It seems that in normal young adults the potent testosterone metabolite dihydrotestosterone, which binds much more avidly with the androgen receptor,[9] is the most important and perhaps the only important androgen in determining male sexual behaviour as reflected in the frequency of orgasms, whereas physiological concentrations of serum oestrogen and adrenal steroids do not seem to play an independent part of comparable importance.

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Prevalence of knee problems in the population aged 55 years and over: identifying the need for knee arthroplasty

Alan Tennant, Jon Fear, Anne Pickering, Micky Hillman, Alison Cutts, M A Chamberlain

Abstract

***Objective*—To determine the prevalence of knee problems in people aged 55 years and over and identify those who should be considered for knee arthroplasty.**

***Design*—Postal survey; questionnaires were sent to a multistage stratified probability sample of residents of North Yorkshire Health Authority aged 55 and over.**

***Setting*—A health district with a population of 210 000 aged 55 and over.**

***Results*—An initial four page postal questionnaire produced an 86% response rate among 18 827 eligible patients. A subsequent detailed questionnaire sent to 1277 patients with knee problems (with a response rate of 78%) then determined the prevalence of severe pain and severe disability. Pain and disability consistent with the need to consider arthroplasty was found in 20·4/1000 (95% confidence interval 18·0 to 23·1); of these, 4·1 (2·7 to 5·8)/1000 had extreme disability. Age and sex specific rates in men who might benefit from arthroplasty were, in those aged 55-64, 12·9 (8·4 to 19·0)/1000; aged 65-74, 12·1 (7·4 to 18·4)/1000; aged 75 and over, 20·3 (12·9 to 30·5)/1000. In women aged 55-64 the rates were 12·9 (8·6 to 18·7)/1000; aged 65-74, 19·6 (13·9 to 26·7)/1000; aged 75 years and over, 42·6 (34·3 to 52·4)/1000.**

***Conclusions*—Total knee replacement has until recently been considered unreliable and often seen as a last resort for many with severe knee problems. Advances in prosthesis design and surgical and anaesthetic techniques have transformed this procedure into a reliable option with a potential for reducing disability and dependency in a large number of people in the community. Understandably, the prevalence pool of those who may benefit is large; health authorities and, increasingly, general practitioners should consider purchasing more total knee replacement surgery to offer real choice to those in need.**

Rheumatology and Rehabilitation Research Unit, Research School of Medicine, University of Leeds, Leeds LS2 9NZ
Alan Tennant, *Charterhouse principal research fellow*
Micky Hillman, *research fellow*
Alison Cutts, *senior research fellow*
M A Chamberlain, *Charterhouse professor of rheumatological rehabilitation*

North Yorkshire Health, York YO1 1PE
Jon Fear, *consultant in public health medicine*
Anne Pickering, *health research manager*

Correspondence to:
Mr Tennant.

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Introduction

In the United Kingdom it has been known for over 20 years that the prevalence of disability varies considerably by locality.[1-2] Given that musculoskeletal disorders cause about half of all disability,[3] it would not be surprising to find that severe disability associated with, for example, knee problems also varies within locality, despite the common prevalence of underlying disease. As well as variations by age and sex in disability,[3] other factors such as occupation can increase the risk of problems.[4-5] Disability levels are also likely to be affected by the historical quality of the management of disease from place to place as well as the success of past local surgical activity.[6]

The recent reforms within the NHS have placed an obligation on purchasing authorities to assess the health needs of their residents. This requires disability to be assessed locally, as national estimates may be of limited value.[7] We describe the results from a survey designed to enable a purchasing authority to determine the numbers of people aged 55 years or more who report problems with their knees such that they might benefit from knee arthroplasty.

Methods

QUESTIONNAIRES

A two stage random sample using postal questionnaires was commissioned by North Yorkshire Health. The initial questionnaire (phase 1) was posted at the beginning of June 1993. Non-respondents were sent a maximum of two further copies. The questionnaire asked about activities of daily living, dependency, and disability and asked respondents to indicate on a manikin which joints had caused problems for more than six weeks in the past three months.

