

WHAT IS ALREADY KNOWN ON THIS TOPIC

Countries that vaccinate adolescent girls against HPV have not yet published data on coverage

UK studies anticipate about 80% uptake but no acceptability or feasibility studies have been done

WHAT THIS STUDY ADDS

Two primary care trusts offering HPV vaccination to girls attending all secondary schools in the area achieved a 70% uptake for the first vaccine dose

The vaccine was acceptable to most parents, and school based delivery was feasible

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- 5 Raffle AE. Challenges of implementing human papillomavirus (HPV) vaccination policy. *BMJ* 2007;335:375-7.
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Accepted: 1 April 2008

Inequity of access to investigation and effect on clinical outcomes: prognostic study of coronary angiography for suspected stable angina pectoris

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BMJ 2008;336:1058-61
doi:10.1136/bmj.39534.571042.BE

This article is an abridged version of a paper that was published on bmj.com. Cite this article as: *BMJ* 2008, doi: 10.1136/bmj.39534.571042.BE

ABSTRACT

Objectives To determine whether coronary angiography for suspected stable angina pectoris is underused in older patients, women, south Asian patients, and those from socioeconomically deprived areas, and, if it is, whether this is associated with higher coronary event rates.

Design Multicentre cohort with five year follow-up.

Setting Six ambulatory care clinics in England.

Participants 1375 consecutive patients in whom coronary angiography was individually rated as appropriate with the Rand consensus method.

Main outcome measures Receipt of angiography (420 procedures); coronary mortality and acute coronary syndrome events.

Results In a multivariable analysis, angiography was less likely to be performed in patients aged over 64 compared with those aged under 50 (hazard ratio 0.60, 95% confidence interval 0.38 to 0.96), women compared with men (0.42, 0.35 to 0.50), south Asians compared with white people (0.48, 0.34 to 0.67), and patients in the most deprived fifth compared with the other four fifths (0.66, 0.40 to 1.08). Not undergoing angiography when it was deemed appropriate was associated with higher rates of coronary event.

Conclusions At an early stage after presentation with suspected angina, coronary angiography is underused in older people, women, south Asians, and people from deprived areas. Not receiving appropriate angiography was associated with a higher risk of coronary events in all groups. Interventions based on clinical guidance that supports individualised management decisions might improve access and outcomes.

INTRODUCTION

We do not know whether potential inequities in the management of cardiovascular disease have consequences in terms of prognosis. Most¹⁻³ but not all^{4,5} studies suggest that older people,⁶ women,⁷ ethnic minorities,⁸ and those who are socioeconomically deprived⁹ have less access to effective interventions for stable angina or acute coronary events.

There are still important uncertainties that hamper the development of policies to reduce inequities.¹⁰ Firstly, in patients with stable angina investigators rarely measure the effect on cardiac events or mortality of variation in management.¹¹ Secondly, most studies that have found inequitable access to services are based on patients with acute events¹² or identified in hospital

outpatient settings,¹³ although many presented years earlier in primary care. Thirdly, most studies have examined access to treatments. Yet investigations are a prerequisite for some decisions about medical management. Finally, most previous studies have not taken account of the appropriateness of coronary angiography¹⁴ or the confounding of comorbidity in decisions about investigations.

We assessed patients in rapid access chest pain clinics to determine whether angiography was underused inpatients who were older, women, from a south Asian ethnic group, or from economically deprived areas; and whether underuse was associated with higher rates of coronary events. In the United Kingdom, most people identified in general practice with recent onset stable chest pain are assessed in rapid access chest pain clinics.

We used a multicentre cohort of consecutive patients attending these clinics and independently assessed their appropriateness for angiography.¹⁵

METHODS

Individual clinical data on 10 634 consecutive people attending six rapid access chest pain clinics were recorded from 2 January 1996 to 31 December 2002.¹⁶ Clinical data were collected at attendance. The clinician recorded the cause of chest pain and ascribed ethnicity as south Asian, white, black, or other.

Before undertaking this study, we defined the appropriateness of angiography with two expert panels using a modification of the Rand/UCLA method of systematically combining evidence with expert opinion. Each panel consisted of five cardiologists, five family physicians, and one cardiothoracic surgeon. We identified 13 clinical descriptors that influence the decision to undertake angiography on

people with suspected or confirmed angina (see bmj.com). The independent panel deemed 1375 patients as appropriate for angiography, judged on a 9 point scale.

We compared white and south Asian patients. In the UK south Asian people are at particularly high risk of coronary artery disease.¹⁷ We used fifths of the 2001 census Townsend index, a score of material deprivation,¹⁸ to compare the most deprived (highest fifth) with the other four combined. We matched indications and their associated ratings to patients from the six clinics. Our sample comprised white or south Asian patients with chest pain and no known coronary heart disease presenting to rapid access chest pain clinics and deemed appropriate for coronary angiography by either panel.

