Radiographic Imaging For Non-Specific Low Back Pain: The communication of radiology report findings

Sarah Gallimore

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Copyright Statement

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Abstract

Non-specific low back pain is a major health and economic problem and cited as one of the most common reasons for consulting a primary care physician. The aim of this research was to understand the relationship between actions, situations and consequences; firstly by establishing how radiology reports are communicated to patients following a referral for lumbar spine radiographic imaging for non-specific low back pain and secondly, how this may influence the outcome (symptoms and behaviour) for an individual from their perspective.

A qualitative approach focused the attention on the research problem. Semi-structured telephone interviews were used to establish how radiology report findings were communicated to the participants. These interviews were then transcribed, analysed and interpreted. To ensure quality, minimise investigator bias and unwarranted selectivity, the radiology report for each of the participants was also analysed. By focussing on the implied meaning of the text of the report, this second data source was used to determine whether the communication of the radiology report findings had been effective.

Twenty-three patients were interviewed, sixteen women and seven men, with a mean age 57 years (range 47 to 65 years). All participants said they felt reassured by the referral for radiographic imaging and the majority returned to their GPs for the results of the investigation. After receiving the results however, only around half of the participants in this research seemed to understand the report and felt reassured by its findings. They were glad to have a diagnosis and they had a positive attitude towards the outcome. While generally they were pleased that there was nothing significant or dangerous and they could be treated, not all were happy to be told that they had age related wear and tear or degeneration. Those who were not reassured by the report findings seemed to either not really understand the results or had misinterpreted the results. They reported being despondent and unsurprised and that it (their low back pain) was something that they would have to live with.

This research has shown that despite guidelines which state that radiographic imaging of the lumbar spine should not be offered to those with non-specific

LBP (NICE 2009), GPs are continuing to request lumbar spine imaging for their patients with non-specific low back pain. The research found that patients, who were reassured by the findings described in the radiology report, were glad to have a diagnosis and it gave them the confidence to pick up their lives, and most continued to work. However, this research also identified that when there is misinterpretation or a misunderstanding of the intended meaning of the radiology report, the outcome for patients was dissatisfaction and despondence, with some unable to work. The findings of this research suggest that improving communication between the Radiologist and the GP and between the GP and the patient may reduce the burden of chronic low back pain.

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Chapter 1. Background and Rationale

The term “low or lower back pain” (LBP) is used to describe pain in the area of the lumbosacral spine, between the lower border of the rib cage and the buttock creases (NICE 2009, Moffett et al. 1995), with or without referred or radicular leg pain (sciatica) (McIntosh and Hall 2011). LBP is classified as either acute (pain persisting for <12 weeks duration) or chronic (pain persisting for >12 weeks duration). Some studies further subdivide acute back pain into acute (<6 weeks duration) and sub-acute (6-12 weeks duration) (McIntosh and Hall 2011). It is often stated that acute LBP is self-limiting, is not related to serious disease and the outlook for a patient is generally excellent, with 90% or greater recovery over three months (Donelson et al. 2012, Balagué et al. 2012, van Tulder et al. 2006, Andersson 1999). It has also been suggested that only 10-15% of those with acute LBP develop chronic symptoms (Balagué et al. 2012).

In 1994, a review of the natural history of LBP found that the previous estimates of the rate of recovery were over-optimistic and 70% of people who experienced an “attack” of back pain suffer three or more recurrences, with 20% continuing to have some degree of back symptoms over long periods of their life (Higginson, 1994:13). Since then, several studies have also challenged this optimistic view of the natural history of LBP by suggesting that many patients still experience back pain a year after the initial episode (Donelson et al. 2012). Andersson (1999) suggested that, as the recurrence rate of LBP is so high, it should be considered to be part of its natural history. Some clinicians believe that each episode of LBP is independent and not influenced by prior attacks; however, Donelson et al. (2012) highlighted that episodes of LBP often worsen as they recur and for some the pain changes location, extending to the buttock or leg.

Studies have shown that all age groups are affected by LBP and most people will experience back pain at some point in their life. The reported prevalence of LBP rises with increasing age up to 65 years, after which it drops off for unknown reasons (Andersson 1999). Jeffries et al. (2007) found that there were high rates of LBP in children and adolescents. They suggested that during the adolescent period (between 10 and 19 years (WHO 2014)) the prevalence of reported pain increased with age to reach adult levels by 18 years. They concluded that there was evidence that pain in adolescence was a risk factor for spinal pain in adulthood (Jeffries et al. 2007). In addition, the study by Murphy et al. (2007) found positive associations between children's musculoskeletal pain and both physical and psychological variables. For example, children with a family member with low back pain reported significantly more neck and low back pain; children who had treatment for musculoskeletal pain, regardless of the area treated, reported more neck and upper back pain; children who had previously had a low back injury reported significantly more low back pain and those children who had an accident reported more low back pain. They suggested that it was important to recognise the influence of psychological and family factors in children's pain, as this could have serious implications for the future workforce, with many young adults entering the workplace with neck and back pain already present (Murphy et al. 2007).

For the elderly (over 65 years), Balagué et al. (2012) suggested that, the effect of low back pain on wellbeing or health related quality of life and functioning is substantial, however few seek care for their symptoms. McBeth and Jones (2007) suggested that the drop in reported prevalence rates could be attributed to a change in the risk factors associated with symptom onset or persistence, for example, a change in workplace factors after retirement. It has also been suggested that it might be due the belief that pain is a normal part of aging that cannot be avoided (Fejer and Ruhe 2012. Sjøgren et al. 2009. Hicks et al. 2008). Meucci et al. (2015), identified Hoy et al. (2012) who suggested that older adults may be more resilient to pain due to factors related to ageing, such as cognitive impairment and decreased pain perception.

Morbidity statistics suggest that LBP is most prevalent amongst people in their middle years (35 to 55 years), when ideally they should be the most productive at work (Moffett et al. 1995, Breivik et al. 2006). In addition, Balagué et al. (2012) highlighted the findings of a UK survey (Jordan et al. 2010) which also found consultation prevalence to be at its highest in a similar age range (45-64 years). Blangue et al. (2012) suggested that is because prevalence estimates vary depending on the definition, for example LBP may in some cases only be reported when it is defined as, requiring sick leave.

A systematic review to estimate worldwide prevalence of chronic low back pain (Meucci et al. 2015) also found an increase in prevalence among individuals aged 30 to 60 and suggested that it may be related to occupational and domestic exposures that overload the low back along with the degenerative articular process shown after 30 years of age. The review also identified, as previously highlighted by McBeth and Jones (2007), that the prevalence stabilises or reduces from the seventh decade of life on and suggested that this could be due to reduced exposure to occupational and everyday activities that increase the risk for LBP. Glenton (2003) suggested that for back pain sufferers, a diagnosis is important as it can lead to an explanation of the cause of the pain and is seen as attempting to get well, as well as allowing access to welfare benefits and social services. However, Mortimer and Ahlberg (2003) found that the most decisive factors for seeking care were disability and pain, without wanting a medical prescription. It was suggested that numerous individuals with low disability and low pain intensity seek care for their pain problems. Therefore better information and advice on the common course of low-back pain may make those individuals less frightened of their pain and, as a result, reduce the consumption of care and social costs for society.

