



## **A review of diagnostic imaging in chiropractic**

**A discussion document prepared by the  
Executive for the GCC Expert reference group**

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## Introduction

This document has been prepared by the General Chiropractic Council following a request by the Coroner in an inquest into the death of a patient in 2017, who became unwell during chiropractic treatment. The patient was subsequently discovered to have suffered severe neck injuries that, tragically, proved fatal. The Coroner noted that no pre-treatment images had been taken of the patient's spine and that ossification of the spine was not known until post-trauma CT images were obtained. The Coroner requested that the GCC undertake *a review of the requirement for pre-treatment imaging may inform whether a patient is suitable for treatment.*

This document has been compiled as an overview of current status of the use of diagnostic imaging by chiropractors, with a framework suggesting how those arrangements be improved. It is not intended as an exhaustive review of the literature but provides references to relevant literature and key documents.

## 1. Background

### a) Diagnostic imaging

Diagnostic imaging is the term used to describe a range of investigations that healthcare professionals use in order to look inside the body to help determine the cause of an illness or injury and arrive at a diagnosis. It can also be used to track the progress of a disease or illness or guide treatment, for example in certain forms of spinal or joint injections.

X-rays are the best-known form of diagnostic imaging because of their widespread use as a means of assessing trauma and, historically, their use in screening for communicable diseases such as tuberculosis. X-rays have been around since the late nineteenth century and for decades were the only form of non-invasive imaging. They work by passing a beam of ionising radiation through the body to create an image that shows bones and some soft tissues. X-rays remain widely available in hospitals and other health facilities. They are relatively inexpensive and modern digital technology has meant that exposures can be optimised and images can be shared digitally.

As ionising radiation has the potential to cause harm to human tissues, its use in the United Kingdom is regulated by statutory regulations. There are also notable limitations to X-rays. They are not as sensitive as other forms of diagnostic imaging, meaning that some illnesses and diseases have to be quite advanced before they can be seen on X-ray, giving rise to false reassurance that a condition is not present when there is a chance that it is. Exposure to ionising radiation can also be cumulative, meaning that risks associated with X-rays are greater depending on the nature and frequency with which an individual is exposed. However, when appropriately prescribed and properly performed, the benefits of imaging outweigh the risks.

As technology has advanced, more forms of imaging are now available, including magnetic resonance imaging (MRI), computerised tomography (CT), positron emission tomography (PET) and ultrasound.

Imaging of the neuromusculoskeletal system (nerves, bones, muscles, joints) now uses MRI as the gold standard. Instead of ionising radiation, MRI uses a strong magnet to get an image of the body. MRI is less widely available compared to X-ray, is more expensive, and is not suitable for a patient with metallic objects or fragments in their body. Also, while not painful, patients can find MRI uncomfortable due to claustrophobia.

Images obtained by MRI are detailed. They can visualise the body in several dimensions, imaging body tissue unseen on X-ray clearly, such as intervertebral discs, brain and nerve tissue and organs. MRI is also more sensitive, meaning disease or illness can be identified earlier. Sometimes, a contrast medium called gadolinium is used in order to image blood vessels and tumours.

The quality of MRI images is largely dictated by the strength of the magnet, measured in Tesla. Most MRI units use 1-2 Tesla magnets, although MRI machines are now being developed with magnet strength of up to 10.5 Tesla. The development of advanced, high-strength magnets has led to much finer detail being achievable.

Chiropractors specialise in disorders of the neuromusculoskeletal system. They have a special interest in the function of the spine and joints and most patients consult chiropractors for back and neck pain. Traditionally, chiropractors have used diagnostic imaging, particularly X-ray, to assist them in their assessment of patients. The training of many chiropractors in the UK and throughout the world includes training in radiography (the physics and practical aspects of obtaining X-rays) and in radiology (the interpretation of X-ray exposure). As such, many chiropractors operate X-ray units within their clinics.

Over the course of the past decade, the value and utility of diagnostic imaging in the management of spinal pain, disability and disease has been questioned. As the costs of managing spinal disorders have increased, national and international guidelines have advocated for far more judicious use of diagnostic imaging and have sought to balance cost and risk versus benefit. For example, a series of papers on the management of low back pain, published in 2018 in *The Lancet* was critical of the overuse of diagnostic imaging, arguing its use in most cases of low back pain had little or no impact on patient outcomes or patient safety.

Advancing knowledge about the management of spinal disorders and the availability of other preferred forms of imaging, involving little or no exposure to ionising radiation, has led to a general decline in the numbers of chiropractors operating X-ray units in their facilities. Many chiropractors have agreements with imaging centres, which undertake X-ray or MRI on referral and provide reports written by consultant radiologists. Despite this, some chiropractors rely on X-ray as part of their assessment of patients, maintaining X-ray units on site.

Information about the accessibility of imaging generally available to chiropractors, and utilisation rates by chiropractors, is unavailable.

## **b) Chiropractic**

Chiropractic is a health profession with no single definition but is concerned with the diagnosis, treatment and prevention of mechanical disorders of the musculoskeletal system and the effects of these disorders on general health. There is an emphasis on manual treatments, including spinal adjustment and other forms of joint and soft tissue manipulation.

There are an estimated 120,000 chiropractors in the world. While chiropractors are known to practise in over 100 countries, over seventy per cent of the world's chiropractors are in North America. The training of chiropractors takes place in tertiary educational institutions at Bachelors, Masters or Doctorate degree level, depending on the jurisdiction. Chiropractic is legally recognised in over 40 countries worldwide, including every state in the United States, every Province in Canada and every state and territory in Australia. In the United Kingdom, chiropractic is legislated

under the Chiropractors Act 1994, which provides for a statutory register, protection of title and regulation by the General Chiropractic Council.

