Recommendations for GPs regarding imaging with respect to low back pain: A modified Delphi and evidence-based study

Felicity A Goodyear-Smith MBChB MGP FRNZCGP, Senior Lecturer, and Bruce Arroll MBChB PhD FRNZCGP, Associate Professor, Division of General Practice and Primary Health Care, Faculty of Medical and Health Sciences, University of Auckland

ABSTRACT

Introduction

Despite evidence-based guidelines, plain x-rays are used more extensively than recommended in low back pain, do not help diagnose simple back pain or nerve root problems and carry high false-positive risk.

Aim

To review the literature regarding GPs' use of plain x-ray and determine expert opinion regarding use of these investigations.

Method

A literature review and modified two-round Delphi consultation was conducted with a panel comprised of professionals involved in the management of patients with low back pain.

Results

There was consensus that most low back pain resolves, and spondylosis and disc degeneration findings are common in both symptomatic and non-symptomatic patients, hence in absence of trauma or other 'red flags' lumbar spine x-rays should be avoided for four to six weeks. X-rays are recommended where serious pathology is suspected. Opinion was mixed regarding MRI as first-line investigation. Lumbar x-rays require 30–40 times the dose of chest x-ray radiation.

Conclusion

Where there is consensus on the literature, GPs should adhere to recommendations. Lack of consensus justifies GP clinical flexibility. A greater awareness by doctors and patients of radiation levels involved may diminish ordering lumbar x-rays when serious pathology is unlikely.

Key words

Low back pain, Delphi technique, diagnostic imaging

(NZFP 2002; 29:97–101)

Introduction

For over a decade there has been extensive review of the acute low back pain literature internationally, starting with the 1987 Quebec Task Force[1] and then the 1994 Agency for Health Care Policy and Research (AHCPR) publication of *A Clinical Guide to Acute Low Back Problems in Adults*[2]. The latter served as a foundation for a number of other guidelines produced in various parts of the world, including Canada,[3] Britain,[4,5] the Netherlands,[6] Australia[7] and New Zealand.[8]

Plain x-rays can detect structural changes in bones but do not show problems in soft tissues such as nerves or vertebral discs. Although the major guidelines are consistent in withholding the use of plain x-rays in uncomplicated cases of low back pain for the first four weeks, such studies are frequently or even routinely used by chiropractic practitioners.[9] Their justifications include ruling out pathology, performing a biomechanical evaluation, protecting against medicolegal action, ob-

taining financial gain and out of habit.[10] Where doctors have received education on implementing the guidelines, use of x-rays has significantly reduced with no detrimental outcomes.[11,12]

An American study of the use of lumbosacral spine x-rays for low back pain by primary care doctors found a wide range of use of between 2% and 48% (average 16%).[13] Disadvantages of inappropriate or over-use of x-rays include a waste of limited resources, unnecessary exposure of gonads and bowel to radiation, and irrelevant findings that result in inappropriate diagnosis or treatment.

One study reported that overuse of imaging studies ranged from 20% of primary care doctors to 70% among orthopaedic specialists

A 1994 study of use of imaging in low back pain found little consensus regarding its use among over 1 000 physicians from eight different specialities, and imaging was generally used prematurely and more extensively than the then-available Quebec Task Force guideline recommended.[14] One study reported that overuse of imaging studies ranged from 20% of primary care doctors to 70% among orthopaedic specialists.[15] Another study evaluated the approach taken in 183 patients and found that using the AHCPR 1994 guidelines, 26% of lumbar spine x-rays, 66% of computed tomography (CT) and magnetic resonance imaging (MRI) scans were inappropriate.[16]

One controlled study of primary care doctors found that those who received the AHCPR guidelines demonstrated no reduction in their use of plain x-rays, even though they reported that they had read the guide and found it useful.[13]

However another case study found significant reductions in imaging use after primary care doctors were educated regarding appropriate low back pain evaluation and management.[11] Similarly, a randomised study of patients found those receiving a brief educational intervention subsequently underwent significantly fewer x-rays, with no difference in symptom resolution, functional improvement, missed diagnoses or patient satisfaction between the two groups.[12]

Plain x-rays do not assist in diagnosis of simple back pain or nerve root problems. They will, however, often detect degenerative changes in the spine. The incidence of spondylosis and disc degeneration increases with increasing age. However a study of the x-rays of patients with low back pain with sciatica found no increased incidence of spondylosis and disc degeneration compared with patients with no low back pain.[17]