A review produced by the Clinical Standards Advisory Group (CSAG) suggested that approximately 60% of the population have reported back pain at some time in their life (Higginson 1994:12). More recently, the reported lifetime prevalence of low back pain had increased to 84%, with 44-78% of people suffering relapses of pain after the initial episode; 26- 37% relapses of work absence and 11–12% of the population being disabled by it (Airaksinen et al. 2006). The Global Burden of Disease 2010 Study identified that when measured in disability-adjusted life years (DALYs), LBP causes more global disability than any other condition (Hoy et al. 2014). Low back pain is the leading cause of activity limitation and work absence throughout much of the world, causing an enormous economic burden on individuals, families, communities, industry and governments. A communication by the Department of Social Security (DSS) (1998) identified that in the UK, between 1994 -1995, 116 million working days were lost due to “incapacity to work” related to back pain. It was estimated that low back pain accounted for £11 billion in direct and indirect expenditure in the year 2000 (Maniadakis and Gray 2000, Hoy et al. 2010), accounting for approximately 13% of all certified days of incapacity (Moffett et al. 1995).

For a minority of patients presenting for initial evaluation in primary care, LBP is caused by a specific disorder. Specific low back pain is defined as symptoms caused by a specific pathophysiological mechanism (Koes et al. 2006) such as tumour, compression fracture (osteoporosis), spinal infection or inflammation, rheumatoid arthritis, ankylosing spondylitis, radiculopathy (nerve root pain), spinal stenosis, or a symptomatic herniated disc (McIntosh and Hall 2011, Chou et al. 2007, van Tulder et al. 2006). The cauda equina syndrome is a rare but serious condition that describes extreme pressure and swelling of the nerves at the end of the spinal cord, and is most commonly associated with massive midline disc (Villavicencio 2016).

A specific cause for LBP is excluded by diagnostic triage (history and physical examination) focused on identification of “red flags” (Fig. 1) (Koes et al. 2006). The history should also include an assessment of psychosocial risk factors, which predict risk for chronic disabling back pain (Chou et al. 2007). Radiographic imaging, computed tomography (CT) and/or magnetic resonance imaging (MRI) (preferred) might be indicated only in patients with red flag conditions, and should be performed only when severe or progressive neurologic deficits are present or when serious underlying conditions are suspected on the basis of the history and physical examination, and only if they are potential candidates for surgery or epidural steroid injection (for suspected radiculopathy) (Chou et al. 2007). Plain radiography could be considered as an option for demonstrating structural deformities (Airaksinen et al. 2006).

Attempts to identify specific anatomical sources of specific LBP have not however been validated in rigorous studies and it has been suggested that epidemiological descriptions relating to the definition, classification and diagnosis of the problem are fraught with uncertainty and frequently conflict with one another (Deyo and Diehl 1988, Chou et al. 2007). In addition, there is no evidence to suggest that labelling patients with specific anatomical diagnoses improves outcomes (Chou et al. 2007).

Figure 1. Red flag conditions indicating possible underlying spinal pathology or nerve root problems (Waddell 1998)

Red flags

- Onset age < 20 or > 55 years
- Non-mechanical pain (unrelated to time or activity)
- Thoracic pain
- Previous history of carcinoma, steroids, HIV
- Feeling unwell
- Weight loss
- Widespread neurological symptoms
- Structural spinal deformity

Indicators for nerve root problems

- Unilateral leg pain > low back pain
- Radiates to foot or toes
- Numbness and paraesthesia in same distribution
- Straight leg raising test induces more leg pain
- Localised neurology (limited to one nerve root)

The majority of patients have LBP that cannot be reliably attributed to a specific disease or spinal abnormality (van Tulder et al. 2006). Once a specific cause has been excluded, when red flags are not present (Koes et al. 2006), the LBP is managed as non-specific (van Tulder et al. 2006, Chou 2007). The National Institute for Health and Clinical Excellence (NICE) clinical guideline 88 Low Back Pain describes persistent or recurrent LBP as “non-specific LBP that has lasted for more than six weeks, but less than twelve months”. The term “non-specific back pain” is used to describe “tension, soreness and or stiffness in the lower back region” (NICE 2009), that lasts beyond the normal healing period of an acute injury, or episode (Stanton et al. 2011). It is characterised by symptoms and distress rather than by demonstrable tissue abnormality (Waddell and Burton 2005).

Non-specific LBP is not a life-threatening condition; however, it does represent a significant epidemiological and economic problem (Maniadakis and Gray 2000). It is very prevalent and, as identified by Linton (1998), has direct and indirect impact on society, the health-care system, the individual and their family. In addition, it seems to be increasing, despite improvements in diagnosis and therapy (Maniadakis and Gray 2000, Hoy et al. 2014). Although the proportion of health-care resources is large, few people seek health care, which results in a relatively small percentage of sufferers consuming large amounts of resources (Balagué et al. 2012, Linton 1998).

NICE (2009) suggested that the appropriate management (of those with pain and disability lasting more than six weeks) has the potential to reduce the number of people with long-term pain and disability. However, their guidance states that radiographic imaging of the lumbar spine should not be offered to those with non-specific LBP (NICE 2009). The European guidelines for the management of acute non-specific LBP in primary care also recommend that diagnostic imaging tests are not routinely indicated for non-specific LBP (van Tulder et al. 2006). Similarly, the Royal College of Radiologists (RCR) iRefer guidelines suggest that, lumbar spine imaging for low-back pain, without suggestion of serious underlying conditions, does not improve clinical outcomes (iRefer 2012, RCR 2007). Abnormalities, such as degenerative changes demonstrated both radiographically or by MRI, seem not to be strongly associated with the severity of non-specific LBP. In addition, abnormalities found when imaging people without back pain are just as prevalent as those found in patients with back pain (Koes et al. 2006).

Despite the evidence against it, the management of non-specific LBP in primary care routinely includes radiographic evaluation, with lumbar spine radiography probably still being the most common investigation undertaken (Somerville et al. 2008, Miller et al. 2002). Often, the images will show age-related anatomical changes, the most common of which is degeneration. A description of these degenerative changes is then relayed by the radiologist in a report to the physician and by the physician to the patient, in a way that could imply that the changes seen are the cause of the pain. The patient hears that there is a long term structural problem with their spine and as a consequence limits activity, contrary to the current advice on the management of back pain (NICE 2009, Roland and van Tulder 1998).

It has been suggested that lumbar disc degeneration (LDD), also referred to as degenerative disc disease (DDD), could be one of the causes of back pain in adults. DDD describes the symptoms of pain and possibly radiating weakness or numbness, stemming from a degenerated intervertebral disc. DDD is described radiographically by the presence of osteophytes, endplate sclerosis and disc space narrowing (de Schepper et al. 2010, van Tulder et al. 1997). While this definition sounds simple, very few agree on the implications and on what does and does not constitute a diagnosis of DDD (Ullrich 2000). Disc degeneration is a natural part of getting older and over time all people will exhibit changes in their discs, consistent with a greater or lesser degree of degeneration (Ullrich 2000). Takatalo et al. (2009) found that both LDD and disc bulges are already common by the age of 20; almost half of the young adults studied had at least one degenerated disc and a quarter had a bulging disc. DDD is variable in its nature and severity and not everyone will develop symptoms (Takatalo et al. 2009, Ullrich 2000).