The work of chiropractors is subject to other laws and statutory instruments. These include regulations in respect of public health, advertising and health and safety. In respect of diagnostic imaging, chiropractors must comply with dedicated legislation, the Ionising Radiation Regulations 2017 and the Ionising Radiation (Medical Exposure) Regulations 2017.

Whilst subject to statutory regulation, chiropractors largely operate outside the National Health Service. Because of this, people consult chiropractors on a self-funded basis or through private health insurers, most of whom cover chiropractic services as part of their policy provisions. Over the past 30 years, the number of chiropractors in the UK has grown significantly, from 450 practitioners to now some 3300. There are five educational institutions in the UK offering chiropractic degrees at Masters level, with more planned in the next few years.

Chiropractic is a diverse profession. While most chiropractors in the UK focus on the management of musculoskeletal disorders, particularly of the spine, others have a broader scope and adopt a more holistic approach to patient health, incorporating areas of health such as diet and nutrition, functional neurology, and psychological counselling. The evolution of chiropractic over the decades has also resulted in numerous technique systems. While chiropractic care is best known for its expertise in the use of spinal manipulation, many chiropractors now integrate other modalities, such as medical acupuncture, rehabilitation, strength and conditioning and electrotherapy. In line with emerging evidence, chiropractors also counsel their patients in healthy lifestyles, use exercise prescription and give preventive advice.

Chiropractors are seen in the UK as having expertise in spinal health. Like osteopaths, their work is based on manual therapy and the provision of conservative, non-surgical, non-pharmaceutical care. There is now much evidence supporting the approaches to care of chiropractors and spine care guidelines now advocate for high-value, low-tech primary approaches to spine care management. Many employers use chiropractors as part of occupational health provision, and elite athletes and sport organisations use the services of chiropractors. The 2012 Olympic Games, held in London, included chiropractors as part of its medical provision to competing athletes and staff.

### **c) The UK chiropractic legal and regulatory framework**

Chiropractic in the UK is regulated by the General Chiropractic Council (GCC). The GCC is an independent statutory body established by Parliament to regulate all chiropractors and protect the public. It is illegal to use the title chiropractor or imply that a person is a chiropractor if they do not hold registration with the GCC. The GCC publishes a Code, which sets standards of conduct, performance and ethics for chiropractors, and protects the public by means of fitness to practise procedures. It also sets standards of education and administers a statutory framework for continuing professional development.

The Royal College of Chiropractors (RCC) is an apolitical, professional membership body. The RCC promotes and supports high standards of education, practice and research. It assists chiropractors in the UK in achieving quality standards, runs postgraduate training for new graduate chiropractors, provides continuing professional development opportunities and supports research.

There are four national chiropractic associations in the UK. These are the British Chiropractic Association, the McTimoney Chiropractic Association, the Scottish Chiropractic Association and the United Chiropractors Association. The roles of the national associations are to advocate for chiropractic, promote the profession of chiropractic and the interests of its respective members, and provide services such as indemnity insurance.

Unlike registration with the GCC, membership of the RCC or the national chiropractic associations is not mandatory.

Many chiropractors in the UK work in private health facilities, either as sole practitioners, with other chiropractors or as part of a multidisciplinary setting with other health professionals. Some chiropractors have full- or part-time contractual agreements with GP surgeries, hospitals, large corporate employers or with professional sports clubs.

#### **d) Safety of chiropractic**

Serious adverse events in chiropractic are rare. Techniques most used by trained and registered by chiropractors, including spinal manipulation, are safe and effective. Short term, benign side effects such as post-treatment stiffness and soreness occur in approximately half of patients.

There are reports in the literature of more serious adverse events, often in patients whose health was compromised, or who had a pre-existing condition. While there has been an association drawn between manipulation of the cervical spine and vascular accidents involving a rare type of stroke, research has not shown spinal manipulation to be causative and the best available evidence indicates that the risk of stroke following a visit to a chiropractor is no greater than following a visit to a general medical practitioner for a comparative condition.

Chiropractors are trained to undertake a detailed case history and physical examination as part of their assessment of patients, which may involve general health screening such as taking blood pressure. They screen for *red flags* in order to identify patients who are not suited to chiropractic treatment approaches and monitor the health of their patients in order to determine if their health and care would be better served by their GP or another health professional.

When clinically indicated, chiropractors may use additional investigations to gather more information about a patient's health in order to better understand their condition and arrive at a diagnosis. Such investigations include diagnostic imaging and blood tests. Where red flags are present, chiropractors will utilise additional investigations to assure themselves as to the safety of their proposed treatment.

**e) Events leading to recommendation by HM Coroner for review of chiropractic guidance regarding the requirement for pre-treatment imaging**

In August 2017, an 80-year old gentleman consulted a chiropractor in York. He had been experiencing pains in his legs and sought advice and treatment from a chiropractor. The patient became unwell during chiropractic treatment and was subsequently discovered to have suffered severe neck injuries that, tragically, proved fatal.

At post-mortem, it was discovered that the patient was suffering from an underlying spinal disorder that caused ligaments in his neck to have calcified and his spine to have become rigid. The Coroner noted that no pre-treatment images were taken of the patient's spine. Ossification of the spine was not known until post-trauma CT images were obtained

At the Inquest, the Coroner heard evidence from two experienced chiropractic expert witnesses who both stated that in the circumstances of the case there was a body of reasonable chiropractors who would not have undertaken diagnostic imaging of the cervical spine. These opinions were in part informed by the declining use of X-rays in chiropractic practice, as a result of guidelines advocating against their routine use in all but cases where red flags were present and by the evidence before the Coroner as to the patient's presenting condition and the chiropractor's proposed plan of care.