A prospective study of patients with low back pain found the yield of explanatory x-ray findings was over three times greater among patients with indications for radiography than among those without. Furthermore, an indication for x-rays existed for all patients found to have a malignancy, and for 13 of 14 patients with identified fractures. However, actual requests for x-rays from doctors did not correspond well with the recommended indications.[18]

A plain lumbar x-ray carries significantly high risk of false-positive findings, which increases with age. Over age 60, 25% of normal adults have spinal stenosis, and 33% have herniated discs.[19] Herniated discs are only clinically important in the presence of pain or dysfunction, indicating pressure on nerve root or cauda equina.[20] Only 2% of all patients with low back pain[21] and 5% to 10% of patients with sciatica eventually require surgery.[22]

If there are no red flags on assessment, then x-rays will detect significant spinal pathology only once in 2 500 patients.[23]

A small randomised trial comparing magnetic resonance imaging (MRI) with plain x-ray found no difference in clinical outcome, although MRI resulted in greater patient reassurance.[24] There is no current cost effectiveness data available regarding patient reassurance as an outcome. Overall, the potential for increased patient satisfaction to result in lower expenditure is a factor to be considered and assessed.

The aim of evidence-based medicine is to match best available evidence with the patient's values.[25] The aim of this study was to review the literature relating to GPs' use of imaging (mainly plain x-ray) and to determine the values of experts in relation to use of these investigations. It is hoped that consensus on the literature should support GP action in provision of quality of health care. Lack of consensus means that GP flexibility is warranted clinically and that these are areas warranting further research.

Methods

A literature review was conducted. Databases searched included Medline, Embase, Cochrane and CINAHL, and a number of guidelines and other resources were also accessed. Relevant

RED FLAGS are physical risk factors which suggest the presence of serious spinal pathology (infection, carcinoma or trauma):

- Unexplained weight loss
- History of cancer
- Unexplained fever
- Patient over 50 years
- Intravenous drug use
- Prolonged corticosteroid use
- Severe, unremitting night-time pain
- Significant trauma
- Pain that gets worse when patient is lying down.
- Features of cauda equina syndrome (especially urinary retention, bilateral neurological symptoms and signs, saddle anaesthesia).

papers were also sourced through hand searching for references from articles retrieved by other methods. The literature was retrieved by a variety of methods including direct access from internet sites, from local and international libraries, and by direct requests to authors of papers not readily available through the library system. Papers regarding the management of low back pain were graded using the Scottish Intercollegiate Guidelines Network (SIGN) revised grading system for recommendations in evidence-based clinical guidelines, and diagnostic tests by the grading system from the Centre for Evidence-Based Medicine Levels of Evidence and Grades of Recommendations for Diagnostic Tests.
(see *http://cebm.jr2.ox.ac.uk/docs/levels.html#levels*).

Summaries of the relevant literature findings and recommendation statements for GPs were prepared from the literature review and formed the basis for the first round of the Delphi consultation process. The Delphi technique is a consensus method used to determine the extent of agreement on an issue. The technique involves asking a panel of experts to take part in a series of rounds to clarify, refine, and gain consensus on the particular issue. It is a tool based on the three characteristics of anonymity, statistical analysis and feedback of reasoning which allows a group of experts to come to some consensus of opinion. As the panel do not meet, individuals can express their opinion without being influenced by others. We used a modified Delphi approach to produce recommendations relating to general practitioner management of low back pain and specifically criteria regarding referral to other health professionals.

The fourteen-member panel comprised two GPs, two orthopaedic surgeons, six physiotherapists, two rheumatologists and two vocationally registered musculoskeletal physicians. The composition of the panel was determined by an advisor from ACC Healthwise, the sponsor for this project. The Accident Compensation Corporation (ACC) is a 24-hour, no-fault, comprehensive and compulsory accident insurance for anyone injured in an accident in New Zealand. Our request to have chiropractors or other manual therapists included on the panel was declined because these practitioners apparently make very few claims against ACC. While ACC specified the panel composition with respect to which professional groups were to be represented and the numbers of each, the selection of individual practitioners to serve on the panel was made independently by the researchers without input from ACC.

One of the GPs failed to return any responses from round one and was unavailable for round two, hence a second GP was co-opted onto the panel for round two of the process. The process was anonymous and the invited doctors were not informed of the identity of others participating in the study.

Traditionally the panel is used to identify the initial issues. In our case we used a modified Delphi technique in which the preliminary statements were generated from the literature rather than from an initial round. While the statements presented to the panel were based on analysis of the comprehensive research conducted in this field, the literature references were not provided to the participants during the first round.

