

General Chiropractic Council

Review on the use of diagnostic imaging in chiropractic: Background document

1. Preface

This document explores issues around diagnostic decision-making. This is an area with few certainties or absolutes. In science, ‘proof’ or binary results (yes/no, true/false) are rare. Probabilities are the rule, and diagnostic decision-making is no exception. Deciding which diagnostic test or tests may best help rule in or rule out certain pathological conditions is a matter of analysing incomplete information and weighing the probabilities of how good a particular test is at detecting a certain disease. Being good at diagnosis means constantly staying updated on developments in the field, to understand those probabilities. Ultimately, clinical judgement plays the greatest part in the use of diagnostic testing, and good judgement relies on good information.

2. Background

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 computed tomography (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.*

There are many causes of calcification of cervical spine structures (e.g. spondylosis, degenerative disc disease (DDD), intervertebral osteochondrosis (IVOC), facet arthrosis, uncinata arthrosis) and spine-adjacent structures (e.g. diffuse idiopathic skeletal hyperostosis (DISH), ossification of the posterior longitudinal ligament (OPLL), carotid atherosclerosis, tracheal, thyroid and other cartilaginous

calcifications) as well as the fact that plain radiography may not depict the extent of some of these or even detect them at all.

3. Context

The approach set out in this document proceeds from a perspective that chiropractors are registered health care providers with primary contact responsibilities. Chiropractors' use of diagnostic imaging modalities such as plain radiography (X-rays), computed tomography (CT), magnetic resonance imaging (MRI), diagnostic ultrasound, and others should be guided by the same principles as other healthcare providers. They should use the same indications as any other health professional when ordering or referring for diagnostic imaging, or in referring for any other type of diagnostic test (blood tests, diabetes checks, bone mineral density analysis, and so on)

There is evidence (1) that some chiropractors use radiographs for different purposes than other healthcare providers and therefore some may assume mainstream guidelines on the use of ionising radiation are a part of their consideration but other considerations also apply. Such an approach is not supported by the health care literature. (2) Other prominent manual therapies that use joint manipulation, physiotherapy and osteopathy, do not make such claims or it is less evident that they do.

The application of mainstream, evidence-based guidelines for diagnostic imaging among chiropractors is not uniform, particularly for plain radiographs.

Bussi eres observed that, "Despite very few patients having serious spine conditions, there have been dramatic increases in the use and costs of certain services in the primary care setting, with little evidence of improved patient outcomes... Although evidence-based diagnostic imaging guidelines are available, [chiropractors] remain divided on whether current guidelines recommendations for spine imaging apply to them." (3) Looking at the international experience, for example, and in particular the USA, there primary care physicians, in general, reduced the number of radiography requests from 2003-2015 for their Medicare patients, the incidence of chiropractors requesting them increased them by more than 14% in the same period. (4)

In 2017, the Australian government undertook a review of Medicare, the national single payer for healthcare. Specifically, they updated reimbursement policies to incorporate new information and technological advances. A routine statistical analysis of the ordering of plain radiographs revealed that, overall, chiropractors ordered more 3-region and 4-region spine/pelvis views than medical practitioners, osteopaths, or physiotherapists. A clinical justification for this could not be found, and so reimbursement for radiographs for these types of views was discontinued for chiropractors only. (5)

Benefitting patients is the primary focus of any health care profession. With that perspective, this report explores several questions:

- Can compliance with existing best practice diagnostic imaging guidelines be improved in chiropractic?

- How might it be improved?
- What role can or should the GCC, or other significant organisations involved in the system of chiropractic, play in facilitating that improvement and what steps might be most useful in doing so?

In developing a more consistently applied approach to the use of imaging in diagnosis a useful starting point is to consider barriers to adherence to imaging guidelines. There are numerous, but the following categories group the principal barriers. Having taken account of these some tools to inform and catalyse adoption and improvement in clinical practice are identified.

Three factors are described:

- a) Clinical
- b) Psychological,
- c) Factors specific to chiropractic.

a) Clinical factors

Incomplete understanding of the appropriate use of diagnostic tests

A consideration of diagnostic decision-making at a general level is beyond the scope of this report. Crucially, there are limitations on the usefulness of *any* diagnostic tool, including diagnostic imaging, in the detection of disease.