The Coroner requested the GCC to undertake *a review of the requirement for pre-treatment imaging may inform whether a patient is suitable for treatment.*



## 2. Statutory and regulatory considerations in X-ray

The application in chiropractic of evidence-based practice to the taking of X-rays started in 1984 when two American physicians, Richard Deyo and Andrew Diehl, applied retrospective analysis of diagnostic yield from lumbar spine X-rays to ordering criteria.<sup>1</sup> They found that many criteria were not justified (albeit at that time based on cost rather than patient exposure) whilst others proved valuable indicators in identifying significant pathologies.

This principle was easily extended to the concept of *dose: yield* - that is whether the amount of ionising radiation used to acquire imaging was justified in terms of the number and significance of the pathologies identified. The potential benefit to a patient from taking an X-ray should outweigh the risk of harm from the consequences of the exposure. This concept is at the heart of extant requirements placed on those carrying out imaging (see below).

Amongst radiological pioneers, the harm caused by exposure to high doses of ionising radiation was evidenced by high mortality rates in the decades following their introduction to medical use. Reductions in exposure was brought about by multi-factorial change, although advances in technology, governance arrangements and equipment has been significant (detailed in section 3).

In 1997, the European Union (EU) revised its medical exposure directive, (97/43/Euratom), laying down the general principles of radiation protection of individuals in relation to medical exposure. This was transposed into UK national legislation with the publication of the Ionising Radiation (Medical Exposures) Regulations (2000) (IRMER). This was reissued in 2017 although the requirements are largely unchanged, regarding chiropractors.

Further guidance was issued in June 2020 jointly by the British Institute of Radiology, British Society of Paediatric Radiology, Institute of Physics and Engineering in Medicine, Medical Exposures Group, Public Health England, Royal College of Radiologists and Society and College of Radiographers: *IR(ME)R: Implications for clinical practice in diagnostic imaging, interventional radiology and diagnostic nuclear medicine*.

Within any consideration of imaging, the role played by IR(ME)R guidance is central and is outlined further here. IR(ME)R identifies four separate *roles* in respect of the procurement of X-rays:

The **employer** (ordinarily the owner of the clinic and, therefore, of the X-ray equipment) is the person responsible for maintaining the equipment; establishing the framework in which the equipment is operated; ensuring the practitioner and operator are adequately trained; and providing diagnostic reference levels for each standard radiological investigation. Regulation 7(8) of IR(ME)R (2017) also identifies the employer as being responsible for ensuring that a clinical evaluation of the outcome of each exposure is recorded.

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<sup>1</sup> Deyo, R.A., Diehl, A.K. Lumbar spine films in primary care. J Gen Intern Med 1, 20–25 (1986).

(Employers, whose duties are further defined by the Ionising Radiation Regulations (2017) are typically assisted by Medical Physics Experts who often act as the Radiation Protection Officer for the clinic whilst the employer acts in the capacity of Radiation Protection Supervisor.)

The **referrer** is responsible for providing the clinical information on the patient to enable a justification for the medical exposure.

The **practitioner** is responsible for justifying the individual medical exposure.

The **operator** is the person who performs the exposure.

It is common in a chiropractic clinic for a registrant to fulfil more than one role and, in sole practice, they can act in all four capacities. Consequently, there are fewer checks and balances within the procurement of imaging placing a higher burden of responsibility upon individuals acting in more than one role.

The guidance emphasises two overarching principles to be addressed in the procurement of X-rays; and which are summarised here as 'Justification' and 'Optimisation':

**Justification:** *That each exposure is prospectively justified by the practitioner in respect of the potential diagnostic benefit outweighing the individual detriment that the exposure may cause together with the efficacy, benefits and risk of available alternative techniques having the same objective but involving no or less exposure to ionising radiation.*

This is simplified in the 2020 guidance to IR(ME)R:

- Consider the data supplied
- Evaluate the information provided
- Request further information if required
- Consider the data supplied to establish net benefit
- Consider guidelines issued by professional or relevant bodies
- Choose a modality that best addresses the clinical problem, utilising non-ionising radiation modalities where appropriate
- Weigh up benefit and risk
- Consider the urgency of the exposure, ensuring that exposures are kept as low as reasonably practicable
- Authorise referrals that are justified They are also urged to optimise:
  - Paediatric exposures
  - Check pregnancy and breastfeeding status

In respect of *clinical* guidelines in the use of X-ray, this is aimed primarily at the person fulfilling the role of *practitioner*, although also have potential relevance to all four role areas, particularly to the *operator*, who may, in certain circumstances, authorise the exposure.

**Optimisation:** This refers to ensuring that the best possible image can be acquired using the least possible amount of ionising radiation. This is achieved by using sound radiographic techniques and the best available technology. A widely-used acronym encapsulates the requirement that X-ray doses are kept “as low as reasonably practicable [ALARP] consistent with the intended purpose”.

This duty is incumbent upon the *practitioner* in being assured that an X-ray is appropriate and necessary and to question whether the diagnostic information can be better acquired using other modalities that do not utilise ionising radiation, such as magnetic resonance imaging or musculoskeletal ultrasound.

The *operator* also plays a role in respect of collimation (limitation of the X-ray beam to the area of diagnostic interest), patient positioning, shielding and dose optimisation; however, these are not informed by the scope of this document. This document also does not cover the duties of the employer.