A large part of the confusion could be the term “degenerative disc disease” itself, as this may sound to some like it is a progressive, very threatening condition and many patients are left wondering exactly what this diagnosis means for them (Ullrich 2000). It is also possible that part of the confusion comes from the term “degenerative”, which implies to most people that the symptoms will get worse as they get older. However, this condition is not strictly degenerative and the term applies to the disc degenerating (dehydration, fissuring and tearing of the nucleus, annulus, and endplates) and not the symptoms (Guiot and Fessler 2000). While it is true that degeneration of the disc is likely to progress over time, the LBP from DDD does not usually get worse and in fact over time, it usually gets better (Wilmink 2011).

The term “disease” could also create a source of confusion; it is actually a misnomer. DDD is not really a disease at all, but rather an age-related condition that may or may not produce pain from time to time (Ullrich 2000). This lack of a precise aetiology can generate different perceptions of the pain experience between patients and health service staff (Hansson et al. 2011). Wilmink (2011) suggested that it is not possible to distinguish degenerative changes of the spine which relate to symptoms of pain and disability from similar changes occurring in normal aging - a person presenting with back pain may have normal radiographs and an older person may have a “young” spine, with no degenerative changes demonstrated (Wilmink 2011).

Patients want to enlist the apparent transparency and rationality of the diagnostic imaging process in the production of a meaningful reality for their pain (Rhodes et al. 1999); in a quest for certainty and control (Epstein et al. 2005). Kendrick et al. (2001) found that patients who were referred for radiography of the lumbar spine were more satisfied with the care given by their doctor and it was found that a referral was (possibly) associated with a minor psychological improvement (Kerry et al. 2002).

However, despite this, it had no effect on pain, physical function or disability (Kerry et al. 2002). It was suggested that a referral for imaging might encourage or reinforce the patient’s belief that they are unwell, leading to greater reporting of pain and a greater limitation of activities (Kendrick et al. 2001). McDonald et al. (1996) suggested that a false positive test result would not provide reassurance; an inconclusive result may leave doubt and anxiety and reassurance may not be entirely successful, despite a normal test result (Page and Wessely 2003) and may contribute to potential negative consequences for the patient. The NHS Choices website, *How do I understand my medical test results* suggests, “Test results only make sense when your personal medical history is taken into account. Only your GP has access to this information and will know why you needed the test”. Little et al. (1998) suggested, although there is not necessarily a link between a lack of confidence and requesting an investigation, it is possible that GPs who are not confident in the management of back pain, find it more difficult to reassure their patients. Trust is an important factor, Epstein et al. (2005) suggested that patients who trust their GP's judgement maybe less likely to demand diagnostic tests.

The Royal College of Radiologists (RCR) referral guidelines (2007) state that a useful investigation is one which the result, either positive or negative, will inform clinical management and/or add confidence to the clinician's diagnosis. Therefore, it is important that the report findings are effectively communicated to the patient in the context of their clinical symptoms. After any diagnostic test, the patient should return to the referring clinician, in this case their GP, to discuss the findings, how they relate to clinical symptoms and appropriate treatment options.

Low back pain is an extremely common problem, which many people will experience at some point in their life. The majority of people who experience activity-limiting LBP will go on to have recurrent episodes (Hoy et al. 2010). Vlaeyen and Linton (2000) have suggested that the role of illness information and feedback about diagnostic tests provided by medical specialists and therapists is an area that might benefit from future research. One example is the feedback of the radiology report following radiographic imaging. It has been suggested that radiology reports using emotive phrases to describe normal age-related degenerative changes have the potential to be misinterpreted as an indication of a pathological abnormality by GPs, other healthcare professionals and patients (Thompson and Carr 2007). In 2007 Thompson and Carr carried out a content analysis of 120 GP requested lumbar spine radiology reports. They found that 89 (74%) contained at least one phrase containing words that suggested the presence of degenerative changes. However, they suggested that it was rare for the report to clarify whether these changes were "normal for age" rather than related to clinical symptoms.

I am an advanced practitioner (Band 7) radiographer, with 23 years of experience working in all areas of diagnostic radiography and a lecturer at a local university. I have a special interest in the reporting of radiographic images and I teach a masters level unit in radiographic image interpretation. My speciality therefore is the communication of radiographic findings; the terminology and the language used to describe radiological anatomy. I was interested in how the language used by health care professionals differed when the communication was between a radiographer and a doctor, and a radiographer and a patient. For example, a break in a bone is described in a radiographic report as a fracture and some patients, who have heard this term used, believe that a “fracture” is something different to a “break”. From my experience, many terms, phrases, or abbreviations have different meanings for different professional groups, as well as for patients, depending on their level of interaction with the healthcare system. Another example is the abbreviation PID; to a gynaecologist this abbreviation refers to pelvic inflammatory disease, whilst for a radiologist this abbreviation stands for prolapsed intervertebral disc. Another example is the term “degenerative disease” or “degenerative change” used commonly in radiology reports to describe age related changes on the radiographic image, which may or may not be a cause of pain. My prior assumption from practice is that this (normal) age related degeneration, described in the report, is misinterpreted by patients to mean something that will progress and get worse over time and creates misunderstandings for the patient. I was interested to find out whether the communication of imaging results is effective and contributes positively to the outcome for patients. My own reflections on communication between professionals and between professionals and patients have caused me to realise that the terminology used can cause confusion, and occasionally unnecessary alarm for patients.

With regard to low back pain, despite the guidelines, many patients continue to be referred for imaging and from the evidence; it seems that many continue to suffer. Could it be that poor communication, or a breakdown in communication, is a contributing factor? It has not been established how GPs interpret the radiographic findings described in a radiology report, or how the results are communicated to their patients, and whether the findings are explained in relation to an individual’s clinical signs and symptoms.

The aim of this research therefore was to explore the perspective of working age adult patients referred by their GP for radiographic imaging of their lumbar spine for non-specific low back pain. Their experience of the referral process and their outcome, in terms of symptom resolution, will establish whether the radiology report has been effectively communicated and understood. The findings of this research will have implications for practice development and education of healthcare professionals, providing an original contribution to knowledge.

Chapter 2. Review of the literature

The literature review provided the background for developing the research question (Haverkamp and Young 2007). The intention of this review was to establish current knowledge and identify questions not answered; this provided the framework for the study (Tashakkori and Teddlie 2010). A review of the relevant existing literature was important in establishing the scientific context and purpose of a study, its rationale, and anticipated contribution (Haverkamp and Young 2007). A well-designed research question ensures that the research problem is explored in a way that is objective, explicit and independently reproducible (Haig and Dozier 2003).

In 1984, Stoan suggested that the quest for knowledge may be complex and personal and research skills require a mastery of the substantive content of a discipline and all its major schools of thought. However, he argued that this involves more than identifying an access tool to determine the best subject headings and finding all there is to find; information seeking is personal, domain specific, subjective and intuitive. In addition, the proliferation of information sources and information technology has made the choice of search technique increasingly complex (Sandelowski and Barroso 2007), particularly for health professionals.