Some tests are inappropriate for some conditions. An obvious example is that no clinician should order a radiograph to check for skin cancer. In this case, a better test is a visual check of the skin. Of course, usually clinical decisions are more complex. Equally, no diagnostic test is 100% accurate, even when appropriately used. Every diagnostic test has a false result rate, often very small. This means that a percentage of any test will indicate that a person without a disease has the disease (false-positive), and a percentage will say that a person with a disease does not have the disease (false-negative).

As an example, plain x-ray images are not very useful for detecting osteoporosis. Some 30-50% of mineralised bone (the bone that is visible on radiographs) must be lost before it is reliably detectable with plain radiography. However, bone mineral density analysis, such as 'DEXA,' can detect very small amounts of bone loss, and allow earlier intervention, reducing the probability of fracture. Radiography is the wrong test for osteoporosis, and many other conditions.

Standard guidelines such as iRefer (<https://www.irefer.org.uk/>) help clinicians decide which modality of diagnostic imaging is the most useful given various clinical signs and symptoms. The Clinical Knowledge Summaries (<https://cks.nice.org.uk/>) from the National Institute of Clinical Excellence are another useful resource. Access to these guidelines is variable – some clinicians will be familiar with such guidelines and access readily, and some will rely more on training and experience.

Negative test results are not negative information

To use a diagnostic test correctly, the clinician will first have worked up a prioritised list of differential diagnoses or conditions that the patient's history, signs, and symptoms indicate the patient could have. The clinician then may choose a diagnostic test that helps establish one more likely than the others. Sometimes it may take more than one test to fully establish a diagnosis, sometimes none are necessary, and sometimes a diagnosis is never fully confirmed. For instance, mechanical low back pain (MLBP) is poorly understood; there is no test that gives a resulting diagnosis of mechanical low back pain. Equally, MLBP is amenable to chiropractic care and diagnostic tests can rule out other conditions that can mimic MLBP, such as intervertebral disc infection or tumour. However, radiography is not necessarily the best test for this differentiation. MRI and/or blood tests for inflammatory change or certain cancer markers may be, depending on the patient's clinical presentation. Therefore, a clinician will have a plan of management if a diagnostic test returns a positive result and a different plan if it is negative. Either way, a test gives valuable information, if it is used in this manner.

Lack of confidence in physical exam skills

Sometimes, a clinician may lack confidence in their physical examination skills. Lack of experience may be a factor, but experienced clinicians may be challenged by a patient with an unusual presentation. When clinicians are uncertain about a diagnosis, some may order radiographs to gain any information on the patient's condition. Before all else, an appropriate clinical history and physical exam must be carried out, and a justification for the use of ionising radiation established by that information, must also be made.

As far as possible, the risks must be worth the intended benefit. For example, there is an argument that every citizen should be screened for hidden disease with a full blood workup and full-body MRI every six months. Such an approach would be burdensome both to patients and the finances of any health care system. Studies have shown that even screening programs are most effective when targeted at a specific disease, using a specifically useful diagnostic test. An example of this was the tuberculosis (TB) skin prick test applied to national populations; a correctly selected and applied test allowed early detection and intervention, curbing spread of the disease. Screening was also done with chest radiographs from the 1930s through the 1960s, but that only detected advanced disease, once TB was well-established in a population, and the outcome of those efforts was uncertain. (6)

Failure to consider the consequences of false negative or false positive results of a test

False negative results have consequences, because disease processes may be advancing while a patient has been 'cleared' of having it. Selecting the correct test based on clinical information and correctly applied indications for that test will minimise this possibility. False positive results have different implications. Positive results usually mean further testing, at further cost, as well as psychological stress for patients, their families, and sometimes the clinicians as well.

Finally, any diagnostic test will provide a certain small proportion of unanticipated findings. These are rarely clinically significant, but like false positive tests, may require follow-up with the associated cost and stress. The more diagnostic tests administered, the more false and/or unanticipated results that need to be followed up.

b) Psychological factors

Intolerance of uncertainty

Sometimes normal human behaviour challenges clinical best practice. Diagnostic and therapeutic decision-making is complex, requiring continual re-evaluation for every patient at every visit. Some people are just less happy than others when circumstances are not readily explained. This state is referred to as intolerance of uncertainty, and clinicians, being human, are prone to it like anyone else. It may lead to suboptimal use of diagnostic imaging (7). In the quest for certainty, some clinicians may order radiographs, with a hope of seeing a definitive diagnosis. As above, an unfocused use of any diagnostic test is unlikely to be useful and has potential negative consequences.