A more detailed questionnaire (phase 2) was sent to all those who reported a problem with their knee and difficulties in daily living. This 12 page questionnaire included the index of severity of osteoarthritis of the hips and knees developed by Lequesne and colleagues to identify those in need of surgery.[8] This instrument gives a score of 0-24 points for each joint, with a threshold of 10-12 points for consideration for surgery. We set our threshold at 11 points, but after exploratory data analysis we decided to increase the threshold to 14 points (equivalent to Lequesne and colleagues' "extremely severe" group), as there was poor discriminant validity for pain and disability in the lower 11-13 point group compared with those not needing arthroplasty (10 points and below). In addition, on examining the distribution of scores we added an

"extreme" level (over 20 points) as we found many people above the 14 point threshold. This gave two groups: those needing to be considered for arthroplasty (conforming to the threshold of the Lequesne group of "extremely severe"—14 points) and those we regarded as in extreme need (21 or more points).

The medical outcomes study short form 36 (SF36)[9] and the Stanford health assessment questionnaire[10] were included to provide evaluations of physical function, pain, and effects on everyday life such as social functioning.

The study was piloted on a sample of 1000 patients aged 19 and over in a general practice in north Leeds, where a diagnostic index was available to validate self reported disease. Almost all (93%) of those aged 50 years and over who reported knee pain associated with disability (the entry criteria into phase 2) also reported that they had been told by their doctor that they had arthritis. A random sample (15%) was taken from these 1000 patients and used to match the information from the diagnostic index to phase 2 entry criteria. All of those aged 50 years and over who met the phase 2 entry criteria were identified as having arthritis.

LOCATION AND SAMPLE SIZE

The population register of the North Yorkshire Family Health Services Authority, which is coterminous with North Yorkshire District Health Authority, was used as a sampling frame. The over 55 population is estimated at about 210 000. Almost two thirds (65%) of residents live in small towns or rural communities.

The sample size was chosen to achieve a systematic random sample of 3/1000 incidence of knee replacement among those aged 55-64 years; 6/1000 for 65-74 years, and 15/1000 for 75 years and over. These figures were chosen from the available literature, but accurate figures for incidence or prevalence do not yet exist.[11]

RESPONSE AND BIAS

An 86% response rate was achieved for the phase 1 questionnaire. Those who responded were slightly younger than non-respondents (mean age 65·5 *v* 66·3 years; $t=5·0$, $P<0·01$). Women were more likely to respond than men ($\chi^2=46·6$, $P<0·01$). For each of the response waves the prevalence of knee problems was found to be similar; thus, as successive sets of non-respondents were followed up, reported prevalence remained the same. In this way response bias with respect to the attribute of interest was deemed to be absent.[12] Phase 2 achieved a 78% response rate 1000/1277; on this occasion there was no evidence of bias by salient topic (for example, reported level of dependency at phase 1), or by age or sex. Data were therefore weighted by non-response for age and sex to take account of the bias found at phase 1. For prevalence estimates, 95% confidence intervals were calculated according to Schoenberg.[13]

Results

PREVALENCE

Table I shows the age-sex specific prevalence of those above the lowest (14 point) threshold on the Lequesne scale. Estimated need for knee arthroplasty among those aged 75 years and over, at 35·0/1000, was nearly three times that for those aged 55-64 years (12·9/1000). The estimated rate for women was nearly twice that for men, arising largely from the distribution in the eldest group. Overall, 20·4 per 1000 people aged 55 years and over were found to be so disabled that they might benefit from arthroplasty.

Estimated need among those considered "extreme" was almost 10 times higher among those aged 75 years and over than in the youngest group (10·7 *v* 1·1/1000; table I). Women were estimated to have three times as great a need as men (5·7 *v* 1·9/1000). Overall, 4·1/1000 were considered extreme, and for North Yorkshire this would translate into a demand of about 850 knee arthroplasties.