In its regulatory requirements, the General Chiropractic Council has referenced the central obligation of Registrants with regard to UK legislation in relation to any use of diagnostic imaging, pointing to, for example, Ionising Radiation Regulations (as updated).

The current *Code of Practice (2016)* notes that patients reasonably expect chiropractors to:

*Be trustworthy and responsible and protect patients from harm and to carry out any assessment or administer care, as required, in accordance with the high standards of the profession while adhering to applicable standards.*

It also states that chiropractors must:

- Prioritise patients’ health and welfare at all times when carrying out assessments.
- Select and apply appropriate evidence-based care which meets the preferences of the patient at that time.
- Ensure that investigations, if undertaken, are in the patient’s best interests and minimise risk to the patient.
- Record the rationale for, and outcomes of, all investigations.

The General Chiropractic Council also introduced guidance to its registrants.  
[GCC guidance](#)

Further background information can be found at:

[The GCC Code](#)

[The Ionising Radiation \(Medical Exposure\) Regulations 2017](#)

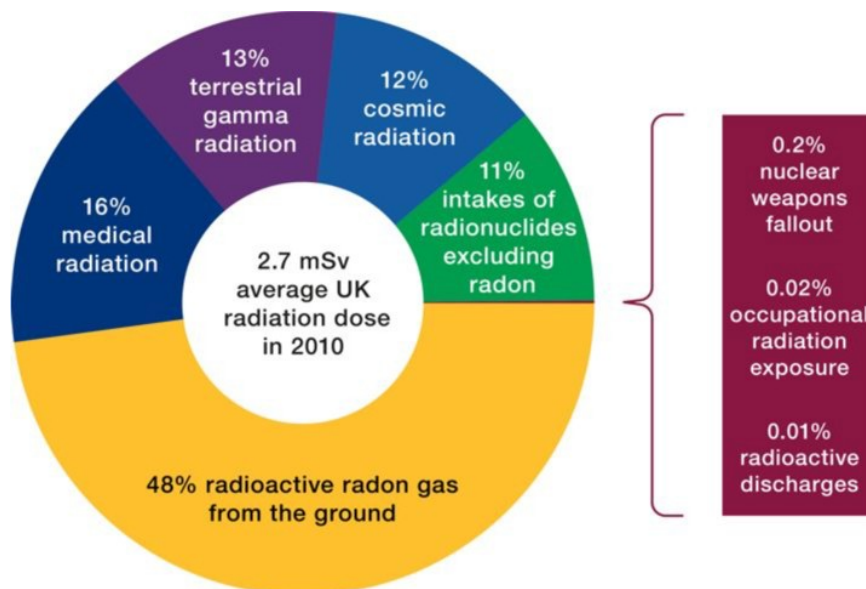
[RCR joint publication: IR\(ME\)R implications](#)

### 3. Risks of exposure

Although the requirement of IR(ME)R is for any exposure to be kept as low as reasonably practicable (ALARP), it is useful to have a concept of the relative risk of ionising radiation in respect of diagnostic spinal X-rays and the epidemiological consequences with a chiropractic framework.

The contribution made by diagnostic imaging to the population as a whole is estimated at 16% of the 2.7 mSv exposure from all sources, the same for a three-region spinal X-ray; therefore, the dose from a full spine X-ray is estimated as one year's worth of exposure.

Studies have looked at chiropractors' contribution to the collective dose and levels of demonstrated patient benefit.<sup>2,3</sup>



Absolute risk is also complicated by factors including exposure protocols, collimation (limitation of the X-ray beam to the area of diagnostic interest), absorbed dose and the variable radio sensitivity of different cells within the body;

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<sup>2</sup> [Aroua A. Chiropractor's use of radiography in Switzerland. J Manip Physiol Ther. 2003;26\(1\):9–16.](#)

<sup>3</sup> [Jenkins et al 2018: Current evidence for spinal X-ray use in the chiropractic profession: a narrative review](#)

however, approximations have been made to the lifetime additional risk of cancer. The relative risk is often stated in terms of equivalent background exposure:<sup>4</sup>

Diagnostic procedure	Typical effective doses (mSv)	Equivalent period of natural background radiation 1	Lifetime additional risk of fatal cancer per examination 2
Limbs and joints (except hip)	< 0.01	< 1.5 days	1 in a few million
Teeth (single bitewing)	< 0.01	< 1.5 days	1 in a few million
Teeth (panoramic)	0.01	1.5 days	1 in 2 million
Chest (single PA film)	0.02	3 days	1 in a million
Skull	0.07	11 days	1 in 300,000
Cervical spine (neck)	0.08	2 weeks	1 in 200,000
Hip	0.3	7 weeks	1 in 67,000
Thoracic spine	0.7	4 months	1 in 30,000
Pelvis	0.7	4 months	1 in 30,000
Abdomen	0.7	4 months	1 in 30,000
Lumbar spine	1.3	7 months	1 in 15,000

These risks must take account of the fact that standard spinal films should ordinarily be taken in orthographic pairs to be diagnostic [cervical films may require three exposures] and that chiropractors tend to take lumbopelvic and lumbosacral films rather than lumbar films, which includes exposure of the whole abdomen. The risk of a three-area full spine series is therefore of the order 1 in 7,500.

There are no definitive data regarding the exact threshold of radiation exposure considered either beneficial or safe; and it is not possible to define a 'safe' level of radiation exposure. Although thresholds for safe levels of radiation exposure are not definitive it can be assumed that risk is associated with the use of X-rays.