Request by patient

Patients occasionally request radiographs when they would not provide diagnostic benefit as defined by mainstream guidelines. This situation is challenging to a clinician. Studies have shown that patients think radiography is an important part of diagnosis, particularly for low back pain (8). Clinicians working in a fee-for-service model may feel pressure to accede so as not to take the chance of losing that patient to a different health care provider. Therefore, clinicians must spend time carefully explaining the risks and benefits of radiography for their clinical situation, reassuring the patient as to why radiographs would not be helpful in their circumstance. As can be seen from the factors leading to this report, this is a complex matter.

Interprofessional issues

There may also be challenges with the NHS. Sometimes there is a delay in patients being able to access diagnostic services, or a test is completed but the report is delayed. Sometimes interprofessional communication is lacking. In these circumstances, clinicians occasionally take radiographs to get information on their patients, even if radiography may not be the best choice of diagnostic test for a given patient.

c) Factors specific to chiropractic

Controversy about the risks of ionising radiation

Like all healthcare professions, chiropractic has a unique history and has developed unique features. Some practitioners adhere to paradigms of health care developed with a historical chiropractic perspective, including on the risks and benefits of radiography.

In the chiropractic community and elsewhere, there is debate about the risks of ionising radiation. This is legitimate. Science rarely sees an issue settled, and with

the small doses of radiation used for diagnosis there is no certainty about its potential to cause disease. Similarly, there is no certainty that it is harmless. In general, when a risk is unknown, the prudent action is to apply the precautionary principle. In other words, assume that risk exists and act accordingly. In this case, that simply means applying clinical judgement in the context of existing mainstream guidelines promoting best practice.

Radiography as a business tool

It is seen, in particular in the USA, that some chiropractic practice management systems see radiographs to encourage increased patient visits and compliance (9) (10). There is a body of chiropractors in the UK that have x-ray facilities, and some chiropractors may see that as conferring an advantage over other manual therapists, who do not typically have diagnostic radiography in their clinics. Arguably, a section of chiropractors may see radiography as integral to their practise and may be inclined, more than other chiropractors, say, to undertake radiographs. That said, the obligations on them to meet IR(ME)R regulations are exacting

Pre-manipulation screening

Some chiropractors see chiropractic as different to other health care professions, because of the use of joint manipulation, and therefore believe that images are necessary to rule out pathology, developmental anomalies, and normal variants prior to manipulation. This idea has yet to be supported in the peer-reviewed literature. In fact, the idea of screening for general pathology with x-rays has been discredited. (11) Other prominent health care professions that use manual therapy such as osteopathy and physiotherapy do not claim that x-rays should be taken prior to manipulation.

Claims of the necessity of radiography on the clinician's approach to, and benefits of, manipulation on, say, 'realigning the spine' or 'putting a bone back into place' are not supported in the peer-reviewed, indexed literature.

4. Next steps

In its consideration the expert group was concerned that practical steps be taken recognising the challenges presented by diagnostic decision-making. Chiropractors are registered health care providers with primary contact responsibilities. Chiropractors' use of diagnostic imaging modalities should be guided by the same principles as other healthcare providers. As set out above there are clinical and psychological factors that present challenges to all clinicians. There are some aspects relating to the history and development of chiropractic that have some bearing albeit patients rightly expect chiropractors to meet the standards set out in the Code of Practice. The expert group identified four areas for consideration by the Council.

- a. Clear advice as to the use of imaging guidelines
- b. A renewed emphasis on shared decision-making

- c. A method for self-reflection and practice pattern analysis to be promoted to the profession
- d. The development of formal GCC guidance on diagnostic imaging

a) Guidelines

The expert group concluded that the development of comprehensive imaging guidelines specific to presentation of conditions seen in chiropractic as problematic.

Since evidence-based guidelines exist, and are periodically updated, the group sees little or no benefit in commissioning the development of new guidelines specific to chiropractors. What is proposed is an approach that seeks to help chiropractors better understand the usefulness of existing guidelines and encourage better uptake of them.

To facilitate this, self-reflection by way of analysis of patterns of practise is encouraged and a comparison with current guidelines and norms undertaken. If a registered chiropractor finds they are practising outside those norms, further analysis to discover why, and how to effect change in practice to better benefit patients is encouraged.

