

Influence of postal distribution of The Royal College of Radiologists' guidelines, together with feedback on radiological referral rates, on X-ray referrals from general practice: a randomized controlled trial

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Background. The Royal College of Radiologists (RCR) have produced regularly updated guidelines on radiological referrals since 1990. A small study in 1992 showed postal distribution of guidelines reduced general practitioners' referrals over the subsequent 9 weeks. However there have been no randomized trials of the longer term effects of radiological guidelines and feedback on referral rates on X-ray requests from primary care.

Objectives. To see if the introduction of radiological guidelines into general practices together with feedback on referral rates reduces the number of GP radiological requests over one year; and to explore GPs' attitudes to the guidelines.

Methods. Sixty-nine practices referring patients to St George's Healthcare Trust were randomly allocated to intervention or control groups. In February 1995 a GP version of the RCR guidelines was sent to each GP in the 33 practices in the intervention group. After 9 months intervention, practices were sent revised guidelines with individual feedback on the number of examinations requested in the past 6 months. The total number of requests per practice was compared for the year before and the year after the introduction of the guidelines. Control practices were sent the guidelines at the end of the study. All doctors were sent a questionnaire about the guidelines.

Results. A total of 43 778 radiological requests were made during the two years 1994–1996. In practices receiving the guidelines there was a 20% reduction in requests for spinal examinations compared with control practices ($P < 0.05$). This corresponded to the effect reported by GPs. There was also a 10% difference between the groups in the total number of requests made, but due to wide interpractice variation in referral rates this failed to reach statistical significance.

Conclusions. Introduction of radiological guidelines together with feedback on referral rates was effective in reducing the number of requests for spinal examinations over one year. Wider use of GP-orientated guidelines with regular updating and feedback might save costs and reduce unnecessary irradiation of patients.

Introduction

Effective implementation of guidelines in general practice often involves considerable participation from GPs in drawing up of the guidelines and attending

teaching sessions.^{1–4} As the number of guideline topics which are relevant to GPs increases, it may be impractical to use such intensive methods. There is also conflicting evidence whether end user involvement in drawing up guidelines improves their implementation.²

The Royal College of Radiologists (RCR) first produced guidelines for radiological referral in 1990⁵ and subsequently updated them in 1993, 1995 and 1998. However a survey published in 1996 showed that 17% of GPs had not heard of these guidelines and a greater number did not use them regularly.⁶ We chose a simple, postal distribution of a locally produced version of the

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RCR guidelines and used routinely collected hospital data on GPs' radiological requests. A previous small study of the introduction of GP X-ray guidelines had shown some changes in referrals over a brief 9 week follow-up period.⁷ Our aims were to see if introduction of guidelines together with feedback on radiological referral rates was effective in reducing GPs' radiological referrals over one year, and to use a postal questionnaire to explore doctors' attitudes to the guidelines.

Methods

All 69 practices (175 doctors) referring more than 50 patients in a six month period (1.6.93–30.11.93) to St George's Healthcare Trust for diagnostic radiology were included in the study. Practices were randomly allocated to an intervention or a control group using a stratified randomization. Ten strata were defined using number of partners (1 or 2, 3 or more), referral rates (>100 or ≤100 in six months), fundholding status and having received guidelines in a previous study.⁷ Thirty-three practices were randomly allocated to the intervention group and 36 to the control group.

The 1993 RCR guidelines were 73 pages long and contained much that was not relevant to general practice. We selected guidelines for examination of chest, hips, knees, spine, skull and sinuses and printed these verbatim on two sides of a sheet of A4 paper which was then laminated. These guidelines were sent with a covering letter to all 91 doctors in the intervention group in February 1995 (Appendix 1).

In September 1995 we sent these doctors a questionnaire about the guidelines (Appendix 2). We revised

our guidelines in the light of their responses and of new national guidelines published in 1995. In November 1995 we redistributed these to intervention practices accompanied by individual feedback on their referral rates. The feedback compared the number and type of X-rays the practice had requested in the two six month periods: February to August 1995 and the same months in 1994. This information was obtained from computerized data on all patients referred to St George's Healthcare Trust for diagnostic radiology. We also included a graph of the average radiation dose for different examinations (Appendix 3). At the end of the study we sent guidelines to all doctors in the control group followed by the questionnaire three weeks later.