The risks of X-rays apply to all healthcare settings, the chiropractic utilisation of X-rays could be a contributory factor in excess deaths.

Further background information can be found at:

<sup>4</sup> <https://www.gov.uk/government/publications/medical-radiation-patient-doses/patient-dose-information-guidance>

[Ionising radiation: risks from exposure - GOV.UK \(www.gov.uk\)](http://www.gov.uk)

[Medical radiation: patient doses - GOV.UK \(www.gov.uk\)](http://www.gov.uk)

#### 4. Sources of guidance – a contested area

There have been several attempts to generate recommendations specific to the chiropractic profession, or to manipulative therapies, and several papers have influenced professional practice.

In 2006<sup>5</sup>, an international multidisciplinary working party published guidelines for the management of nonspecific low back pain in primary care. The panel, which included two chiropractors and a physiotherapist, considered appropriate treatments but also gave heed to the use of X-rays and concluded that, X-rays, CT and MRI are not routinely indicated for nonspecific [chronic] low back pain.

Regarding acute non-specific back pain, the group concluded that plain film x-rays are not useful in acute nonspecific low back pain and their use should be restricted to suspected underlying pathology evidenced by the presence of *red flag* indications.

In 2008 Bussi eres<sup>6</sup> et al, published a review of 400 papers on musculoskeletal disorders and made recommendations covering a wide range of clinical circumstances. These findings, published in the *Journal of Manipulative and Physiological Therapeutics*, reached similar conclusions to the 2006 study, notably:

- Radiography is not initially indicated for non-specific acute, subacute, or persistent back and neck pain in the absence of 'red flags'.
- Plain film radiography is indicated after blunt trauma and if there is no improvement after 4-6 weeks of conservative care, or increasing disability.
- Conventional radiography and specialised imaging can be appropriate for investigation of radicular syndromes and in the presence of 'red flags'.
- Urgent specialised imaging (for example magnetic resonance imaging (MRI)) should be used for spinal pain with adverse features (sphincter or gait disturbance; saddle anaesthesia; severe or progressive neurologic deficit; systemic illness [cancer, infection]; vascular causes [suspected abdominal/thoracic aorta aneurysm]; or cervical artery dissection).

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<sup>5</sup> [European guidelines for the management of acute nonspecific low back pain in primary care](#)

<sup>6</sup> [Diagnostic Imaging Practice Guidelines for Musculoskeletal Complaints in Adults—An Evidence-Based Approach—Part 3: Spinal Disorders](#)

In 2009, professional guidelines were proposed by the Practising Chiropractors' Committee on Radiology Protocols (PCCRP) on behalf of the international Chiropractic Association (2009)<sup>7</sup>. The PCCRP stated that its 'guidelines are in direct competition/opposition to current attempts to restrict Chiropractic Radiography to "Red Flag Only" conditions or diagnosis.'

In 2018<sup>8</sup>, Jenkins et al acknowledged the use of routine spinal X-rays within chiropractic has a contentious history. The authors concluded that in most cases the potential benefits from routine imaging, including spinal X-rays, do not outweigh the potential harms; and the use of spinal X-rays should not be routinely performed in chiropractic practice, and should be guided by clinical guidelines and clinician judgement.

The 'gold standard' for making best use of radiography is, arguably, the Royal College of Radiologist's guidance on *Making the Best Use of Clinical Radiology*, generally identified as *iRefer*. The seventh edition (2012) was the first to be accredited by NICE, and the General Chiropractic Council was amongst the groups consulted.

The guidelines are based on exhaustive searches of the literature, then synthesised by a panel of experts and specialists. They are based on the level of supporting evidence, the consideration of radiation dose and cost-effectiveness.

Successive editions of the guidance have increasingly moved away from recommending plain film X-ray for many of the conditions, historically included in chiropractic radiological guidelines, in favour of other modalities. The content of current guidelines is discussed further in Section 6; but their basis is that appropriate referrals are essential in order to:

- Promote uniform and best care for patients
- Reduce the number of unhelpful or repeat investigations
- Support rapid diagnosis, which can shorten patient management pathways
- Protect the patient by avoiding unnecessary ionising radiation
- Ensure that resources are used efficiently and effectively to avoid waste and promote a sustainable service.

They are also aimed at all healthcare professionals, including physiotherapists, albeit chiropractors are not specifically mentioned.

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<sup>7</sup> [PCCRP guidelines](#)

<sup>8</sup> [Jenkins: Current evidence for spinal X-ray use in the chiropractic profession: a narrative review](#)



## 5. Current chiropractic guidance and protocols

It may be the case some chiropractors rely on somewhat outdated guidance in the form of pre-printed justification proformas produced in the past.

This guidance is not consistent with that used in the undergraduate training courses and the largest association, the British Chiropractic Association, and the Royal College of Chiropractors have withdrawn any guidance from their websites. It is known that some chiropractors continue to rely on the form:

Name.....  
Date.....  
Ref. no.....  
-----  
I am not pregnant  
I may be pregnant. I have had the risks of x-radiation in pregnancy explained to me, and the reason why an x-ray examination is necessary for my treatment, and I hereby give consent to be x-rayed as requested below  
Signed..... dated.....  
-----  
I have made a clinical examination of this patient and now request an x-ray examination. The patient meets the following criterion/a:  
50+ | Tra | Neu | UWL | Art | DAA | Mal | Ste | Pyr | Sco | Sur | FTI | EBF | Pos | LEP  
Clinical indications.....  
Clinical summary.....  
Signed.....chiropractor (as referrer) Date.....  
-----  
Please take the following x-ray films of this patient  
APCx | LatCx | OblCx | APOM | Shldr | PTh | LatTh | OblTh | PALx | LatLx  
→ → R/L → → R/L → → R/L  
Other.....  
Notes.....  
Authorised by (sign)..... (as practitioner) ..  
Date.....

