likely to order an exercise tolerance test for elderly people were more likely to prescribe a statin for them ($r = -0.57$, $p<0.05$). In contrast, those cardiologists who were less likely to order statins, angiograms, or revascularise older patients tended to be influenced by age on more than one of these decisions ($r = 0.52$, 0.63, and 0.81 for the correlation between statins and angiograms, between statins and revascularisation and between angiogram and revascularisation respectively, $p<0.05$).

The interviews

Doctors discussed four different ways in which age might influence decision-making. Illustrative quotes are included in box 1. Forty five doctors (64%) identified age as having a *direct* role in their decisions. Of these, 13 doctors (19%) indicated that they would be less likely to give older people treatment or tests, two (3%) indicated they would be more likely to. Nine (14%) did not specify how age influenced their decision-making (though they said it would do so). Five doctors (7%) mentioned the direct role of age in local policies and 29 doctors (41%) listed age among other influential risk factors.

Twenty doctors (27%) identified how age might *indirectly* influence their behaviour, because of covarying factors. These doctors saw old age as having an influence because of its association with frailty, comorbidity, the nature and duration of potential benefit of treatment, risk of complications of testing and treatment, and patients' wishes regarding intervention. Two doctors (3%) mentioned these associations but indicated that they deliberately *dissociated* the role of age in their decision-making from the other factors. Five doctors discussed the *general* or potential use of age information in decision-making, not indicating whether or not it influenced their own behaviour.

DISCUSSION

These results replicate national and international case and survey research showing that elderly people receive different clinical management. They were less likely to be referred to a cardiologist, to be given angiograms, exercise tolerance tests, or revascularisation, than middle-aged patients. The study revealed that these differences reflect the independent influence of patient age on decision-making. Half the doctors in all three specialties treated the patients aged 65 and over with chest pain differently from those aged under 65, regardless of comorbidity or presentation. Each was influenced on one or two decisions. Those doctors who were influenced by patient age tended to be older than others.

Those GPs and care of the elderly physicians who were less likely to refer elderly patients to a cardiologist were more likely to use alternative management strategies for them. Cardiologists who were less likely to provide a particular treatment for elderly patients were also less likely to provide other treatments for them. Examination of the reasoning behind decision-making suggests that age may be directly influential, indirectly influential, or may be used as a proxy for patients' wishes and other age covariates.

This study used a blunt cut-off for analysis at age under 65 or 65 and over. This was due to insufficient statistical power to demonstrate substantial differences between patients aged, for example, between 65 and <75 and 75 or more. However, it is clear from the more qualitative data that doctors themselves appeared to make this distinction. It is unfortunate that the study lacked sufficient power to demonstrate such a difference. It is also unknown whether the visual appearance of the electronic patient (how old they looked, rather than chronological age) influenced results. Two further methodological points should be made. First, the tests of influence of age on individual decision-making which were used in this study were relatively stringent.[7] The combination of insignificant results across a set of participants can lead to a demonstration of a significant (but small) effect across a population,[21] just as it can in meta-analysis. Here however, we also identified differences in the behaviour of individuals at various points during the decision-making process, and the size of the effect on certain decisions was substantial. Second, we may have underestimated the extent of the influence of age on decision-making for real patients. This was an electronic study, and although behaving as they did in real life, participants in our sample, all busy doctors, were prepared to spend time participating in the study and discussing their decision-making. They may well have been more reflective and more conscientious than the average doctor, and possibly better informed, and hence less likely to be influenced by a patient's age independent of other factors.

Appendix 1 Characteristics by patient age group: mean number of cases with each characteristic per doctor

Age group	45–64	65+
Mean age	54.41	72.27
Number of cases	46	26
Demographics		
Male	22	14
Female	24	12
Ethnicity		
Asian	14	10
Afro-Caribbean	16	8
European	16	8
Professional occupation	8.46	4.68
History		
Symptom typicality		
Shortness of breath	5.84	3.35
Burning	11.14	6.18
Aching	11.28	6.55
Heavy	11.74	6.76
Tight	5.68	3.15
Severity		
High exertion	7.60	4.36
Walking	15.11	8.61
Any activity	15.16	8.42
No activity	7.81	4.60
Risk factors		
Smokes	22.61	12.48
High-fat diet	24.35	14.07
Drinks heavily	20.54	11.91
BMI overweight	21.07	12.74
Family history	21.88	13.38
Cholesterol: total/HDL >4.5	28.02	16.04
Hypertension >140/95	20.75	13.15
3+ angina medicines	27.82	16.09
5 or more illnesses recorded including angina	35.05	19.39
Tests		
ECG: abnormal	36.54	21.69
ETT: abnormal	26.93	14.95
Thallium scan: positive	22.67	11.73
Angiogram: stenosis	32.08	18.13

International research, based on actual patients, shows that older people are less likely than younger people to receive indicated cardiological treatments. Our research shows that age is indeed a factor that drives these differences, but that reasoning about old age is rarely distinguished from reasoning about its clinically relevant covariates. Interventions are needed to address clinicians' reasoning about patients of different ages at each step in patient management.