In 1989, Bates also argued against the classic or traditional model of presenting a single search query matched to the database contents, as it only produces a single output set from the documents in the preliminary retrieved set, no matter what is discovered. The limitations of this classic model, she argued, were that that the ‘terms’ used in the central question could be too broad and too static (Bates 1989). The solution she proposed was ‘berry-picking’; a dynamic and interactive process, akin to qualitative research itself, whereby researchers continually modify the search terms for a query, as well as the query itself (Sandelowski and Barroso 2007:41).

Higgins and Green (2011) also pointed out that although a research question may address particular populations, settings or outcomes, these concepts may not be well described in the title or abstract of an article and are often not well indexed with controlled vocabulary terms and so do not lend themselves well to searching. In addition to this, Day et al. (2005) suggested, these complex searches often result in a high yield, with numerous resulting references that are not always precise and require enormous amounts of time to screen. Their study found that simple search strategies could be highly specific, effective and efficient way of searching the literature, particularly when pertaining to pain and musculoskeletal disorders (Day et al. 2005). However, they did point out that a simple literature search might lack sufficient sensitivity.

Booth (2008) proposed that information retrieval might require the use of different search styles and tactics (Figure. 2).

Figure 2. From knowledge support to decision support (Booth 2008:313)

At the knowledge end of the continuum is the ‘classic’ systematic review, which synthesizes and summarizes current knowledge in a specific field - search techniques for this must be comprehensive and exhaustive. Towards the middle (inclining slightly towards the decision side) are health technology assessments and clinical guidelines. These aim to give a fairly complete picture but their emphasis is on multiple types and sources of information to inform a specific clinical decision or context - search techniques for these are typically systematic and reproducible and yet their quest for answers also justifies use of creative and imaginative strategies that are less systematic but address an otherwise unanswered question. At the decision end of the continuum is search support for clinical question answering - searches to inform clinical answers or evidence digests must be specific and relevant. They do not claim to be exhaustive; indeed they cannot do so because of time constraints. Nevertheless they follow a searching protocol to increase the likelihood that they have covered all major potential sources.

The aim of a literature search process is to optimise the ability of the search to identify relevant articles and to exclude irrelevant articles for a specifically defined research question (Shaw et al. 2004). Dixon-Woods and Fitzpatrick (2001) acknowledged that searching for and identifying appropriate qualitative research is both frustrating and difficult, particularly with regard to health and healthcare (Shaw et al. 2004). To locate the specific and relevant literature required for this research, the search strategy used the processes of ‘browsing’ and ‘berry-picking’ (Bates 1989), with the search query being satisfied by a series of selections of individual references and pieces of information at each stage of the ever-modifying search. Bates (1989) suggested that this evolving search strategy might actually be closer to the behaviour of searchers than traditional models of information retrieval (Barroso et al. 2003).

2.1. Defining the research question

In 2007, Thompson and Carr conducted a formal content analysis of general practitioner requested lumbar spine reports and found that three-quarters included at least one phrase containing words indicating the presence of “degenerative changes”. They suggested that such phrases may be emotive and could lead to misinterpretation by patients. They also indicated that there were unable to find any studies that explored how the findings of these reports were explained to patients.

From this, the research problem (central question) this research sought to determine was, “Are radiology report findings effectively communicated to patients and does this influence the outcome for an individual?” As suggested previously, low back pain (LBP) is a leading cause of activity limitation and work absence, resulting in an enormous health, social and economic burden. This research therefore explored the perspectives of working age adult patients with non-specific low back pain referred by their GP for radiographic imaging of their lumbar spine, to establish how their experience affected self-reported symptoms, behaviour and perceived ability to cope.

Denscombe (2010:200) identified the importance of a search having key features and a focus of attention. The initial focus of this review therefore, was to explore the central issues, previous research and previous theories identified in the study by Thompson and Carr (2007).

These include,

1. Patients who have radiographic imaging are more satisfied but report worse pain and disability.
2. Information transmitted and interpreted can influence outcome.
3. The radiology report: a description of radiological findings.
4. Psychological factors have been shown to be predictors of disability.

These statements were used to inform the key terms / search terms of the review For example

Patient	Radiographic imaging	Satisfaction
Patients	X-ray	Satisfied
People	X-rays	
Clients	Radiograph	

Information	Research	Outcome
Communication	Study	
Discussion	Studies	

Information	Research	Outcome
Communication	Study	
Discussion	Studies	

Psychological factors	Disability	
Fear avoidance	Ability	
Catastrophising		

(Appendix 1)

Each piece of useful information encountered prompted new concepts and directions to follow, thus permitting the search to evolve and allowed for searching in a variety of sources, using a variety of techniques.

There is general agreement on the need for search strategies, aiming to identify qualitative research, to be systematic and explicit. However, the need for comprehensive, exhaustive searches in quality research is questioned (Hannes and Macaitis 2012). Dixon-Woods et al. (2005) suggest there is a need for rigorous methods for synthesising evidence of diverse types generated by diverse methodologies and to exclude any type of evidence on grounds of its methodology, qualitative and or quantitative, could have potentially important consequences.

The most important threat to the validity of any research effort is to fail to conduct a sufficiently exhaustive literature search and the challenge for researchers is to find all the studies that are relevant to their work (Barroso et al. 2003). In recent years, there has been an unprecedented proliferation of studies on various aspects of health, illness and life transitions across the disciplines and health-related publication venues (Barroso et al. 2003). As more resources are brought online, the researcher has a more complex search environment to consider, both in terms of types of sources to use and search techniques to employ with these resources (Bates 1989). How this was achieved in this research will now be outlined.

2.2. Synthesis of the evidence

Current methods for evidence synthesis tend to favour quantitative forms of evidence only. For example, systematic reviews often omit qualitative evidence and, as suggested by Dixon-Woods et al. (2005), the use of randomised controlled trials, as the only source of evidence, has its limitations. Complex questions demand complex forms of evidence, particularly with regard to issues such as understanding the experiences of people and their access to health care. Dixon-Woods et al. (2005) suggest that some questions can only be appropriately answered by the examination of a range of data sources; methods of synthesis that can accommodate diversity, both of questions and of evidence, are also required. Current discussions on the potential of qualitative research findings to inform complex decision-making processes have increased the interest in qualitative evidence synthesis (QES). However, there is on going debate on whether or not quality assessment should be part of QES and if so, what criteria should be used to distinguish high quality studies from others (Hannes et al. 2010).

Hannes et al. (2010) evaluated three online critical appraisal instruments used to evaluate the validity of eighty-two qualitative research reports. The Joanna Briggs Institute (JBI) tool, the critical appraisal skills programme (CASP) tool and the evaluation tool for qualitative studies (ETQS). All three instruments were developed in the context of systematic reviews and are used to assess the quality of original research articles. Hannes et al. identified that the CASP tool, the most popular appraisal instrument, did not score well in evaluating the intrinsic methodological quality of an original study when compared with the ETQS or the JBI tools. The ETQS provided detailed instructions on how to interpret criteria, and the JBI tool focussed on congruity appeared to be the most coherent. However, the study suggested that whilst these techniques could be of assistance in evaluating research, they should not be rigidly applied as they do not contribute directly to the rigor of a quantitative research project, nor provide an accurate picture of whether the choices researches made were grounded.

Due to the complexity of the research question and lack of relevant studies found, the aim of this enquiry was not to produce a systematic review but to inform and support clinical answers. Therefore, due the limitations of these appraisal instruments, the evidence was evaluated using the CASP tool to guide the appraisal process. It was not applied rigidly, but was used to provide direction and structure to assessing the level of methodological soundness of the range of studies identified.