A small randomised trial comparing magnetic resonance imaging (MRI) with plain x-ray found no difference in clinical outcome, although MRI resulted in greater patient reassurance

Respondents were asked whether they agreed or disagreed with each statement and whether this was their opinion or evidence-based. If the latter, supporting references were requested. Responses were collated and sections of the draft document rewritten in accordance with the opinion and the evidence-based comments submitted at the first round. The references submitted by the respondents were reviewed. Many of these, especially systematic reviews, were already known to us and had formed the basis of our initial statements.

Round two statements included our initial references and also incorporated additional references provided by panel members. Where there had been full consensus for a statement, panellists were asked to record only if they had changed their mind since round one. All fourteen panel members completed round two. Their responses were collated and summarised.

Key points

- The major guidelines are consistent in withholding the use of plain x-rays in uncomplicated cases of low back pain for the first four weeks.
- One study reported that overuse of imaging studies ranged from 20% of primary care doctors to 70% among orthopaedic specialists.
- If there are no red flags on assessment, then x-rays will detect significant spinal pathology only once in 2 500 patients.
- GPs can safely avoid low back x-rays in most patients with uncomplicated low back pain for at least six weeks.

Results

The panel were unanimous that given that the majority of low back pain resolves in four to six weeks, and that spondylosis and disc degeneration findings are common in both symptomatic and non-symptomatic patients, in the absence of trauma or

other 'red flags' lumbar spine x-rays should not be ordered in the first four to six weeks.[26-28] [B]*.

Plain x-rays are recommended in acute low back pain when any of the red flags are present.[2,18,29,30] [C] A plain x-ray is also indicated in cases of trauma where there is a high risk of spinal fracture (major trauma or patients at risk for osteoporosis – age >70 or sustained steroid use).[31,32] [C] The panel was in complete consensus on these points.

The panel all agreed that if a patient with low back pain and no 'red flags' has not responded to treatment after four to six weeks, then a repeat assessment (history and examination) and plain lumbar x-rays should be performed.[7,26,33] [C]

Three panel members believed it better to refer these patients on without ordering a plain x-ray. There was no agreement as to the type of practitioner to refer to, including manipulative physiotherapist, musculoskeletal physician and orthopaedic surgeon, with panel members tending to favour their own speciality.

The majority (11/14) agreed that in the 10% of patients whose symptoms persist after four weeks, a full blood count including erythrocyte sedimentation rate (ESR) and a plain x-ray should be ordered to help exclude neoplasm and osteomyelitis.[18,30,32] [B] While the literature suggests that if an occult infection or neoplasm is suspected, the first-line radiological investigation should be MRI, or alternatively a bone scan, which provides less sensitivity and specificity but is considerably less expensive,[31,34] [B] there was not full consensus on this.

The literature indicates that if a herniated disc is suspected in patients with clinically severe symptoms, MRI or CT confirmatory studies are indicated,[26] and an MRI rather than a plain x-ray is indicated in patients with any neurological deficit, evidence of radiculopathy or cauda equina compression.[35] [B] However only a minority of the panel (4/14) agreed that in patients with neurological symptoms (pain in a nerve distribution without any signs), the first-line radiological investigation therefore should be MRI. On the other hand, most of the panel (12/14) agreed that in patients with neurological signs (a straight leg test is positive, absent reflexes, inability to heel or toe walk, evidence of muscular weakness or sensory deficit) the first-line radiological investigation should be MRI (or possibly CT scan) to determine if these signs are caused by disc herniation.

All but one panellist agreed that where herniated disc is suspected in patients with clinically severe symptoms, MRI or CT confirmatory studies are indicated.[7,36,37] [B] Most felt that it was not always necessary to perform this investigation immediately, but this investigation should be performed when surgery is being contemplated and in patients showing no response to conservative management.

All but one agreed that when plain x-rays are ordered they should be limited to anteroposterior and lateral views, as oblique and coned lateral views give little new diagnostic information and significantly increases the radiation exposure dose.[31,38–40] [C] The exception to this is when spondylolysis, spondylolisthesis or ankylosing spondylitis are suspected, when oblique or sacroiliac views are required to confirm the diagnosis.

> Our review suggests that GPs can safely avoid low back x-rays in most patients with uncomplicated low back pain for at least six weeks

Discussion

In the majority of cases of acute low back pain it is not possible to diagnose specific pathology. Yet a sound presumptive diagnosis determines subsequent management, investigation and referral. Waddell and other commentators advocate a diagnostic triage in acute low back pain: simple backache, nerve root pain and possible serious spinal pathology.[23] The vast majority of low back pain is non-specific, self-limiting pain of musculoskeletal origin.[23] Pain is located in the lumbosacral region, and may extend to one or both buttock(s) and thigh(s). The pain ranges from mild to severe and varies with physical activity. Evidence suggests that about 80% of acute non-specific low back pain resolves spontaneously irrespective of management, but 20% progresses to chronic back pain, presenting complex psychosocial and occupational problems.[19]

Radicular pain is commonly caused by peripheral nerve root compression from intervertebral disk protrusion; less commonly from intraspinal tumour, abscess or haematoma. Less than 5% will have nerve root pain. In most cases radicular pain stems from a single nerve root. Involvement of more than one nerve root increases the likelihood of a more widespread neurological condition.