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REFERENCES

1 **Barakat K**, Wilkinson P, Deaner A, *et al*. How should age affect managmenet of acute myocardial infarction? A prospective cohort study. *Lancet* 1999;**353**:955–9.
2 **Zaidi A**, Fitzpatrick A, Keenan D, *et al*. Good outcomes from cardiac surgery in the over 70s. *Heart* 1999;**82**:134–7.
3 **Conaway D**, House J, Bandt K, *et al*. The elderly: Health status benefits and recovery of function one year after coronary artery bypass surgery. *J Am Coll Cardiol* 2003;**42**:1421–6.
4 **Stone PH**, Thompson B, Anderson HV, *et al*. Influence of race, sex and age on management of unstable angina and non-Q-wave myocardial infarction. The TIMI III registry. *JAMA* 1996;**275**:1104–12.
5 **Department of Health**. National Service Framework for Older People: A Report of Progress and Future Challenges. 2003. Available at http://www.dh.gov.uk/assetRoot/04/06/72/49/04067249.pdf
6 **Dudley N**, Bowling A, Bond M, *et al*. Age and sex-related bias in the management of heart disease in a district general hospital. *Age Ageing* 2002;**31**:37–42.
7 **Bowling A**, Bond M, McKee D, *et al*. Equity in access to exercise tolerance testing, coronary angiography and coronary artery bypass grafting by age, sex and clinical indications. *Heart* 2001;**85**:680–6.
8 **Age Concern and British Geriatrics Society**. *Implementation of the National Service Framework and Intermediate care seen from geriatricians' and older people's perspectives. A joint statement from Age Concern and the British Geriatrics Society*. London: British Geriatrics Society, 2002.
9 **Age Concern England**. *Age Concern's response to The National Service Framework for Older people*, Policy Papers. London: ACE, 2001.
10 **Gill PS**, Quirke TP, Mant JW, *et al*. The use of lipid-lowering drugs across ethnic groups in the secondary prevention of ischaemic heart disease: analysis of cross-sectional surveys in England. *Br J Gen Pract* 2004;**54**:442–3.
11 **European Secondary Prevention Study Group**. Translation of clinical trials into practice: a European population-based study of the use of thrombolysis for acute myocardial infarction. *Lancet* 1996;**347**:1203–7.
12 **Reid FDA**, Cook DG, Whincup PH. Use of statins in the secondary prevention of coronary heart disease: is treatment equitable? *Heart* 2002;**88**:15–19.
13 **Morris RW**, Whincup PH, Papacosta O, *et al*. Inequalities in coronary revascularisation during the 1990s—evidence from the British Regional Heart Study. *Heart* 2004;**91**:640.
14 **Fuat A**, Hungin APS, Murphy JJ. Barriers to accurate diagnosis and effective management of heart failure in primary care: qualitative study. *BMJ* 2003;**326**:196.
15 **Evans JStBT**, Harries C, Dennis I, *et al*. General Practitioners' tacit and stated policies in the prescription of lipid lowering agents. *Br J Gen Pract* 1995;**45**:15–18.
16 **Schulman KA**, Berlin J, Harless W, *et al*. The effect of race and sex on physicians' recommendations for cardiac catheterization. *N Engl J Med* 1999;**340**:618–26.
17 **Arber S**, McKinlay J, Adams A, *et al*. Influence of patient characteristics on doctors' questioning and lifestyle advice for coronary heart disease: a UK/US video experiment. *Br J Gen Pract* 2004;**54**:673–8.
18 **Hamel MB**, Teno JM, Goldman L, *et al*. Patient age and decisions to withhold life-sustaining treatments from seriously ill, hospitalized adults. *Ann Intern Med* 1999;**130**:116–25.
19 **Arber S**, McKinlay J, Adams A, *et al*. Patient characteristics and inequalities in doctors' diagnostic and management strategies relating to CHD: a video-simulation experiment. *Soc Sci Med* 2006;**62**:103–15.
20 **Profile of UK General Practitioners** 2004.
21 **Jonckheere AR**, Bower GH. Non-parametric trend tests for learning data. *Br J Math Stat Psychol* 1967;**20**:163–86.