In the total cohort of 10 634 patients, 801 had incomplete baseline data (7.5%) and were excluded from the main analysis. Over 99% of patients were successfully matched at the Office for National Statistics and the NHS-wide clearing system, who informed us of the date and cause of death and hospital discharge. Average follow-up for the cohort was three years. Data on use of coronary angiography were obtained from the NHS-wide clearing system. We analysed a single combined end point of death from coronary heart disease and admission to hospital because of acute coronary syndromes. We used the primary discharge diagnosis after hospital admission to define non-fatal events.

Analysis

We fitted univariate and multivariable regression models to estimate rates of receipt of angiography by age group, sex, ethnic group, and deprivation. We used severity of symptoms to define appropriateness ratings. We used similar models to estimate the hazard

Hazard ratios for receipt of angiography (n=420) within three years of index clinic attendance of 1375 patients deemed appropriate for angiography

Variable	No of procedures/No of patients (%)	Hazard ratio (95% CI), P value	
		Univariate	Multivariable*
Age (years):			
≤49	42/112 (38)	1†	1†
50-64	217/669 (32)	0.82 (0.70 to 1.13), 0.227	0.80 (0.64 to 1.01), 0.058
≥65	161/594 (27)	0.66 (0.42 to 1.06), 0.083	0.60 (0.38 to 0.96), 0.031
Sex:			
Men	270/630 (43)	1†	1†
Women	150/745 (20)	0.39 (0.32 to 0.46), <0.001	0.42 (0.35 to 0.50), <0.001
Ethnicity:			
White	370/1112 (33)	1†	1†
South Asian	50/263 (19)	0.50 (0.32 to 0.78), 0.002	0.48 (0.34 to 0.67), <0.001
Deprivation (fifths):			
Less deprived (1-4)	360/1087 (33)	1†	1†
Most deprived (5)	60/288 (21)	0.58 (0.34 to 0.995), 0.048	0.66 (0.40 to 1.08), 0.099

*Adjusted for age, sex, ethnicity, deprivation (all four variables shown in table), and secondary prevention medication (aspirin, β blockers, statins).
†Reference.

of non-fatal acute coronary syndrome or death from coronary heart disease within five years of clinic visit according to whether patients underwent coronary angiography within three years of the index clinic attendance. To address the possibility of confounding by indication—those who did not undergo the procedure might have had too high a coronary risk—we adjusted for all other demographic variables, secondary prevention medication, and result of exercise ECG. The regression models were fitted for each demographic subgroup separately. The hazard ratios presented refer to the risk of an event related to not undergoing angiography. We assessed differences in the event rates between subgroups.¹⁹

RESULTS

Receipt of coronary angiography by appropriate patients

Overall, 69% of patients deemed appropriate for angiography did not undergo this investigation. Multivariable analysis shows that people aged over 65, women, south Asian patients, and those in the most deprived population fifth were less likely to receive coronary angiography compared with those aged under 50, men, white patients, and those living in the less deprived fifths, respectively (table). The inequitable pattern of receipt was not explained by comorbidity in patients who did not receive angiography; it persisted when we excluded from the analysis the 252 patients with a non-coronary admission in the year after the index visit to the chest pain clinic. When patients were assumed to have more severe angina we found similar results: multiple adjusted hazards ratios 0.64 (0.35 to 1.17) in 65 and older, 0.36 (0.30 to 0.44) in women, 0.53 (0.37 to 0.76) in south Asians, and 0.64 (0.43 to 0.96) in the most deprived fifth.

Coronary events by receipt of coronary angiogram in appropriate patients

For the whole cohort, prognosis of patients deemed appropriate for coronary angiography and who received the procedure was better than those who did not (hazards ratio 1.71, 95% confidence interval 1.24 to 2.34). Hazard ratios for a coronary event were >1 for all demographic groups, with a significantly increased risk for younger people, older people, men, women, white people, and the less deprived fifths (figure). Tests for interaction showed no significant difference between hazard ratios for the three age groups (P=0.203 and 0.223), between men and women (P=0.493), between white people and south Asians (P=0.426), and between the most deprived and less deprived population fifths (P=0.077). The worse prognosis for appropriate patients who did not undergo angiography persisted when we excluded those with non-coronary admissions in the year after index clinic attendance.