Authors of guidelines generally state guidelines are not exhaustive and there are occasions when a clinician might reasonably step outside of them, albeit with the caveat that any such decision should be risk-assessed, documented and defensible.

The following section examines each criterion (as identified in this form) to explore its clinical significance and why it might lead a chiropractor to order X-rays; and

how the abbreviated form used differs from other guidance, and the materiality of this.

### **'50+'**

The long-hand form of this abbreviation is sometimes cited as 'aged 50 or over'; however, this compares with the form given in medical guidelines since 1998 as 'aged under 20 or over 50 at onset of symptoms'.

The rationale behind this long form is that, whilst spinal pain is very common in the 25-45 year age group and frequently recurrent into later life, first onset below 20 or over 50 years is relatively rare and much more likely to be associated with pathology. There is a perception that within the chiropractic profession some patients may be exposed based on age, possibly in the absence of any regional symptoms.

### **'Tra' = Trauma**

Whilst the reasons for X-raying patients suffering from trauma is self-evident (fracture, dislocation, loss of structural integrity and so on), it might be argued that *significant* trauma might aid decision-making.

Whereas the significance of any trauma is a marker of clinical judgement, suggested criteria include falls from a height greater than 3m or road traffic accidents at a combined speed of 50 mph.

Many guidelines emphasise, however, the need for a lower threshold of suspicion in a more elderly population (65+), particularly when in conjunction with other risks factors such as known osteoporosis, a history of cancer or prolonged corticosteroid.

### **Neu = Neurological deficit**

This can be interpreted widely; say a history of pins and needles; isolated muscle weakness, regardless of whether it arises from pain rather than neurogenesis; or asymmetrical deep tendon reflexes, without correlation to existing symptoms or any previous radiculopathy (which can often leave permanent areflexia) leading to X-rays being taken.

More appropriately, the clinical concern should be for significant (that is, involving multiple nerve roots or with evidence of spinal stenosis) or progressive neurology and, in those circumstances, urgent magnetic resonance imaging is, in the absence of significant trauma, the modality of choice.

### **UWL = Unexplained weight loss**

A classic 'red flag' for neoplasm in an elderly patient or one with a history of cancer reporting spinal pain. Magnetic resonance imaging is a more sensitive modality for the detection of spinal tumours and there is a risk that early X-ray giving a false negative. This superiority of magnetic resonance imaging needs to be balanced against the limitations in availability in the UK, as discussed below.

### **Art = Inflammatory arthropathy**

There are many inflammatory arthritides, each displaying characteristic clinical and radiographic signs and symptoms. Inflammatory arthritides should be distinguished from osteoarthritis (degenerative joint disease), which is considered a normal accompaniment to ageing. A suspicion of inflammatory arthritis would be considered a justification for imaging, although X-ray findings may be negative in the early stages. Blood tests are recommended as an adjunct investigation.

Once a diagnosis has been confirmed, X-rays prior to manipulation may be indicated, particularly in ankylosing spondylitis, which often presents as sacroiliitis and can cause spinal and sacroiliac joint fusion; and in chronic rheumatoid arthritis, which can cause upper cervical instability.

### **DAA = Drug and alcohol abuse**

Drug abuse can cause an increased risk of infection and, excessive alcohol consumption and smoking, early onset osteopaenia.

### **Ste - History of use of steroids**

Chronic steroid prescription can cause both an increased risk of infection and early onset osteopaenia. This is sometimes misinterpreted as referring to any patient who has ever used an asthma inhaler (however long ago) or who has received a cortisone injection in any joint.

### **Pyr = Pyrexia**

Originally, 'unexplained pyrexia (elevated temperature) of over 38°C for more than three days', which can be indicative of osteomyelitis. Further to COVID-19, this would indicate referring a patient to a testing centre rather than inviting them in for an X-ray.

### **Sco = Investigation of scoliosis**

Perhaps straightforward: new onset scoliosis can be idiopathic in adolescents for whom there should be a higher threshold for X-ray, or indicative of pathological vertebral collapse in an elderly population. For previously identified scoliosis, pre-existing films are usually available and further films would add to the exposure burden of repeat X-rays, used to monitor possible progression.

The development of sophisticated digital postural software, which can run on smartphones and tablets, arguably lessens the need for monitoring of progression in juveniles; with progression in a skeletally mature individual unlikely unless associated with progressive vertebral collapse.

### **Sur = Surgery in region of interest**

X-ray films can be used to identify regional instability from procedures such as laminectomies of which the patient might be historically unaware; however, pre- and post-operative imaging (usually MRI) is normally available.

### **FTI = Failed to improve with conservative treatment**

Many of the chiropractic guidelines discussed recommend a trial course of care for four to six weeks in benign back pain with imaging recommended if the patient does not respond to the plan of management.

It is possible this criterion could be utilised to prospectively justify X-rays on the grounds the patient had taken over the counter or prescription painkiller without response; undergone massage or remedial exercise without benefit; experimented with reflexology; or seen an acupuncturist.

### **EBF = Equivocal biomechanical findings**

Equivocal biomechanical findings (also referred to as inconsistent biomechanical findings) are those signs identified during a physical examination which do not definitively rule a potential underlying condition in or out. An example might be in a patient exhibiting severe muscle spasm that prohibits a satisfactory assessment of underlying osseous tissues. It is possible that this criterion is overly relied upon and would appear to already be covered by 'Examination Limited by Pain' (see below).