Our review suggests that GPs can safely avoid low back x-rays in most patients with uncomplicated low back pain for at least six weeks. This is important as there are both cost and safety reasons, with plain lumbar spine x-ray delivering 30 to 40 times the radiation dose of a chest x-ray.[41] GP education regarding the radiation dose patients receive could help reduce requests for unnecessary lumbar x-rays.

X-rays are indicated if red flags are present and referral should be undertaken in patients with signs of neurological damage. It may be reasonable to observe patients with neurological symptoms but no signs, particularly if the pain is improving.

In these circumstances, where there is consensus on the literature, GPs should adhere to the recommendations. While indications for x-ray

* Letter designates the Centre for Evidence-Based Medicine Level of Evidence for Diagnostic Tests, http://cebm.jr2.ox.ac.uk/docs/levels.html

use in acute low back pain are straightforward, investigation of subacute and chronic pain is less clear-cut. There is some indication that even in the presence of pathology, plain x-ray should be avoided and the first-line approach be MRI or possibly bone or CT scan. An RCT comparing MRI and plain x-ray with respect to patient outcome and cost effectiveness should be conducted. Lack of consensus justifies GP clinical flexibility. A greater awareness by doctors and patients of radiation levels involved may diminish ordering lumbar x-rays when serious pathology is unlikely.

Acknowledgements

This study was conducted at the request of ACC Healthwise, New Zealand. The information in this report is the opinion of the authors and the Delphi panel. There may be aspects of this paper that are not fully endorsed by every member of the panel.