Statistical analysis

For each practice the number of requests before and after the introduction of the guidelines were compared by calculating the ratio of the number of requests in the year after the introduction of the guidelines (1.2.95 to 31.1.96) to the number of requests the year before the guidelines were introduced (1.2.94 to 31.1.95).⁸ The mean percentage reduction for intervention and control groups was calculated weighting⁹ for the number of X-rays in the year before the guidelines were introduced, and confidence intervals calculated using the *t*-distribution. The percentage reduction in the intervention and control groups were compared using a *t*-test. In this way the percentage reduction is the same as the reduction calculated from the total numbers in each group but the confidence intervals allow for randomization by practice rather than patient. Practices making large numbers of requests are therefore given more weight.

TABLE 1 Number of X-rays requested in the year before and the year after the introduction of guidelines

Type of examination requested		Number of practices	All practices			
			Before guidelines	After guidelines	% reduction (95% CI)	Difference between intervention and control (95% CI) ^a
All	Intervention	33	11 960	11 025	8 (0 to 16)	10 (–1 to 21)
	Control	36	10 300	10 493	–2 (–9 to 6)	
Chest	Intervention	33	3950	3712	6 (–3 to 15)	4 (–7 to 16)
	Control	36	3463	3410	2 (–6 to 9)	
Limbs and joints	Intervention	33	4275	4253	1 (–10 to 11)	10 (–5 to 25)
	Control	36	3646	3986	–9 (–20 to 2)	
Spine	Intervention	33	2655	2181	18 (9 to 27)	20 (4 to 36)*
	Control	36	2171	2221	–2 (–15 to 11)	

^a The reduction is calculated for each practice then analysed using a *t*-test weighting by the number of requests made in the year before the introduction of the guidelines.

**P* < 0.05

Results

Number of radiological requests

Table 1 shows the number of referrals made in each of the main types of examination during the study year (1/2/95 to 31/1/96) and the previous year. The number of referrals for all spinal examinations fell by 18% in the intervention group compared with a 2% rise in the control group ($P < 0.05$). Fifty-six per cent of these requests were for examination of the lumbar spine. Taking requests for the lumbar spine alone, there was a reduction of 15% in the intervention group compared with a rise of 5% in the control group, giving a difference of 20% between the groups (95% CI 3–37). Overall an 8% reduction in total numbers of radiological requests was observed in the intervention group compared with a 2% increase in the control group, giving a difference of 10% between the two groups, but this did not achieve statistical significance.

Questionnaire

A total of 108 GPs replied to the questionnaire (57 intervention, 51 control) giving a response rate of 60%. Ninety-two per cent of GPs could remember receiving the guidelines and 88% found them easy to use. Seventy-seven per cent of the GPs thought the guidelines had changed their clinical practice (Table 2). Where a reason was given, this was usually that they thought they were referring fewer patients for X-ray.

Table 3 gives the guidelines which GPs considered the most/least helpful.

Thirty GPs specifically stated that the spine guidelines were the most useful with another 13 mentioning the “six-week rule”. This applies to clinical situations such as backache or hip pain where the problem often resolves with time, and radiology is recommended if symptoms are still a problem after six weeks.

Table 4 gives the factors which GPs gave which might make them ignore the guidelines. The most common reason given was pressure from patients. Some GPs commented that this is increasing.

Discussion

This is the first randomized controlled trial of the effect of the RCR guidelines plus feedback on GPs’ radiological

TABLE 2 *Have the guidelines altered your own clinical practice?*

	<i>n</i>	%
Yes, definitely	10	10
Yes, a bit	68	67
Not at all	23	23
Total	101	

TABLE 3 *Which guidelines were most/least useful?*

Type of examination	Number of replies for each category	
	Most useful	Least useful
Spine	30	2
Chest	13	11
Six week rule	13	1
All	12	0
Head	9	7
Sinus	8	1
Ankles and feet	5	4
Pelvis and hips	5	2
Skeletal system	2	0
Foreign body	1	0
Shoulder	1	0
Comments	1	0
Coccyx	0	2