### **Pos = Investigation of extreme postural anomaly**

Structural deformity can be a physical manifestation of a spinal fracture. It is possible that some chiropractors might use anterior head carriage; a high shoulder or iliac crest; an increased thoracic kyphosis; swayback; or 'military spine' as a justification to X-ray.

Once common and benign postural adaptations are identified visually, a question arises as to whether X-rays add to the diagnosis. Contributing pathologies such as spondylolisthesis or Scheuermann's disease have not shown any correlation to pain levels and are unlikely to affect management and response to treatment can often be tracked with digital postural software at no risk.

### **ELP = Examination limited by pain**

Sometimes there can be 'yellow flag' reasons why a patient cannot co-operate with a normal physical examination. Yellow flags are psychosocial factors that can impact negatively on patient outcomes. Examples displayed by a patient include fear-avoidance behaviour, catastrophising, acute anxiety, or negative beliefs about their condition. These reasons can usually be identified by Waddell's triage for functional pain.<sup>9</sup>

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<sup>9</sup> Waddell G, McCulloch JA, Kummel E, Venner, RM: Nonorganic Physical Signs in Low-Back Pain Spine 5:117-125, 1980.

There are also circumstances where a patient's inability, say, to be able to get onto the treatment couch or perform a basic range of motion or orthopaedic testing can be indicative of extreme muscle guarding associated with a vertebral fracture, infection or neoplastic infiltration.

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Fitness to Practise proceedings involving chiropractors have seen a range of justifications for proceeding to X-ray examination. Some of these justifications have been rejected by panels hearing the cases. These include:

### ***Screening for congenital anomalies***

There is no evidence that anomalies such as spina bifida occulta, transitional segments, accessory joints or supernumerary ribs affect outcomes; these are usually incidental findings. Anatomical anomalies in the upper cervical spine, such as agenesis of the dens and fusion of the occiput and atlas, have been postulated to be associated with increased upper cervical instability or neural compromise that may contraindicate manipulative therapy. No evidence could be found for the contraindication of manipulative therapy for patients with these anomalies.

### ***Screening for serious pathology***

Whilst some cases of serious pathology, such as cancer and infection, may not initially present with definitive symptoms, X-ray assessment at this early stage of the disease process is also likely to be negative and its use as a screening tool is not supported by evidence.

### ***Screening for osteoporosis***

Plain film X-ray is an inappropriate modality for early identification of bone loss, with 30-50% depletion of bone density required to be radiologically identifiable. The Royal College of Chiropractors' Quality Standard on osteoporosis recommends eliciting of historical risk factors, used in combination with an appropriate validated risk assessment tools, to identify those patients who would benefit from referral for *DEXA* scanning and/or appropriate medical advice to formulate an individual care plan.

### ***Biomechanical analysis***

Some chiropractors seek to identify aberrant vertebral positioning by analysis of X-rays. There are some techniques that advocate assessment of spinal posture or

vertebral alignment by X-rays, justified by the proposal of linear<sup>10</sup> or hormesis<sup>11</sup> models of tissue response to ionising radiation. Neither of these models are consistent with the requirements of IR(ME)R and, furthermore, it is unclear whether such practice lead to better outcomes (including any additional short and long-term cost and health benefits) compared to treatment without the use of X-ray analysis. As such, evidence to recommend the use of routine spinal X-rays to analyse spinal biomechanics is absent.

### ***Offering reassurance to a patient***

Some patients place great faith in X-rays and attend chiropractors with the hope of securing an 'X-ray diagnosis'. It is expected that the clinician/patient relationship places an expectation on a clinician to counsel and advise patients as to the risks and benefits of any treatment path; that this involves an element of education; and the provision of reassurance together with information on the evidence base as regards the use of routine imaging.

Overdiagnosis can create unwarranted concern for patients or foster belief in a pathoanatomical cause for their symptoms, which could lead to a perception that their condition will not improve until the X-ray findings have resolved or shown this. This may increase the risk of chronicity, dependency and contribute to fear-avoidance behaviour by the patient.

### ***Medicolegal reasons***

That a practitioner protects themselves in the event of a claim by a patient, for negligence or malpractice. No evidence was found indicating routine imaging reducing the risk of malpractice claims made against chiropractors.

### ***The potential for improved patient management***

This is a contested point in chiropractic utilisation of X-rays. The 2020 supplemental guidance to IRMER requires, amongst other things, practitioners to consider these questions:

- What is to be gained by carrying out the exposure?
- What is the expected benefit of the exposure?
- What is the likely dose from the exposure?
- What is the risk to the individual from that dose?
- Is the exposure likely to answer the clinical question?
- Will the individual's treatment be altered?
- How may the outcome affect the management of the individual?

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<sup>10</sup> The linear threshold model incorporates a threshold below which radiation exposure is not associated with increased risk of cancer.

<sup>11</sup> the hormesis model postulates that low levels of radiation exposure may in fact produce benefits rather than damage to tissue.

An argument sometimes advanced is that X-rays will inform a chiropractor's choice of manipulation versus mobilisation; rehabilitation and the recommendation for prophylactic care and that the dose involved is low compared to the potential benefit to the patient. Some also argue that a biomechanical analysis cannot be performed without X-ray, and doing so may materially impact on the chiropractor's choice of a patient's treatment and management.