2.3. Scope of enquiry

An initial search was carried out from 1980 to 2010 using the TRIP (Turning Research into Practice) Medical search engine, emphasising on evidence based medicine (EBM), clinical guidelines and queries and included content from Cochrane, Bandolier and primary research databases such as PubMed (http://tripdatabase.com/publications). Other electronic databases used included, Medline, CINAHL, EMBASE, PsychINFO and SCOPUS.

2.4. Review of the evidence

The review of evidence presented seeks to identify the key themes of the research. The research question needs to be precisely defined (Haig and Dozier 2003). It does not aim to be directive; it merely intends to identify a gap in knowledge. This is of particular importance in qualitative research where some of the literature is used in dialogue with the findings.

In this chapter, the key themes are discussed under four separate headings (central issues): Patients who have radiographic imaging for non-specific LBP are more satisfied but report worse pain and disability, Information transmitted and interpreted can influence outcome, The radiological report: a description of radiographic findings and Psychological factors have been shown to be predictors of disability. Within each section the individual papers, which have contributed to the theme, are outlined and evaluated, followed by a short synthesis to draw together the overall picture which these papers present. A more integrated synthesis was considered, but as there is a paucity of literature on each individual point within the themes, this was problematic. Instead, each paper is outlined and evaluated, with a statement synthesising the concepts within each section at the end of that section/ theme.

The central issues:

1. Patients who have radiographic imaging for non-specific LBP are more satisfied but report worse pain and disability.

The two studies that directly addressed this issue found that patients who have radiographic imaging for non-specific LBP are more satisfied, but report worse pain and disability. These studies were both randomised unblinded controlled (RCT) trials (Kendrick et al. 2001, Kerry et al. 2002) and both used large enough sample sizes to achieve generalizability.

In the first study, (Kendrick et al 2001) patients (over 20 and under 55) with LBP were identified by searches of computerised medical records or having been flagged up by the doctor in their notes. 421 patients (from 52 general practices), aged 31-46 years, with LBP for more than six weeks (median duration of ten weeks) and on the day of randomisation, were included in the study. Participants were either allocated to an intervention group and were given a card to attend for a radiograph of their lumbar spine, or to a control group who were not offered radiography. Block randomisation was used to ensure equality of numbers between the groups and both groups received similar care. There was no evidence to suggest that the intervention group had any clinical benefit over the control group.

At three months, participants who had radiography of the lumbar spine reported a longer duration of pain, more severe pain, reduced functioning and an overall poorer health status than those who had not had radiography. The suggestion was that radiography encouraged or reinforced a patient’s belief that they were unwell leading to the greater reporting of pain and greater limitation of activity.

At the nine months, both groups reported an improvement in function and a reduction in severity of LBP. However, the intervention group was found to be significantly more satisfied with the care they had received from their doctor than those in the control group. It was suggested that, the longer the pain continues the more important having a diagnosis or adequate explanation becomes to the patient. In addition to this, it was reported that if given the choice, over 80% of participants, from both groups, would choose to have radiography, demonstrating that doctors do need to address patients’ expectations.

As this was the largest published trial at the time, with 394 (94%) participants having completed the trial, the results were thought to be generalisable and transferable to the UK setting, particularly as LBP is recognised as a global problem (Hoy et al 2012). One of the limitations of this study was the selection process, those selected would not be classified as having either acute (< 6 weeks duration) or chronic back pain (> 12 weeks); their back pain would be considered sub-acute (McIntosh and Hall 2011). As a significant number of participants were still included in the trial at nine months, the findings were useful in determining the natural history of back pain (symptoms) in this sub-acute stage. Unfortunately, as the assessments were carried out at three and nine months, the study would not identify those whose symptoms would resolve spontaneously, or those who were still symptomatic at a year. Nonetheless, overall, the findings of the study did uphold the hypothesis, that radiography of the lumbar spine, in patients with low back pain, is not associated with improved clinical outcomes, and contrary to the hypothesis, the patients who were imaged were significantly more satisfied with their care highlighting the need for further exploration of the factors contributing to patient satisfaction with care for LBP.

Kerry et al. (2002) carried out a similar study by comparing the long and short-term outcomes for (GP) patients with LBP referred, or not referred, for lumbar spine radiographic imaging at first presentation. They conducted a randomised (unblinded) control trial with an observational arm, recruiting 659 patients with LBP who had not consulted their GP in the previous four weeks aged between 16-64 years, from 94 general practices - 153 to the RCT and 506 to the observational study. The main findings of this research were, as with Kendrick et al., that a referral for radiographic imaging was not associated with improved patient functioning, severity of pain, or overall health status, but was associated with improved psychological measures – those referred for imaging had lower depression scores. Despite this, they suggested that there was little evidence that early referral for imaging during this sub-acute stage, leads to less morbidity, reflected in time off work. Again, due to the relatively large numbers recruited, these observations were thought to be generalisable.

These two studies have identified that the outcome for patients with LBP is similar, in terms of reported improvement in function and a reduction in severity of LBP, whether or not they are imaged. However, both studies have identified that those who are imaged reported greater satisfaction with their care. The question is therefore, what is the economic cost of satisfaction (and lower depression). Miller et al. (2002) carried out a prospective economic analysis of the Kendrick et al. study. The hypothesis, that referral for lumbar spine radiography is cost effective in primary care patients with LBP of at least six weeks’ duration, compared with usual care in which referral is not routine. The main finding was that radiography could be considered cost-effective when satisfaction is valued as a positive outcome. At baseline, the two groups, those assigned to have lumbar spine radiography and those assigned for routine care, were broadly similar with respect to the eight direct and five indirect economic variables considered. These included, cost of radiographs, inpatient admission, outpatient attendance, GP visits, physical therapies, medication, special equipment purchased, patient and companion travel and work-loss when appropriate. The indirect costs included; cost of practical help, extra expenses incurred (increased heating bills, paying for gardening or housework), social security payments (incapacity benefit, income support, family credit), loss of earnings (time off work or change in duties) and loss of productivity for the employer. At nine months, the intervention group had higher costs than the control group, solely due to the cost of radiography.

The study found that there were no significant differences in any indirect cost variables and no significant differences in health and functional outcomes. However, “satisfaction with care” was greater in the group receiving radiography. The cost-benefit of one unit increase in the satisfaction score equated to an additional £19.54 per person, based on the 80% of participants who, if given the choice, would have chosen to have radiography. Therefore, radiography could be considered cost effective, in terms of increased satisfaction, compared with routine practice. This was based on how much the participant would consider paying for radiography if they had to and was therefore based on assumptions. This finding is important, as psychological factors, such as depression, have been identified as important in the aetiology of chronic LBP.