The intention is to both reduce the risk to patients of ionising radiation; to improve the effectiveness and efficiency of care provision; and to reduce costs to patients

The iRefer guidelines (<https://www.irefer.org.uk/>) are the standard for imaging in the UK. Developed by the Royal College of Radiologists, they are available by subscription to all healthcare practitioners. The Royal College of Radiologists (RCR) has published *RCR iRefer Guidelines: Making the best use of clinical radiology* (iRefer) since 1989. iRefer is now widely accepted as the major tool to promote evidence-based imaging. The guidelines are now also available as a web-based system, appropriate for modern health care settings.

The group expect that chiropractors will use these guidelines at a minimum.

b) Shared decision-making

The expert group emphasises that modern care is a partnership between clinician and patient, and that the GCC and professional bodies take steps to emphasise this further.

Diagnostic imaging should never be 'routine', but rather should only be applied after patient and clinician agree on the usefulness of a particular imaging modality for a particular condition, and that the risks are outweighed by the benefits. Patients and clinicians are now considered to be in a collaborative relationship for clinical decisions. NICE has recently published new guidelines on shared decision-making, here: <https://www.nice.org.uk/guidance/ng197/chapter/Context>.

Attention to the benefits arising seen from sharing in decision-making is drawn:

- greater satisfaction with the decisions made
- greater understanding about the risks and benefits of the available options
- better communication between people and their healthcare professional, including people feeling that they have 'been heard'
- improved trust between people and their healthcare professional
- better concordance with an agreed treatment plan
- people reporting a better experience of care, including more satisfaction with the outcome.

Further, the emphasis on informed consent for health care providers is established. Within chiropractic, a study giving an extensive consideration of informed consent has recently reported (12). It noted that principles of informed consent have expanded in recent years to include potentially legally disclosable items not previously considered part of informed consent, including “practitioner experience, personal characteristics, health, disability, training, practice patterns, qualifications, statistics related to outcomes, disciplinary history, financial and research interests as well as religious or conscientious beliefs.” (12)

The report emphasised that: “A signed form is not consent. The conversation between the clinician and the patient or carer is the true process of obtaining informed consent. The signature on the consent form is proof that the conversation took place and that the patient understood and agreed.” (12)

Within diagnostic imaging, this means a discussion of the differential diagnosis list for the patient, the working diagnosis, tests that may rule in or out each possibility and the risks associated with each test. The discussion of appropriate tests would not usually be limited to imaging but may include different forms of imaging.

Adhering to a chiropractic technique system that relies on radiography to help patients understand the potential benefits of chiropractic care based on a specific basis is unacceptable, and inconsistent with the proper application of informed consent, (1) (13) - even where a consent form may have been signed.

The concept of informed consent is closely allied with an important aspect of modern health care, shared decision-making between the clinician and patient. A patient is not capable of sharing the decision process if not appropriately informed by the clinician. Practice pattern analysis may reveal this. For instance, a chiropractor may review practice records and discover most new patients are radiographed. This would be above the average for musculoskeletal complaints in primary-contact clinicians. A conscientious practitioner would then investigate the cause and rectify the issue(s), or possibly discover that the patient population was unusual in some way. Either outcome is informative and helps the clinician understand the practice better as well as provide evidence-based care.

c) A method for self-reflection and practice pattern analysis

The expert group sees a role for self-reflection by practitioners in relation to imaging practice.

At the same time, the group considered that guidance on this would be required and this could most usefully be developed by the profession – in that it is not usually a role played by the regulator. Equally, such guidance would take 12-18 months to be developed. The GCC could incentivise adoption of such an approach by building in aspects within CPD requirements in the future.

An understanding of practice and how that compares with standards arrived at through research evidence is important to providing the best care possible to patients. Self-reflection allows a private consideration of elements of practice, both the good and where improvement is desirable.

The expert group concluded that creating an opportunity for open, transparent and honest self-appraisal will facilitate engagement with that process.

It noted a potential approach for illustration only, outlining steps for a practice pattern analysis of imaging referrals:

Percentage of new patients/conditions x-rayed

1. Select a recent 3-month period and determine the number of new patients and add it to the number of patients with a new condition for whom a new examination has been recommended.
2. Determine the number of these patients x-rayed or referred for x-rays over the same period.
3. Divide #2 by #1 and multiply by 100 to get the percentage of patients with 'new' patients/conditions x-rayed.
4. This should be somewhere around 5-15%. Review result and reflect on reasons why it may be outside this range.
 - a. The numbers are not everything. Even if results are in that range, continue with the process below.