This might be addressed in the provision of information to the patient during their consenting to exposure to ionising radiation. The risks are well quantified. This is further detailed in Section 14 of the 2020 IRMER guidance:

**14.**  
**Communicating**  
**benefits and risks**

Communicating the benefits and risks associated with an ionising radiation exposure has always been recognised as a fundamental principle of diagnostic imaging, interventional radiology and nuclear medicine services. In normal daily practice, duty holders have conversations with patients with the intention of improving understanding of the benefits of having the examination and providing information on the associated risks. The introduction of Schedule 2(i), requiring an employer's procedure for providing adequate information relating to the benefits and risk associated with the exposure, formalises this recognised practice. Information should be given, where practicable, to the individual being exposed or their representative prior to the exposure.

Schedule 3 includes the requirement for IR(ME)R duty holders to have adequate training on the benefits and risks of radiation and risk communication. It is recognised that communication of the benefits and risk from radiation exposure can be quite challenging. Individuals and/or their representatives may have difficulty processing information due to an array of emotions, stress, confusion and worry. They may give greater weight to negative information than to positive information being provided.<sup>68</sup> Therefore, it is important to ensure that the benefits of the exposure are clearly described along with the implications of not having the examination. IR(ME)R duty holders may wish to reference the justification process, emphasising that the examination is the most appropriate option to answer the clinical question posed, has been tailored to the individual and that radiation doses are optimised.

Information may be provided by a combination of IR(ME)R duty holders, such as referrer, practitioner or operator, or it may fall to only one duty holder. The employer's procedure should specify how this information is delivered to ensure a consistent message is provided across the patient pathway. This information will support the individual being exposed to make an informed decision about the examination they are being offered.

The way in which this information is delivered will vary depending on the type of examination, the individual being exposed, the diverse delivery of service provision, and so on. The information can take various forms, such as posters,<sup>69</sup> leaflets, verbal discussions and appointment letters, or be part of written consent.

The employer's procedure should outline a range of scenarios where different types of information are provided. The method of communication and level of information provided may vary depending on the complexity of the examination and the level of risk.<sup>70</sup>

Within Wales employers should ensure any information is made available in Welsh and English to comply with the requirements of the Welsh Language Act 1993 and the Welsh Language (Wales) Measure 2011.<sup>71,72</sup> Table 14.1 lists examples of different communication methods and things to consider when establishing an employer's procedure.

## 6. A way forward

### a) Consideration of existing guidance and protocols for utilisation by chiropractors

1. In previous sections it is discussed that, when compared to other primary healthcare professions such as medicine, physiotherapy and osteopathy, there is little or no evidence that the utilisation of X-ray imaging within chiropractic should differ.
2. Evidence-based clinical guidelines across the different professions contain similar recommendations. Therefore, it can be argued that X-ray utilisation rates across all primary care professions managing spinal pain should be similar.
3. In consideration of this, and as set out in Section 4 above, the iRefer guidelines as produced by the Royal College of Radiologists (limited to those relating to spinal imaging) could be a suitable starting point for the development of a set of 'clinical scenarios' for chiropractic treatment that chiropractors would be required to have regard to. Further background information can be found at: <https://www.irefer.org.uk/>. The Annex to this document suggests an approach for doing so, based on typical clinical scenarios presented to chiropractors.
4. An important consideration is that alternative modalities are not always easily accessible to chiropractors working in private practice. Some rely on sourcing local private facilities for magnetic resonance imaging (typical cost £270 - £400 per area) or musculoskeletal ultrasound (typical cost £60 - £150 per area). These can often be accessed and reports received within five working days.
5. An alternative route for a chiropractor is to refer the patient via their general practitioner. Whilst general practitioners can refer for X-ray speedily, these can take up to three weeks to report. Magnetic resonance imaging organised through the NHS usually requires a consultant referral, and can take several weeks to arrange. Musculoskeletal ultrasound is often accessed via local musculoskeletal triage pathways, which can involve long waiting times, and its use in musculoskeletal pathways is not common.
6. As such, it is important that chiropractors know whether the need for any referral is routine, urgent or an emergency. Routine referrals can be facilitated by private or NHS pathways. Emergency referrals, whilst uncommon, require immediate action by referral to a hospital. The problematic category relates to urgent referrals occasionally giving rise to the taking of civil action against chiropractors. The 2020 update to IR(ME)R guidance may be helpful here. This requires practitioners to decide:
  - How effective are any alternative modalities compared with the planned exposure?
  - Are the alternative diagnostic imaging options available locally in a clinically acceptable timeframe?



## **b) Possible next steps**

7. It is expected this report or aspects of it - as amended by the involvement of the expert reference group - will be subject to wider consultation in 2021.
8. The development of guidance is to be considered, potentially at a greater level of specificity than that currently available to chiropractors by either the GCC or professional bodies. The development of such guidance must take into account best practice in imaging generally.
9. We note the development of guidance can be expensive, and time consuming. For example, at a minimum it will be necessary to conduct a literature review and synthesis; to assemble a body of experts to review that synthesis and an extensive period of consultation. Of note is a recent rapid review of the literature published in July 2020.<sup>12</sup>
10. It is noted that the 'iRefer' guidance is rigorous; designed to be in the best interests of patients, and has been developed for use by a spectrum of clinicians regardless of the setting in which patients are treated.
11. There is advantage in signalling an approach that affirms the centrality and importance of the iRefer guidance, at least, to the chiropractic profession. Other forms of extant guidance in relation to imaging more generally may also be appropriate and applicable.

**GCC February 2021**

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<sup>12</sup> [Corso et al: The clinical utility of routine spinal radiographs by chiropractors: a rapid review of the literature](#)