Despite the importance of this topic, these three papers remain the key evidence on the issue of patient satisfaction and outcomes. In 2005, Carley reviewed these three papers, Kendrick et al., Kerry et al. and Miller et al. using ‘Best Evidence Topics’ (BestBETs). The question, in patients presenting with simple LBP was, whether routine plain radiography of the lumbar spine was better than directed radiography, at providing reassurance to patients and therefore a more rapid recovery. An Ovid Medline search found two from 317 papers using the strategy, back-pain, radiography, prognosis (sensitivity). The third paper was found by examination of the references. This review identified that the patients in these trials want to be imaged radiographically, even though it was unlikely to demonstrate significant pathology (without clinical indicators - red flags). The review concluded that the choice faced by GPs was to opt for popular medicine (imaging) or good medicine (no imaging); the latter of which would mean that the patient would probably have less pain and get better quicker, but would be less satisfied with the experience.

The limitations of these studies, with regard to the question posed by Carley, was the lack of data on patients with acute back pain and it was suggested that this was probably due to the “overwhelming” evidence that acute back pain has a favourable prognosis. This however is not sufficient to inform practice as all the patients included in these trials had sub-acute back pain. In addition, the impact of increased patient satisfaction and lower depression scores in those who are imaged has not been evaluated in those with chronic LBP, which is characterised by symptoms and distress rather than by demonstrable tissue abnormality (Waddell and Burton 2005).

These four papers have shown that patients want to be imaged for LBP; their expectation is to have a diagnosis and if they are offered a diagnostic test, they are more satisfied with their care. This has links with evidence related to other elements of healthcare. For example, in 2006, van Bokhoven et al. carried out a study entitled, Why do patients want to have their blood tested: A qualitative study of patient expectations in general practice. The study aimed to obtain information on patients’ preferences with regard to diagnostic tests. The participants were recruited from the waiting rooms of five practices (17 GPs). Of the 314 patients invited to participate, 224 completed the questionnaire, which identified 57 who stated that they, would or might like to have blood tests done. To minimise the influence of the GP on the patient’s views, the interviews were obtained before the consultation with the doctor. Due to time restrictions, twenty-eight semi-structured interviews were completed and twenty-two interviews were analysed. Six participants had misinterpreted the questionnaire and did not want a blood test. Similar to the other studies in this review, the average age of the participants interviewed was 45 years. This study found that the participants who wanted to have their blood tested had, “high hopes” for blood tests as a diagnostic tool. They believed that, tests are important to provide certainty in situations when the GPs are not capable of providing certainty themselves, and it provided “proof of a good health status”, while also having the ability of detecting serious disease at an early stage without mistakes.

One of the limitations of this study was that only those who wanted to have their blood tested were interviewed and therefore the findings can only be applied to this small group. In addition, less than 23% of the total invited to participate, completed the questionnaire. This qualitative study has reiterated the findings of previous studies in this review by demonstrating that patients do want diagnostic tests which maybe unnecessary and as a result GPs have to balance the benefits of reassuring their patients against the benefits of avoiding unnecessary tests (van Bokhoven et al. 2006).

Rather than focussing on clinical outcomes or satisfaction, a study by Espeland et al. (2001) also explored the views of patients with the aim of understanding the value patients place on diagnostic tests. This study carried out quantitative and qualitative cross-sectional interviews to investigate how patients who are referred for plain radiography because of LBP, perceive the importance of the examination. The study was motivated by the belief that it may be possible to reduce unnecessary use of radiography and meet patients’ needs at the same time. There were 274 GP referrals for lumbosacral spine radiographic imaging over a two-month period. Ninety-nine patients (65 women aged between 14 - 91 years and 34 men aged between 19 - 78 years) were interviewed immediately after the radiographic procedure, but before the radiographs had been interpreted. Quantitative analysis was used to compare proportions of patients who rated radiography as very important between groups classified by age, gender, clinical history and clinical appropriateness of radiography, based on the information in the referral compared with the criteria set out in the Norwegian (British) recommendations (RCR, 1995) for the use of radiography.

The majority of patients (68%) rated the radiographic examination as very important. The proportion was higher for men, for those with worsening symptoms rather than improved or unchanged and for inappropriately rather than appropriately referred patients. This analysis had limited statistical power due to the low number analysed; however, it did provide quantitative support to the qualitative data.

Template analysis was used for the qualitative analysis of the semi-structured interviews based on the patients' views of the importance and usefulness of the radiography examination. Seven separate issues were identified:

- Patients' criteria for radiography based on symptoms and clinical history - long-standing or worsening pain, trauma, previous malignancy.
- Information and advice - patients' expectations can be influenced by information from their personal health care providers. Therefore, it is important that health care providers use the same criteria for radiography and not confuse patients by giving then conflicting information or advice.
- Need for emotional support - asking for a diagnostic test may serve symbolic functions; a legitimate way of asking for emotional support.
- Need for certainty and reassurance - ruling out serious disorders.
- Need for symptom explanation and diagnosis - seeking to establish a specific cause of symptoms.
- Reliability of radiography compared with clinical evaluation - radiography was considered more reliable than clinical investigation.
- Expected practical consequences of the examination - the hope or belief that a diagnosis, explanation, aid to treatment would lead to an improvement or cure; specialist referral, or to get sickness certification or disability pension.

This study again highlighted the importance of patient expectation, suggesting that it may be one of the main reasons for the overuse / inappropriate use of imaging tests. One of the strengths of this study was that it demonstrated the usefulness of qualitative interviews to explore the needs of patients from their perspective; the identification of the issues of concern for patients is required before they can be addressed.

Another important perspective to be investigated is that of the GPs themselves. The study by Kendrick et al. (2001) referred to the findings of a quantitative survey of the opinions of GPs on the role of radiology in patients with low back pain, carried out by (Owen et al. 1990). In this study postal questionnaires were sent to 177 GPs and 90 (51%) were returned completed. When asked for the reasons for requesting radiographs, 88% indicated that they requested radiographs for the sole purpose of reassuring patients and 78% requested radiographs for their own reassurance. The strength of this study was the high response rate. It was suggested that the reasons for this were the importance GPs place on having open-access referral for lumbar spine radiography, that a loss of this service would affect their referrals for specialist opinions and as a consequence, would place an even greater burden on hospital consultants (Owen et al. 1990).

In 1998, Little et al. also carried out a quantitative study using a postal questionnaire to determine the reasons GPs request radiography of the lumbar spine. The response rate was 166/236 (70%), which is accepted by Nulty (2008) as an adequate response rate. The study suggested that, there were both medical and social reasons why GPs request radiographic imaging for LBP. The medical reasons were mostly in line with current guidelines. The psychosocial reasons identified the importance of patient satisfaction and reassurance. In addition to this, as with Owen et al (1990), this study found that many GPs lack confidence in the management of back pain and as a result, find it difficult to reassure patients without resorting to requesting radiographic imaging (Little et al. 1998). The findings of these two studies are important as, due to their high response rates, they give a valuable insight as to why GPs request diagnostic tests and in particular, why they request radiographic imaging for non-specific LBP, when it is not recommended by clinical guidelines.

In the letters section of the British Journal of General Practice, a GP suggested that, on rare occasions, there is a strong case for therapeutic imaging, despite knowing that the likely result will be negative, and that a referral might be beneficial in terms of reduced anxiety, improved perception of health and fewer consultations on behalf of the patient (Neal 1994). Whilst this letter was not based on research, it appears to summarise the challenges faced by GPs in determining the complex reasons to be considered when deciding whether or not to request radiological imaging.