Justifications for imaging

Taking the list of justifications specific to practice, whether that is 'red flags' or an alternative, reflect on a few aspects of it:

- a. When is the last time this was updated?
- b. What standard was used to update it? (e.g., RCR iRefer, Bussieres, et al)
- c. Is it due for review?
- d. Should a different standard be chosen?
- e. On what basis have these choices been made?
- f. Is there a clinical need for imaging?

Diagnostic accuracy

1. Consult each patient record for the justification entered for the use of ionising radiation. (e.g., suspected malignancy, suspected inflammatory arthropathy)
2. Make a chart with columns, each column headed by a particular justification
3. Under each justification enter the working diagnosis at the time for that patient
4. Under each working diagnosis enter the final diagnosis

5. Under the final diagnosis, enter a tick if the working and final diagnoses matched, or a cross if they were different.
6. For any mismatches, review the records more completely to determine why, and enter the reason in the appropriate column.

d) New GCC Guidance

The expert group saw most utility in the development of guidance by the GCC.

It notes the expectations of the Code of Practice requiring chiropractors to meet the principles detailed – many of which are directly relevant to considerations around diagnosis and assessment. As such, the development of new and focused guidance to chiropractors by the GCC in relation to diagnostic imaging is seen as being the most useful step to be taken to support chiropractors and at the same time in the establishing of clear expectations. In turn, patients can be assured that their expectations of care can be met. Such guidance would be subject to consultation with the profession.

Draft guidance is annexed.

References

1. Young KJ. Evaluation of Publicly Available Documents to Trace Chiropractic Technique Systems That Advocate Radiography for Subluxation Analysis: A Proposed Genealogy. *Journal of Chiropractic Humanities*. 2014;21(1):1-24.
2. Corso M, Cancelliere C, Mior S, Kumar V, Smith A, Côté P. The clinical utility of routine spinal radiographs by chiropractors: a rapid review of the literature. *Chiropractic & manual therapies*. 2020;28(1):33.
3. Bussièrès AEDCP, Sales AERNP, Ramsay TP, Hilles SDCMBA, Grimshaw JMMP. Practice Patterns in Spine Radiograph Utilization Among Doctors of Chiropractic Enrolled in a Provider Network Offering Complementary Care in the United States. *J Manip Physiol Ther*. 2013;36(3):127-42.
4. Mizrahi DJ, Parker L, Zoga AM, Levin DC. National Trends in the Utilization of Skeletal Radiography From 2003 to 2015. *Journal of the American College of Radiology*. 2018;15(10):1408-14.
5. Taskforce MBSMR. Changes to Medicare Benefits Schedule (MBS) Items for Spinal X-Ray Services. Canberra: Australian Government; 2017.
6. Miller C, Lonroth K, Sotgiu G, Migliori GB. The long and winding road of chest radiography for tuberculosis detection. *European Respiratory Journal*. 2017;49(5):1700364.
7. Innes SI, Leboeuf-Yde C, Walker BF. The relationship between intolerance of uncertainty in chiropractic students and their treatment intervention choices. *Chiropractic & manual therapies*. 2017;25(1):20.
8. Jenkins HJ, Hancock MJ, Maher CG, French SD, Magnussen JS. Understanding patient beliefs regarding the use of imaging in the management of low back pain. *European journal of pain*. 2016;20(4):573-80.
9. Strategic Chiropractor L. Why 80% of your chiropractic practice is missing: Strategic Chiropractor; 2021 [Available from: <https://strategiccdc.com/why-80-of-your-chiropractic-practice-is-missing/>].
10. PostureCo I. PostureRay radiographic EMR - exacting x-ray analysis: PostureCo, Inc.; 2020 [Available from: <https://www.postureanalysis.com/x-ray-analysis-for-chiropractic/>].
11. Jenkins HJ, Downie AS, Moore CS, French SD. Current evidence for spinal X-ray use in the chiropractic profession: a narrative review. *Chiropractic & manual therapies*. 2018;26(1):48.
12. Simpson JK, Innes S. Informed consent, duty of disclosure and chiropractic: where are we? *Chiropractic & manual therapies*. 2020;28(1):60.
13. Young KJ. Gimme that old time religion: the influence of the healthcare belief system of chiropractic's early leaders on the development of x-ray imaging in the profession. *Chiropractic & manual therapies*. 2014;22:36.