

THEORY AND METHODS

Performance of the WHO Rose angina questionnaire in post-menopausal women: Are all of the questions necessary?

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Objective: To assess the performance of a shortened version of the Rose angina questionnaire focusing on exertional chest pain.

Methods: Cross sectional analysis of 3987 women aged 60 to 79 years from 23 British towns. The performances of definite Rose angina (using data from the full Rose angina questionnaire) and exertional chest pain (using data from a subset of three questions from the Rose angina questionnaire) were assessed against a medical record of angina.

Results: The sensitivity (the proportion with a medical record of angina who were identified as having angina by the questionnaire) was 29.9% (95% confidence intervals 25.7% to 34.4%) comparing definite Rose angina to any medical record of angina since 1978 and 50.7% (45.9% to 55.5%) comparing exertional chest pain to any medical record diagnosis of angina. The positive predictive values of both questionnaires were similar. When the two questionnaires were compared with a gold standard of a primary care consultation for angina symptoms within the past five years the sensitivity of definite Rose angina was 33.0% (26.9% to 39.6%) and that of exertional chest pain was 51.8% (45.1% to 58.5%). Although the sensitivity of both versions of the questionnaire was greater in those aged 60–69 years compared with those aged 70–79 years, it remained higher in the exertional chest pain version of the questionnaire than for definite Rose angina based on the full version of the questionnaire in both age groups. Performance of either version of the questionnaire was not affected by occupational social class.

Conclusions: With respect to identifying women with a medical diagnosis of angina or those presenting to primary care with anginal symptoms, these results suggest that a shortened version of the Rose angina questionnaire focusing on exertional chest pain performs better than the full version. Other studies suggest that exertional chest pain is the crucial element of the Rose angina questionnaire with respect to predicting future coronary events. It is concluded that using a shortened version of the Rose angina questionnaire is adequate in epidemiological studies.

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The WHO Rose angina questionnaire¹ is widely used in epidemiological studies as a standardised method for assessing angina. Although it is a screening tool, rather than a diagnostic test,² and was originally designed for use in men (the figure used to localise the chest pain is a male torso, which is used in study populations of both sexes), it has been found to predict major coronary events in middle aged men³ and coronary heart disease mortality in both women and men.⁴ In studies of the ability of the Rose questionnaire to predict future events the crucial predictive component of the questionnaire seems to be experience of exertional chest pain, raising the possibility that some of the questions may be redundant. The entire questionnaire is long, taking up one side of A4 (see fig 1). Shorter questionnaires are one way in which response rates can be increased⁵ and response bias is an important concern in all epidemiological studies.

The aim of this study was to assess the performance of "definite Rose angina" defined using the complete Rose angina questionnaire (fig 1) and "exertional chest pain" defined using just three questions from the questionnaire (box 1) against a clinical diagnosis of angina in post-menopausal women.

METHODS

Data from the British Women's Heart and Health Study were used. Full details of the selection of participants and measurements have been previously reported.⁶ Women aged 60–79

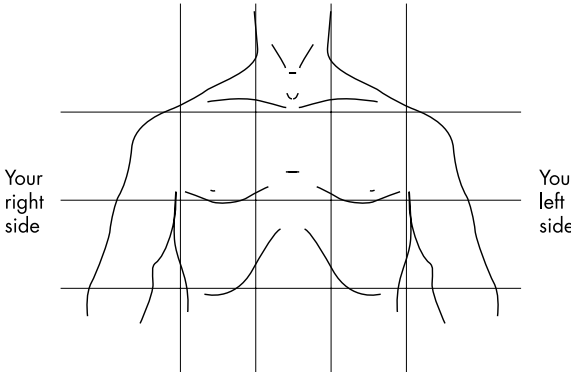
years were randomly selected from general practitioner lists in 23 British towns. A total of 4286 women (60% of those invited) participated and baseline data (self completed questionnaire, research nurse interview, physical examination, and primary care medical record review) were collected between April 1999 and March 2001. Local ethics committee approvals were obtained.