Overall, the evidence does indicate that patients who have radiographic imaging for non-specific LBP are more satisfied but report worse pain and disability. Whilst there are relatively few studies of this phenomenon, the evidence across all those identified is consistent. Despite the limitations of the individual studies, this consistency of findings lends weight to the suggestion that there are indeed two aspects to decisions about radiography for LBP: physiological benefit and psychosocial benefit, both of which are important to patients and practitioners.

The evidence has shown that the reasons why patients go to their GP with non-specific LBP are often multifactorial. There was also evidence of some cost benefit for radiography in relation to its improvement in patient satisfaction - patients who are referred for radiographic imaging of their lumbar spine are more satisfied with their GP than those who are not. It also been shown that for GPs, satisfaction with their care is an important outcome to maintain a productive relationship with their patients; they want to be able to reassure their patients that there is nothing seriously wrong. The problem is that this “satisfaction” comes at a cost: the cost of the unnecessary diagnostic test and for radiographic imaging and the cost of an unnecessary exposure to radiation. In addition, as there is often no resolution of pain and disability and therefore the impact on the patient, their family and society, in terms of sickness certification or disability pension is not resolved. The evidence also suggests that this phenomenon is not limited to the management of back pain and that patients’ feelings and beliefs/ thoughts are a critical part of how they perceive their care/ treatment.

2. ‘Information transmitted and interpreted can influence outcome’.

Communication is one of the most pervasive, important and complex features of human life, becoming especially important in the twentieth century, mainly due to the introduction of communication technologies such as radio, television, telephone and computing. Social science research also developed at this time, with sociology and social psychology emerging as leaders in the study of communication. During the 1930s, a great deal of the sociology research investigated the ways in which communication affects individuals and communities (Littlejohn 2002). The use of information technology was identified as one of the forces necessary to improve the quality of patient care (ACOG 2014).

In 2013, Bianco et al. carried out a cross-sectional randomised study of parents seeking health-related information on the Internet. The purpose of this study was to establish the extent of Internet access and use to gather information about health topics and the potential implications to health care among the adult population (in Italy). A sample of students was randomly selected from ten public schools. Each student was given a letter summarising the purpose of the study, nature of participation, consent and a questionnaire, which was to be given to their parents. A total of 1039 adult (≥18 years) parents completed the questionnaire.

The study identified that the main source of health-related information was the GP (65%). Other sources included the Internet 44.5%, TV/radio 27.6% and scientific journals 15.2%. In particular, the advancement of technology had made the Internet more accessible. The study also identified the variables associated with Internet use related to health or medical issues and the impact of the information on health-related behaviours. One of the variables they identified was, not satisfied with their GP’s health related information. It suggested that due to consultation time constraints, patients, particularly those with chronic conditions, could be left with a sense of frustration and dissatisfaction with the information provided, whereas they would like to be fully informed and be part of the medical decision-making. The Internet improved their understanding of health care issues and they learned more about an illness or a specific symptom. In addition, Bianco et al. (2013) also reported that only a quarter of patients talked with their GP about the information retrieved from the Internet. The limitations of this study were that the age range of the sample was under 50 years old, which is lower than the age ranges sampled when considering LBP. In addition, due to the sample selection method, those who did not have children were also excluded and therefore the results from this study may not be directly transferable. Despite this, due to the large response rate, this study provided an appreciation of changing Internet health-seeking behaviours, particularly for those who were confident with seeking information from the Internet.

Iverson et al. (2008) carried out a similar study to determine the prevalence of online information-seeking behaviours by patients. Questionnaires were offered to patients as they arrived for a previously scheduled appointment; 154 surveys were completed. The study suggested that most patients thought that their primary care physician as the most reliable source of health-information. However, it also found that Internet use led to an increase of questions from patients and an increase for requests for inappropriate or unavailable testing or treatment, increasing the burden on physicians and resources.

Again, one of the limitations of the study was that the prevalence was greatest in 31 to 45 year olds (Iverson et al. 2008). These two studies have shown that, particularly for those less than 50 years old, obtaining medical information online is common and may benefit the patient-physician relationship; patients want to be informed and be included in the decision-making process. One of the main issues with seeking this information on the Internet is the quality and reliability of that information. In addition, these two studies highlight how qualitative evidence can be used to explain some of the relationships uncovered by the analysis of the survey data (Bryman 2006).

New discoveries and innovations have created sophisticated tools and technologies that have changed the way diseases are diagnosed and managed (Levinson and Pizzo 2011). They suggested that some of these technologies have taken precedence over one of the most important skills of the compassionate physician, the art of listening. Levinson and Pizzo also pointed out that physicians want to have the time to focus on the individual needs of the patient and be able to tailor specific treatment to them. However, they are also under pressure to be productive, measured by the number of patients observed in units of time. Their article identified that a deficiency in communication between patients and their doctors could contribute to a negative patient experience (Levinson and Pizzo 2011).

The health care environment is characterised by technical terminology and conventions of communication among professionals and with patients. An understanding of this health care terminology and language is developed through enculturation by formal training, or by service utilisation in the role of the patient. Language in this context can impact significantly on the ways in which health care professionals relate to one another and provide clinical services, as well as the way in which patients conceptualise their role in the health care encounter.

Unfortunately, as identified by Marshall et al. (2011), making assumptions about language we use every day may lead to misunderstandings between professionals, patients and their families. If professionals are unaware of the implications of the use of language in practice, a collaborative health care approach that includes patients and their families would be unlikely to develop. The outcome would be the loss of the patient voice in health care process (Marshall et al. 2011). Therefore, it is important to examine the language and communication between health professionals and patients.

For example, information-processing research suggests that people have cognitive structures called “schemas” (schemata), which organise their thinking (Entman 1989); a pre-existing assumption about the way the world is organised (Axelrod 1973). Entman (1989) referred to the work of Rokeach (1973), suggesting that a person’s system of schemas stores their substantive beliefs, attitudes, values and preferences, along with rules for linking different ideas. Entman (1989) also referred to Fiske and Kinder (1981) who suggested that the schemas direct attention to relevant information, guide its interpretation and evaluation, providing inferences when information is missing or ambiguous and facilitate its retention (Entman 1989).

Information-processing theory also recognises and helps explain how attitudes emerge from a dynamic interaction of new information with people's existing beliefs and suggests whether people ignore or pay attention to new information depends more on whether it meshes with their interests, rather than whether it conflicts with their existing beliefs (Entman 1989). Schemas have a tendency to remain unchanged, even in the face of contradicting information. For example, the treatment for low back pain used to be not moving and bed rest, now the advice is to keep moving as much as possible. Chronic and persistent pain is most often not associated with an injury or tissue damage, even if it began with an injury (Belton 2014). Many still believe the treatment for pain is rest. Schemas are also thought to be a contributing factor in those who have a tendency to catastrophise. The theory is that, when confronted with the minimally noxious stimulus, this schema is activated and heightens the pain experience, which eventually over time, translates to a learned expectancy (or self-fulfilled prophecy) regarding the high threat of pain and their own inability of management (Leung 2012, Sullivan et al. 2001).