TABLE 4 *What factors might make you decide to ignore the guidelines?*

	No. of replies for each category
Patient pressure	46
Specific clinical situations/clinical judgment	30
Patients reassurance/anxiety/psychological help	22
Degree of symptoms	11
Legal reasons	9
Not GP owned	2
Specialist referral	1

referrals over one year. The 20% reduction in referrals for lumbar spine examinations is particularly important in view of the high radiation dose. Since most of the guidelines are negative indicating when a radiological examination is not appropriate,^{5,10} any influence of the guidelines is likely to reduce the number of requests made. The overall reduction of 10% in number of requests, although not statistically significant, is comparable to the 13% observed reduction in the Royal College of Radiologists’ audit of GP referrals.¹⁰ Our study was of similar size but was a randomized trial and the analysis took into account the large variation in referral rates both between practices and from year to year.

The study design also avoided a common problem with guideline intervention trials, that of volunteer bias, where practices have to be actively involved in the study

and only the enthusiasts may agree to take part. This may bias the results in favour of the intervention when compared to routine introduction of guidelines to an unselected group of doctors. In this study these effects were minimized by randomizing all referring practices and using routinely collected data to assess the impact of the guidelines.

The RCR study was much more intensive, involving the setting up of a committee to oversee the introduction of the guidelines and meeting with all the large practices. In contrast, our intervention was designed to be low cost and one that could be implemented with few extra resources. In both studies the number of X-rays requested was used as the main outcome measure but with the caveat that this does not necessarily reflect the quality of individual decision making. In addition, both studies included feedback and reminders which may reinforce guideline interventions.

Barriers to implementing the guidelines came mainly from pressure from patients to refer for X-ray. Most guideline implementation studies have concentrated on educating the health professionals involved and have largely ignored patient groups. In future guideline implementation strategies may need to involve patient education as well.

This study shows that postal distribution of a locally produced version of national radiological guidelines with feedback on referral rates was associated with a significant reduction in referrals for spinal examinations. This corresponded with the effect reported by doctors. Wider use of GP-orientated guidelines with regular updating and feedback might save costs and reduce unnecessary irradiation of patients.

Acknowledgement

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Appendix 1

Making the Best Use of a Department of Radiology 1995 Guidelines for General Practitioners

Clinical Situation	Guideline	Comment
Chest		
Pre-employment or screening medicals	Not indicated	Not justified except in a few high-risk categories e.g. at risk immigrants with no recent X-ray
Chest wall pain (as opposed to pleuritic pain)	Six week rule* *See footnote	Conditions such as Tietze's disease do not show on X-ray. Main purpose is reassurance
Chest trauma mild	Not indicated routinely	Showing a rib fracture does not alter management
Heart disease/hypertension—follow-up	Not indicated routinely	Only if signs or symptoms have changed
Upper respiratory tract infection e.g. cough	Not indicated	
Chronic obstructive airways disease/asthma—follow up	Not indicated routinely	Only if changed signs or symptoms
Pneumonia—adults—follow-up	Indicated	To confirm clearing in middle-aged and elderly; pointless to re-examine at less than 7–10 day intervals as clearing can be slow
Skull and Facial Bones		
Headaches	Not indicated	Skull, sinus or cervical spine X-rays are of little use in the absence of focal signs or symptoms
Dementia, epilepsy	Specialists only	A skull X-ray is very rarely of value. CT, MRI and radionuclide imaging may be more informative
Sinusitis	Not indicated routinely: specialist request	Thickened mucosa is non-specific and may occur in asymptomatic subjects. Refractory cases need ENT opinion
Cervical Spine		
Acute neck pain without trauma	Six-week rule*	Usually due to disc/ligamentous changes undetectable on X-ray.
Chronic neck pain	Not indicated routinely	Degenerative changes begin in early middle-age regardless of symptoms. X-ray only indicated for neurological signs or suspicion of non-degenerative disease.
Suspected vertebro-basilar disease	Not indicated	Degenerative disease is universal in middle-age and there is no way of telling if the vertebral arteries are affected.
Thoracic Spine		
Pain without trauma	Six-week rule*	Degenerative changes are invariable from middle-age Examination rarely useful in the absence of neurological signs or evidence of metastases or infection
Lumbosacral Spine		
Acute pain without trauma	Six-week rule*	Most such patients recover: X-rays seldom show relevant findings. Older patients with possible osteoporotic vertebral collapse are an exception