The full Rose Angina questionnaire (fig 1) was administered by trained research nurses at the interview. "Definite Rose angina" was defined according to standard criteria as chest pain or discomfort (yes to question 1) that fulfilled all of the following criteria: (a) was brought on by exertion (yes to either question 3 or 4); (b) was situated in the central or left anterior chest (site 4, 5, or 8 on diagram in question 2); (c) forced the subject to slow down or stop (question 5); (d) was relieved if the subject did so (yes to question 6), and (e) was relieved within 10 minutes (question 7). This definition was further subcategorised into severe (grade II) if the exertional chest pain comes on when walking on level ground (yes to question 3) and not severe (grade I) if the exertional chest pain only comes on when hurrying or walking up hill (no to question 3 and yes to question 4). Angina based just on the subset of three questions from the questionnaire (box 1) was defined as exertional chest pain (yes to question 1 and yes to either question 2 or 3). Again this was subcategorised as grade I and grade II as described above.

The performance of these two definitions of questionnaire angina were compared with a clinical diagnosis of angina

1 Do you ever have any pain or discomfort in your chest?
Yes/No

2 Where do you get this pain or discomfort?
Please mark **X** on the appropriate places



3 When you walk at an ordinary pace on the level does this produce the pain?
Yes/No/Unable

4 When you walk uphill or hurry does this produce the pain?
Yes/No/Unable

5 When you get any pain or discomfort in your chest on walking, what do you do?
Stop Slow down Continue at same pace Not applicable

6 Does the pain or discomfort in your chest go away if you stand still?
Yes/No

7 How long does it take to go away?
10 minutes or less
more than 10 minutes

Figure 1 Complete WHO Rose Angina questionnaire.

from the medical records. Detailed reviews of participants' general practice medical records (including general practitioner notes, hospital letters, and computer data) were undertaken independently by a member of the primary care medical team to identify all diagnoses of angina occurring since 1978, with their date of occurrence. The people undertaking the medical record reviews at each practice were unaware of any of the participants responses to the Rose angina questionnaire. Each questionnaire diagnosis of angina was compared with a "gold standard" of any record of a diagnosis of angina since 1978. As the questionnaire refers to symptomatic angina, and some patients with a diagnosis of angina in their medical records may be well controlled and symptom free, we repeated the analyses with a different "gold standard": consultation with a doctor with anginal symptoms within the five years before the Rose angina assessment was carried out.

Statistical analysis

Sensitivity (the proportion of those with angina in their medical records identified by the questionnaires); specificity (the proportion of those with no diagnosis of angina in their

Box 1 Shortened WHO Rose Angina questionnaire, focusing on exertional chest pain

- 1 Do you ever have any pain or discomfort in your chest?
– Yes/No
- 2 When you walk at an ordinary pace on the level does this produce the pain?
– Yes/No/Unable
- 3 When you walk uphill or hurry does this produce the pain?
– Yes/No/Unable

medical records who were defined by the questionnaires as not having angina); positive predictive value (the proportion identified by the questionnaire as having angina who actually had a medical diagnosis), and negative predictive value (the proportion identified by the questionnaire as not having angina who did not have a medical diagnosis) were expressed as percentages, with 95% confidence intervals calculated using the exact binomial method. Analyses were repeated stratified by age (two age groups: 60–69 years and 70–79 years) and occupational social class (manual occupational class and non-manual occupational class based on the participant's husband's longest held occupation for married women and her own longest held occupation for single women) to determine whether accuracy was affected by age or social class.

RESULTS

Of the 4286 participants in the British Women's Heart and Health Study 3987 (93%) had complete classifiable data for the Rose angina questionnaire; as the subset of "exertional" chest pain questions was derived from the complete questionnaire the response rate was identical for both applications of the questionnaire. Of the 299 women without complete classifiable data 237 had missing data on at least one question and 62 had unclassifiable responses, for example an indication that they were unable to walk on the level (question 3) and then a response indicating that they stopped or slowed down if the pain came on while walking (question 5). These women did not differ from those with complete data with respect to age (68.8 years versus 68.7 years, $p=0.95$), medical record diagnosis of myocardial infarction (2.03% versus 2.01%, $p=0.98$), angina (11.00% versus 12.00%, $p=0.44$), stroke (1.73% versus 2.00%, $p=0.31$), diabetes (4.56% versus 4.68%, $p=0.96$) or cancer (9.08% versus 9.70%, $p=0.72$). All participants had medical record review data. All further presented analyses refer just to the 3987 women with complete data on the angina questionnaire.