DISCUSSION

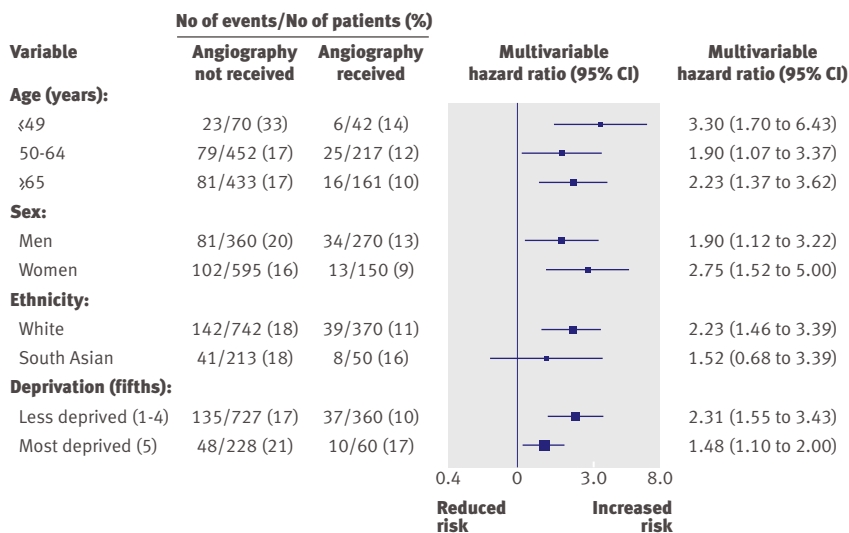
We found that older people, women, and south Asians who were deemed appropriate for coronary angiography were significantly less likely to receive the investigation. Deaths from coronary heart disease and admissions for unstable angina and myocardial infarction were more common in patients deemed appropriate for coronary angiography but who had not received it. The prognostic validity of appropriateness ratings for coronary angiography was apparent in all demographic subgroups, with hazard ratios for a coronary event >1 for appropriate patients who did not undergo angiography.

Strengths and weaknesses

The key contributions of this study are the robust measurement of inequity in use of coronary angiography, taking into account the appropriateness of the investigation and comorbidity; and demonstration of the detrimental effect of this inequity on prognosis. Our findings are probably applicable to patients attending chest pain clinics throughout the UK as the risk profile and prognosis of the cohort is comparable with that in other studies in chest pain clinics.²⁰

We used independent and reliable measures of coronary events and deaths. A strength of the study is the precise attribution of need for coronary angiography using appropriateness ratings. The sample size allowed robust comparison between demographic and clinical subgroups. Other strengths include the use of data on non-coronary admissions to test the effect of potential indication bias.

A potential limitation in this study is the broad classification of ethnicity and its source in the labelling of patients by clinicians. However, in an analysis of 33 patients in chest pain clinics, Zaman (J Zaman, personal communication) found a high agreement (κ of 0.77) between ethnic group according to the patients and the cardiologist. A second



Risk of coronary event (n=230) within five years from index clinic attendance in 1375 patients deemed appropriate for angiography comparing patients who did not undergo angiography with those who did. Forest plot shows multivariable hazard ratios. Univariate hazard ratios and further details are on bmj.com

WHAT IS ALREADY KNOWN ON THIS TOPIC

Potential inequities in the management of cardiovascular disease might have consequences in terms of prognosis

Access to cardiac investigation early in the course of chronic coronary disease might be inequitable

Few studies on inequitable use of investigations consider appropriateness of the procedures

WHAT THIS STUDY ADDS

In patients with angina of recent onset deemed appropriate for angiography, older patients, women, south Asians, and those living in the most deprived wards were less likely to undergo this procedure

Older patients, women, south Asians, and those from the most deprived areas deemed appropriate for coronary angiography who did not receive it had a higher rate of coronary events than those who did

limitation stems from the use of a deprivation measure that is based on ward rather than individual level socioeconomic status, and therefore the analysis is less precise. Finally, we did not assess potential inequities related to age, ethnicity, or deprivation in referral of patients with chest pain from primary care into specialist services.²¹

Relevance of findings

Inequities in use of coronary angiography could reflect differential referral of appropriate patients,²² although in a previous study differential referral for treatment proved not to be the cause of differences in rates of coronary revascularisation.¹³ Some variation in use of coronary angiography might result from patients' choices not to undergo the procedure.²³ There is a role for further qualitative research to elucidate why patients who are deemed appropriate for coronary angiography do not receive it. It is striking that there is underuse across our whole cohort, with less than a third of appropriate patients receiving it. This is consistent with the findings of the Euro Heart study from outpatient cardiology services in 34 countries.¹¹

Conclusion

The prospective validity of appropriateness ratings for cardiac investigation means that they are a robust basis for guidance to clinicians in rapid access chest pain clinics. Application of that guidance to decision making about individual patients might help to address inequitable access to angiography. Appropriateness ratings might have a wider application for investigative and treatment decisions in other clinical settings.

In memory of Sarah Cotter (1949-2004), who worked on an earlier version of this analysis.

Contributors: See bmj.com.

Funding: NHS service delivery and organisation research and development programme.

Competing interests: None declared.

Ethical approval: Trent multicentre research ethics committee and all local research ethics committees.

Provenance and peer review: Not commissioned; externally peer reviewed.

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Accepted: 26 March 2008