Estimated demand arising from those at the "extremely severe" level was substantially higher. Age and sex differences were not as great as in the "extreme" group, but overall 16·4/1000 should be considered. This translates into a potential demand for over 3000 knee arthroplasties in North Yorkshire Health Authority.

DISABILITY

Because of the high levels of demand identified, the results were compared with findings of other instruments to confirm levels of pain and disability across the different severity groups. Of the SF36's eight dimensions, table II shows physical and social functioning, bodily pain, and vitality, which is essentially a measure of fatigue. The validation scores from a sample of those not reporting problems that would have led to entry to the second stage sample reflect the best scores that could be achieved for this age group. The severity of symptoms in the groups in phase 2 show that all those entered into the second stage, even those considered not to be in need of arthroplasty, had significantly lower (that is, worse) scores on all these dimensions than the validation sample.

Generally there were downward (worse) trends in SF36 subscale scores as severity increased. Both the extremely severe and extreme groups had scores significantly ($P<0·05$) lower in all dimensions than those deemed not in need of arthroplasty. Thus the discriminant validity of the grouping based on the Lequesne questions is confirmed by the scores from the SF36.

TABLE I—*Number of people aged 55 and over who should be considered for knee arthroplasty, overall and according to severity of pain and disability. Values are rate per 1000 (95% confidence interval)*

Age	Men	Women	All
		Overall	
55-64	12·9 (8·4 to 19·0)	12·9 (8·6 to 18·7)	12·9 (9·7 to 16·8)
65-74	12·1 (7·4 to 18·4)	19·6 (13·9 to 26·7)	16·2 (12·4 to 20·7)
≥75	20·3 (12·9 to 30·5)	42·6 (34·3 to 52·4)	35·0 (29·0 to 42·3)
Total	14·3 (11·1 to 18·0)	25·1 (21·5 to 29·4)	20·4 (18·0 to 23·1)
		Extreme pain and disability	
55-64	1·0 (0·1 to 3·54)	1·3 (0·3 to 3·8)	1·1 (0·4 to 2·7)
65-74	1·1 (0·1 to 3·79)	2·1 (0·6 to 5·4)	1·6 (0·6 to 3·5)
≥75	5·1 (1·9 to 11·1)	13·6 (9·1 to 19·6)	10·7 (7·4 to 14·8)
Total	1·9 (0·9 to 3·6)	5·7 (4·0 to 7·8)	4·1 (2·7 to 5·8)
		Extremely severe pain and disability	
55-64	12·0 (7·7 to 17·8)	11·6 (7·5 to 17·2)	11·8 (8·7 to 15·6)
65-74	11·0 (6·6 to 17·1)	17·5 (12·3 to 24·2)	14·6 (10·9 to 18·9)
≥75	15·3 (8·9 to 24·4)	29·1 (22·3 to 37·2)	24·3 (19·4 to 30·4)
Total	12·4 (9·4 to 15·9)	19·4 (16·2 to 23·3)	16·4 (14·1 to 18·9)

TABLE II—*Physical and social functioning scores, bodily pain, and vitality scores from the SF36 in people with knee pain and disability*

Group	Physical function	Social function	Bodily pain	Vitality
Phase 1†				
Validation	81·4	91·2	82·4	67·2
Phase 2‡				
No need for arthroplasty	34·4	62·6	39·9	41·8
Extremely severe pain	17·0*	45·8*	27·8*	35·0*
Extreme pain	3·3*	31·8*	21·9*	33·0*

*($P<0·05$) in comparison with no need for arthroplasty (Tukey's HSD multiple range test).
†Scores from sample of those not reporting problems that led to entry into phase 2 of study.
‡Scores on scale of Lequesne *et al*: no need for arthroplasty=0-13; extremely severe pain=14-20; extreme pain=21-24.