Table 1 shows the prevalence of definite Rose angina, exertional chest pain and non-exertional chest pain (as determined by the questionnaire) together with the prevalence of angina determined by the review of medical records and the prevalence of those presenting with anginal symptoms within the past five years. Thirteen per cent of the women had exertional chest pain; 7.7% definite Rose angina, and 11.0% a clinical diagnosis of angina in their medical records, with 5.6% having consulted with anginal symptoms in the past five years. Only 68 (1.7%, 1.3% to 2.2%) women had had revascularisation procedures (coronary artery bypass graft or balloon angiography) and 301 (7.5%, 6.7% to 8.4%) women were taking anti-anginal nitrate medication. Exclusion of these women from subsequent analyses did not materially affect our findings, and all presented results include these 369 women.

Table 2 shows the performance of definite Rose angina and exertional chest pain compared with a clinical diagnosis of angina. The sensitivity was higher with the exertional chest pain (51%) than when definite Rose angina (30%) was used. Specificity was slightly higher for definite Rose angina. The positive predictive value of both were similar. Sensitivity of

Table 1 Response to WHO Rose angina questionnaire. Women aged 60–79 years

	Number/total number of women	% (95% confidence intervals)
Questionnaire		
Exertional chest pain (total)	519/3987	13.0 (12.0 to 14.1)
Not severe grade I	378/3987	9.5 (8.6 to 10.4)
Severe grade II	141/3987	3.5 (3.0 to 4.2)
Definite Rose angina (total)	307/3987	7.7 (6.9 to 8.6)
Not severe grade I	232/3987	5.8 (5.1 to 6.6)
Severe grade II	75/3987	1.9 (1.5 to 3.4)
Medical record		
Clinically diagnosed angina	438/3987	11.0 (10.0 to 12.0)
Consultation with angina symptoms in past five years	224/3987	5.6 (4.9 to 6.4)

Table 2 Sensitivity, specificity, positive predictive value, negative predictive value of definite Rose angina, exertional chest pain against medical diagnosis of angina

	Definite Rose angina	Any exertional chest pain
Gold standard=any diagnosis of angina since 1978 in medical records		
Sensitivity % (95% CI)	29.9 (25.7 to 34.4)	50.7 (45.9 to 55.5)
Specificity % (95% CI)	95.0 (94.3 to 95.7)	91.6 (90.7 to 92.5)
Positive predictive value % (95% CI)	42.7 (37.1 to 48.4)	42.8 (38.5 to 47.2)
Negative predictive value % (95% CI)	91.7 (90.7 to 92.5)	93.8 (92.9 to 94.6)
Gold standard=medical record of anginal symptoms within the five years before completion of Rose angina questionnaire		
Sensitivity % (95% CI)	33.0 (26.9 to 39.6)	51.8 (45.1 to 58.5)
Specificity % (95% CI)	93.8 (93.0 to 94.6)	89.4 (88.4 to 90.4)
Positive predictive value % (95% CI)	24.1 (19.4 to 29.3)	22.5 (19.0 to 26.4)
Negative predictive value % (95% CI)	95.9 (95.2 to 96.5)	96.9 (96.3 to 97.4)

Table 3 Sensitivity, specificity, positive predictive value, negative predictive value of definite Rose angina, exertional chest pain against medical diagnosis of angina stratified by age group

	Definite Rose angina	Any exertional chest pain
Age 60–69 years (n=2165)		
Sensitivity % (95% CI)	31.1 (29.1 to 33.0)	56.5 (54.4 to 58.6)
Specificity % (95% CI)	95.1 (94.2 to 96.0)	91.8 (90.7 to 93.0)
Positive predictive value % (95% CI)	36.2 (34.2 to 38.2)	38.0 (36.0 to 40.1)
Negative predictive value % (95% CI)	93.9 (92.9 to 94.9)	96.0 (95.1 to 96.8)
Age 70–79 years (n=1822)		
Sensitivity % (95% CI)	29.1 (27.0 to 31.2)	45.2 (42.9 to 47.5)
Specificity % (95% CI)	94.9 (93.9 to 96.0)	91.4 (90.1 to 92.7)
Positive predictive value % (95% CI)	49.0 (46.7 to 51.3)	49.8 (47.5 to 52.1)
Negative predictive value % (95% CI)	88.9 (87.5 to 90.3)	90.9 (89.6 to 92.2)

both definite Rose angina and exertional chest pain increased when the comparison was made with those who had consulted with symptoms in the past five years. However, exertional chest pain still performed better with respect to sensitivity. The positive predictive values decreased for both tests because the prevalence of women who had presented with symptoms during the previous five years was lower than that for any diagnosis of angina.