References

1. Quebec Task Force on Spinal Disorders, 1987. Scientific approach to the assessment and management of activity-related spinal disorders. A monograph for clinicians; Spine 12:S1–59.
2. Agency for Health Care Policy and Research. Clinical guide to acute low back problems in adults. US Department of Health and Public Services, 1994.
3. University of Alberta Occupational Medicine Department, 1998. Medical Advisory Guidelines: Low back pain (acute) – L2.1. Alberta Workers´ Compensation Board Medical Advisors.
4. Clinical Standards Advisory Group (CSAG), 1994. Report on back pain. HMSO.
5. Royal College of General Practitioners (RCGP). Clinical guidelines for the management of acute low back pain. Royal College of General Practitioners, 1996.
6. Faas A, Chavannes A, Koes B, et al. NHG-Standaard 'Lage-Rugpijn'; Huisarts Wet, 1996; 39:18–31.
7. Bogduk N. Evidence-based clinical guidelines for the management of acute low back pain. Australasian Faculty of Musculoskeletal Medicine for the National Musculoskeletal Medicine Initiative, 1999.
8. Accident Rehabilitation and Compensation Insurance Corporation (ACC), National Advisory Committee on Core Health and Disability Support Services (Core Services Committee). Clinical Practice Guideline. Acute low back problems in adults: assessment and treatment. Ministry of Health, 1995.
9. Reinert OC. An analytical survey of structural aberrations observed in static radiographic examinations among acute low back cases; J Manipulative Physiol Ther, 1988; 11:24–30.
10. Phillips RB. Plain film radiology in chiropractic; J Manipulative Physiol Ther, 1992; 15:47–50.
11. Klein BJ, Radecki RT, Foris MP, et al. Bridging the gap between science and practice in managing low back pain. A comprehensive spine care system in a health maintenance organization setting; Spine, 2000; 25:738–40.
12. Deyo RA, Diehl AK, Rosenthal M. Reducing roentgenography use. Can patient expectations be altered?; Arch Intern Med, 1987; 147:141-5
13. Freeborn DK, Shye D, Mullooly JP, et al. Primary care physicians' use of lumbar spine imaging tests: effects of guidelines and practice pattern feedback; J Gen Intern Med, 1997; 12:619–25.
14. Cherkin DC, Deyo RA, Wheeler K, Ciol MA. Physician variation in diagnostic testing for low back pain. Who you see is what you get; Arthritis Rheum, 1994; 37:15–22.
15. Carey TS, Garrett J. Patterns of ordering diagnostic tests for patients with acute low back pain. The North Carolina Back Pain Project; Ann Intern Med, 1996; 125:807–14.
16. Schroth WS, Schectman JM, Elinsky EG, Panagides JC. Utilization of medical services for the treatment of acute low back pain: conformance with clinical guidelines; J Gen Intern Med, 1992; 7:486–91.
17. Witt I, Vestergaard A, Rosenklint A. A comparative analysis of x-ray findings of the lumbar spine in patients with and without lumbar pain; Spine, 1984; 9:298–300.
18. Deyo RA, Diehl AK. Lumbar spine films in primary care: current use and effects of selective ordering criteria; J Gen Intern Med, 1986; 1:20–5.
19. Deyo RA, Phillips WR. Low back pain. A primary care challenge; Spine, 1996; 21:2826–32.
20. Andersson GB, Deyo RA. History and physical examination in patients with herniated lumbar discs; Spine, 1996; 21:10S–18S.
21. Deyo RA, Tsui-Wu YJ. Descriptive epidemiology of low-back pain and its related medical care in the United States; Spine, 1987; 12:264–8.
22. Wipf JE, Deyo RA. Low back pain; Med Clin North Am, 1995; 79:231–46.
23. Waddell G. The back pain revolution. Edinburgh: Churchill Livingstone, 1998.
24. Jarvik JG, Maravilla KR, Haynor DR, et al. Rapid MR imaging versus plain radiography in patients with low back pain: initial results of a randomized study; Radiology, 1997; 204:447–54.
25. Guyatt GH, Haynes RB, Jaeschke RZ, et al. Users' Guides to the Medical Literature: XXV. Evidence-based medicine: principles for applying the Users' Guides to patient care. Evidence-Based Medicine Working Group; JAMA, 2000; 284:1290–6.
26. American Academy of Orthopaedic Surgeons, North American Spine Society. Clinical guideline on low back pain. American Academy of Orthopaedic Sugeons & North American Spine Society, 2000.
27. Ferriman A. Early x-ray for low back pain confers little benefit; BMJ, 2000; 321:1489.
28. van Tulder MW, Assendelft WJ, Koes BW, Bouter LM. Spinal radiographic findings and nonspecific low back pain. A systematic review of observational studies; Spine, 1997; 22:427–34.
29. American College of Radiology. Appropriateness Criteria for uncomplicated low back pain, 1996.
30. Deyo RA, Diehl AK. Cancer as a cause of back pain: frequency, clinical presentation, and diagnostic strategies; J Gen Intern Med, 1988; 3:230–8.
31. Staiger TO, Paauw DS, Deyo RA, Jarvik JG. Imaging studies for acute low back pain. When and when not to order them; Postgrad Med, 1999; 105:161–2, 165–6, 171–2.
32. Scavone JG, Latshaw RF, Rohrer GV. Use of lumbar spine films. Statistical evaluation at a university teaching hospital; JAMA, 1981; 246:1105–8.
33. Lindstrom I, Ohlund C, Eek C, et al. Mobility, strength, and fitness after a graded activity program for patients with subacute low back pain. A randomized prospective clinical study with a behavioral therapy approach; Spine, 1992; 17:641–52.
34. The Royal College of Radiologists. Making the best use of a Department of Clinical Radiology: Guidelines for Doctors. 4th ed. London, The Royal College of Radiologists; 1998.
35. Franklin G, Plaeger-Brockway R, Grannemann T. Review, regulate, or reform? What works to control workers' compensation medical costs? Medical treatment guidelines: Washington State Department of Labor and Industries. 1999; pp.3–19.
36. Jackson R, Cain J, Jacobs R, et al. The neuroradiographic diagnosis of lumbar herniated nucleus pulposus: II. A comparison of computed tomography (CT), myelography, CT-myelography, and magnetic resonance imaging; Spine, 1989; 14:362–7.
37. Herzog RJ. The radiologic assessment for a lumbar disc herniation; Spine, 1996; 21:19S–38S.
38. Scavone JG, Latshaw RF, Weidner WA. Anteroposterior and lateral radiographs: an adequate lumbar spine examination; AJR American Journal of Roentgenology, 1981; 136:715–7.
39. DeLuca SA, Rhea JT. Are routine oblique roentgenograms of the lumbar spine of value?; Journal of Bone & Joint Surgery – American Volume, 1981; 63:846.
40. Davies AM, Fowler J, Tyrrell PN, et al. Detection of significant abnormalities on lumbar spine radiographs; Br J Radiol, 1993; 66:37–43.
41. Whalen J, Balter S. Radiation risks associated with diagnostic radiology; Dis Mon, 1982; 28:73.