Appendix 1 Continued

Clinical Situation	Guideline	Comment
Chronic back pain with no clinical evidence of infection or neoplasm ? Disc prolapse	Not indicated routinely	Degenerative changes are universal and non-specific from middle-age. Main value in younger patients (e.g. spondylolisthesis or ankylosing spondylitis) or patients over 60 with possible vertebral collapse. Acute back pain is usually due to conditions which cannot be diagnosed on plain films. Persistent, progressive, unremitting pain, or neurological signs are exceptions
Before physiotherapy	Not indicated routinely	
Pelvis and Hips		
<i>Combined lumbar spine and pelvis examination is unnecessary: the sacroiliac joints are shown on lumbar spine views</i>		
Hip pain—full movement	Not indicated routinely	Many middle-aged patients have short-lived 'twinges'. Only if symptoms and signs are persistent with well advanced osteoarthritic changes will hip replacement be contemplated
Hip pain—limited movement	Six week rule*	
Coccyx		
Coccydynia/injury to coccyx	Not indicated	Neither condition has X-ray findings which influence management: tenderness on palpation is diagnostic of coccydynia
Knees		
Knee pains—without locking or restricted movement	Not indicated routinely	Most symptoms are from soft tissues. Osteoarthritic changes are common from late middle-age. X-rays should be taken at the time of an orthopaedic or rheumatological consultation, after full clinical examination
Knee pains with locking or restricted movement	Indicated	Many films are normal but X-ray is necessary to identify opaque loose bodies
? Osgood–Schlatter's disease	Not indicated	Apophyseal irregularity is non-specific: the key finding is soft tissue swelling so X-rays add nothing to clinical examination
Ankles and Feet		
Plantar fasciitis? calcaneal spur	Not indicated	Plantar spurs are common incidental findings. The pain is from plantar facial 'inflammation' seldom detectable on X-ray
Ankle injury	Not indicated routinely	X-ray is indicated if there is both bony tenderness and soft tissue swelling

These guidelines are not intended to replace clinical judgement but to support it in times of doubt or difficulty. They are based on formal studies. All X-rays are potentially carcinogenic or teratogenic. When requesting any radiological investigation please consider whether the result will affect patient management. Relevant history and clinical findings should be given.

*Six week rule: situations where the clinical problem usually resolves with time therefore radiology recommended only if symptoms are still a problem after 6–8 weeks.

Appendix 2

Questionnaire on GP X-ray referral guidelines

Please ring the number corresponding to appropriate answer

- | | |
|---|--|
| <p>1. What proportion of your patients requiring X-ray examination do you refer to St George's Healthcare Trust (St George's or the Bolingbroke)?</p> <p>Has this proportion changed in the past 12 months?</p> | <p>1 Less than 25%
2 25%–75%
3 More than 75%</p> <p>1 Yes, Increased
2 Yes, Decreased
3 No</p> |
| <p>2. Did you receive a copy of 'Making the Best Use of a Department of Radiology: 1995 Guidelines for General Practitioners'?</p> | <p>1 Yes
2 No</p> |
| <p>3. Did you find the format (one laminated sheet of A4) easy to use? If no, please explain</p> | <p>1 Yes
2 Not used
3 No</p> |
| <p>4. How relevant are the guidelines to your own clinical practice?</p> | <p>1 Very relevant
2 Fairly relevant
3 Little relevance
4 Not at all</p> |
| <p>5. Have the guidelines altered your referral practice If yes, in what way?</p> | <p>1 Yes, definitely
2 Yes, a bit
3 Not at all</p> |
| <p>6. Which of the guidelines are most useful?</p> | |
| <p>7. Which of the guidelines are least useful?</p> | |
| <p>8. Are there other clinical situations for which guidelines for plain X-ray should be included?</p> | |
| <p>9. What factors might make you decide to ignore the guidelines?</p> | |
| <p>10. Has your practice developed any practice guidelines for X-ray referral? If yes, please give details</p> | <p>1 Yes
2 No</p> |

Appendix 3

Typical doses received during various X-ray examinations