Tables 3 shows the analyses stratified by age group (60–69 years versus 70–79 years). With respect to sensitivity both versions of the questionnaire performed better in women aged 60–69 years than those aged 70–79 years. However, a similar pattern to that for the whole cohort, between the two versions of the questionnaire, remained, with sensitivity being greater in both age groups for exertional chest pain than for definite angina. As the prevalence of angina is greater in older age groups the positive predictive values of both versions of the questionnaire was greater among older women. However,

positive predictive value was similar with both versions of the questionnaire (as in the main cohort) in the age stratified analysis. There was no difference in the performance of either version of the questionnaire when analyses were stratified by social class, for example sensitivity of definite Rose angina among women from manual social classes was 29.72 (27.65 to 31.79) compared with 28.86 (26.75 to 30.97) for non-manual social classes. Similar results for exertional chest pain were 49.00 (46.73 to 51.26) and 48.43 (46.08 to 50.77).

DISCUSSION

Our results suggest that in post-menopausal women using a shortened version of the Rose angina questionnaire, a subset of just three questions, performs as well as the full version. One difficulty with assessing the performance of any screening tool for angina is the lack of a clear gold standard.⁷ However, the consistency of our findings, using independent medical record diagnoses as the gold standard, with those of

Key points

- The entire Rose angina questionnaire is long, taking up at least one side of A4
- Response bias is an important problem in epidemiological studies and one way to reduce this is to maximise the response rates by keeping questionnaires as short as possible
- Prospective studies suggest that the crucial component of the Rose angina questionnaire with respect to predicting future coronary events is exertional chest pain
- In this study a shortened version (three questions) of the Rose angina questionnaire focusing on exertional chest pain performed better than using data from the full questionnaire when both were compared with a medical record of a diagnosis of angina or consultation within the past five years with anginal symptoms
- These findings were not changed when results were stratified by age group or by occupational social class

Policy implications

- A shortened (three question) version of the Rose angina questionnaire is adequate as a screening tool for angina in epidemiological studies
- With either the full or shortened version of the questionnaire at least 50% of post-menopausal women with a medical record diagnosis of angina will not be identified by the questionnaire

two prospective studies that suggested that questions about exertional chest pain predict future ischaemic events to the same extent as definite Rose angina, in women and men^{3,4} support the idea that the shortened version of the questionnaire is valid. Though higher for the shortened version of the questionnaire, the sensitivity was low for both versions—the shortened version would identify only 52% of women with symptoms defined as angina in their medical records over the preceding five years. The remaining 48% may have been asymptomatic at the time of the questionnaire. However, the low sensitivity of the Rose angina questionnaire highlights its limitations with respect to assessing the population disease burden of angina.

Similar proportions of severe angina (27% of those with definite Rose angina and 25% of those with exertional chest pain) were defined as having severe (grade II) symptoms. The better performance of the shortened version of the questionnaire is therefore unlikely to be attributable to differences in proportions of severity of angina between the two definitions. This study assesses the performance of the full and shortened version of the questionnaire cross sectionally with respect to a clinical diagnosis. An important aspect of the Rose angina questionnaire is its ability to predict future cardiovascular events. With long term follow up of these women we will further assess the performance of the full and shortened version of the questionnaires to determine whether results of previous studies with respect to the prediction of future events are confirmed in this group of post-menopausal women.^{3,4}

In conclusion we would suggest that a shortened version of the Rose angina questionnaire performs better than the full version with respect to identifying patients with clinical angina in post-menopausal women. Although both versions of the questionnaire perform better in younger compared with older women the difference between the full and a shortened version of the questionnaire remained in both age groups suggesting that the shortened version may be suitable for all age groups. Prospective studies suggest that a shortened version of the questionnaire focusing on exertional chest pain may also be adequate for men,^{3,4} and our results suggest that socioeconomic position does not importantly affect the performance of either version of the questionnaire when administered by a research nurse.

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Contributors

All authors developed the study aim and design. DAL undertook the initial analysis and coordinated writing of the paper. All authors contributed to the final version.

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