use of health services

Of those who should be considered for arthroplasty, how many have had access to specialist care, or indeed are currently on the waiting list for surgery? Table III shows that almost all of those interviewed at the second stage had seen their general practitioner within the last year about their joint problems. Typically, two thirds had seen a specialist about their joint problems (not necessarily knees) at some time, including all the younger respondents who were in extreme need. About two thirds of those aged 55-64 years were currently under the care of a hospital doctor compared with less than a quarter of those aged 75 years and over. This age variation is accentuated in the waiting list for surgery. Of those with extreme pain and disability, a quarter (26%) of those aged 55-64 were on the waiting list, but none of those aged 75 or over reported being on the waiting list. Only 2% of those aged 75 or over who were in the extremely severe group were on the waiting list, yet almost half of the total potential demand arises from this group.

TABLE III—*Access to health care by people with knee pain and disability. Values are percentages of respondents to postal questionnaire (estimated numbers in North Yorkshire population)*

Age and level of pain and disability	Saw general practitioner in past year	Saw specialist		On waiting list	Estimated No in North Yorkshire
		Ever	Currently		
55-64:					
Extremely severe	99 (902)	86 (783)	61 (556)	9 (82)	(911)
Extreme	100 (88)	100 (88)	72 (63)	26 (23)	(88)
65-74:					
Extremely severe	96 (1005)	77 (806)	44 (461)	10 (105)	(1047)
Extreme	100 (116)	56 (65)	44 (51)	14 (16)	(116)
⩾75:					
Extremely severe	95 (1398)	67 (986)	26 (383)	2 (29)	(1472)
Extreme	100 (645)	62 (400)	24 (155)	0	(645)
Total	97 (4154)	73 (3128)	39 (1669)	6 (255)	(4279)

Discussion

Knee replacement surgery has for a long time been considered as a last resort for those with knee problems. However, the advent of reliable prostheses and improvement in surgical and anaesthetic techniques have now made knee arthroplasty an option for many with severe pain, disability, and reduced quality of life.[14-16] The historical reluctance to refer for surgery may explain why the prevalence pool is likely to be large, and the current survey confirms this. Yet in many parts of Britain contracting for knee arthroplasty falls well behind that for hip replacements.[11] North Yorkshire is no exception, with the ratio of recent provision for knees and hips being about 1:2.

Many matters need to be resolved. Patients identified in this survey have levels of pain, disability, and dependency that give strong indications for surgery,[17] but we do not know how many would agree to surgery if offered the opportunity. Though almost all (98·2%) reported that they had been told by their doctor that they had arthritis, we considered carefully how many would be unlikely to be fit for surgery so as to arrive at realistic estimates. The estimates given above exclude patients with known central nervous system disorders such as Parkinson's disease and stroke. They also exclude those with heart disease, dementia, and a body mass index above the 95th centile (above 32). Clinical follow up may show that we need to exclude some patients for other reasons such as severe deformity or peripheral vascular disease.

One final (and perhaps major) complication is that purchasers are themselves changing. In North Yorkshire almost two thirds of general practitioners are now fundholders reponsible for purchasing both hip and knee surgery. We calculated that meeting extreme need for knee replacement surgery would consume 15-20% of the average practice's annual inpatient budget. How can any inroads into the potential demand be expected under these circumstances?

We have shown that patients over 75 years old have poor access to specialist rheumatological and orthopaedic services, and it is thus important to develop an adequate audit of these matters. General practitioners may have a view about surgery for older patients: do they think knee arthroplasty is a poor choice for them? Answers to this question may go some way to explaining variation in referral rates[18,19] and why there seems to be an age bias in access to such care.

Key messages

- Recent improvements in surgical techniques, anaesthesia, and the reliability of new knee replacements make knee arthroplasty an option for reducing disability and dependency
- About two in every 100 people aged 55 years or older might benefit from knee replacement surgery
- Most of those aged 75 years and over who might benefit are not being referred to the hospital, and hardly any are on the waiting list for surgery
- An audit of access to specialist services might help improve services, especially for those aged 75 years and over
- The knee replacement programme provides a substantive marker of the success of the current health service reforms

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