Patient outcomes depend on successful communication and the words and attitudes of clinicians can have a powerful effect on their patients. Benedetti (2002) suggested that a positive context can produce a reduction of symptoms (placebo effect) and a negative context can produce an increase in symptoms (nocebo effect). An individual may say words and use long, complex sentences with correct grammar, but still have a communication problem if he or she has not mastered the rules for social language (pragmatics); for example the term 'degenerative change'. As highlighted previously, this term can mean something different to different groups or individuals, both lay and professional, depending on their background. In a radiology report it is a term used to describe anatomical changes depicted on a radiographic image, whilst for some it can be misinterpreted to represent a debilitating progressive disease, which will affect a persons ability to function normally. The key to a successful patient-physician relationship is the physicians' ability to effectively and compassionately, communicate information (ACOG 2014).

In a review article, “How the doctor’s words affect the patient’s brain”, Benedetti (2002) proposed that the context, the atmosphere around the treatment in which a treatment is carried out, can affect the effectiveness of that treatment or therapy. Doctors, nurses, consulting rooms, hospitals, syringes, pills and machines, all represent a very important component of the context because they transmit a great deal of information to the patient through words, attitudes and behaviour. Benedetti referred to the study carried out by Thomas (1987). Patients who presented at 59 consecutive general practice surgeries with symptoms and no abnormal physical signs and in whom no definite diagnosis could be made were randomly selected for one of four consultations: a “positive” consultation with or without treatment; where patients were given a firm diagnosis and therapeutic assurance; or a “negative” consultation with or without treatment, where no firm reassurance was given. The only treatment offered in this study was the doctor himself, acting either directly or indirectly through a placebo, a prescription for 3mg tablets of thiamine hydrochloride (vitamin B1). Following the consultation, the patients were asked to complete a satisfaction survey and two weeks later a card was sent to each patient asking if they were “better” and if they required further treatment. Two hundred patients were allocated to the four groups, 50 patients per group.

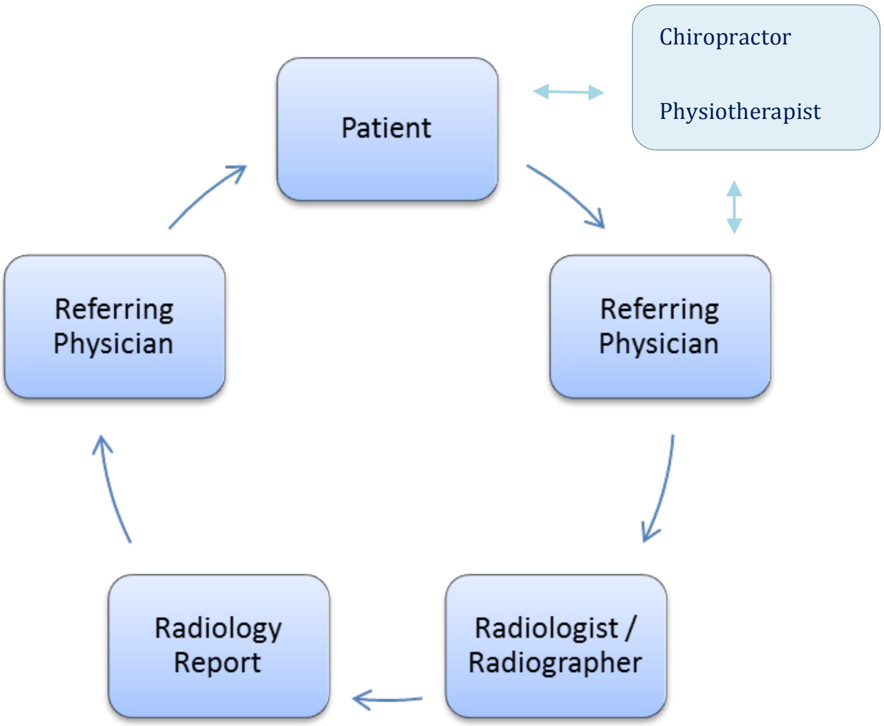
The findings demonstrated that patients showed greater satisfaction and significantly, are more likely to have recovered from their illness within two weeks following a positive rather than a negative consultation. It established that the way in which general practice consultations are conducted, either positively or negatively, is crucial for recovery, that there “is a point in being positive”; no difference was found between the “treated” and “non-treated” groups. The artificially negative consultations were only negative in that an ‘element of doubt’ was introduced by the (truthful) statement, “I cannot be certain what the matter is with you” and for those in the “treatment” group, “I am not sure the treatment will have an effect”. One of the limitations of this study was that it did not identify the age range of the patients, though it stated, “no significant differences were found for age, sex, or social class between the groups”. Whilst a significant number of patients were recruited, the study did not identify whether all those who were approached were recruited, or whether the response rate was 100%. This may influence the generalizability of the findings.

Benedetti (2002) also referred to Kirsch and Weixel (1988) who carried out a double blind versus deceptive administration of a placebo trial. Undergraduate students, 31 males and 69 females aged between 17 and 31 years, were given varying doses of a placebo, decaffeinated coffee. Deceptive administration simulated clinical situations in that the subjects were led to believe that they were receiving an active drug. Subjects in double-blind conditions were aware that they might receive a placebo. The study established that different verbal contexts, whether the subjects are given reason to doubt that they are receiving a pharmacological agent (double blind), produce different outcomes. This unexpected outcome suggested that double-blind procedures might not be appropriate to evaluate drug effects. This suggests that it does make a difference whether we tell patients “this pain killer may work”, or “rest assured, this painkiller does work” and that there is a point in being positive (Greville-Harris and Dieppe 2015, Jakovljevic 2014, Benedetti 2002).

Communication between patients and their physicians and radiologists and referring physicians have traditionally been in written form or by direct or indirect approaches (telephone or fax). Berquist (2009) identified the circle of communication (Fig. 3). For any given radiographic referral, it will start with the patient visiting their physician for an answer to a clinical problem. The physician requests an imaging study to assist with his or her evaluation and following the procedure, the results are generally ‘reported’ to the physician, or other health care professional, and the patient.

Guidelines for the communication of diagnostic imaging findings highlight that effective communication is a critical component of diagnostic imaging and the communication of information is only as effective as the system that conveys the information. To ensure the optimisation of patient care, a request for imaging should include relevant clinical information, a working diagnosis and/or pertinent signs and symptoms. By including a specific question to be answered, this can help to tailor the most appropriate imaging study to the clinical scenario, which in turn enhances the clinical relevance of the report (ACR 2010).

Figure 3. Adapted from, "Circle of communication among health care professionals and patients" (Berquist 2009:558).



In summary, there is relatively little evidence specifically concerning how the findings from radiography reports influence patient outcomes, and much of the related research does not apply solely or specifically to the patient group that this research concerns. The evidence from across specialities is that what is stated by one party is not always what is heard and understood by others. In addition, there is evidence that expectations, as well as physiological effects, influence patients' experiences and perceptions of illness and interventions. It is also clear that a number of interrelated factors influence what an individual perceives another to have said, and how this is interpreted. The increasing plethora of potentially conflicting information available to patients via the Internet and other media, may further complicate how patients perceive what is said. Despite a relative paucity of literature in this area, the overall, and consistent, evidence points strongly to the importance of patients' experience of communication with their healthcare providers. In relation to radiography of the lumbar spine, the report itself can form the basis for this communication, and is therefore potentially important.

3. The radiological report: a description of radiographic findings.

In 1995, Gagliardi wrote an historical account of the evolution of the radiology report for the American Journal of Roentgenology in preparation for the centennial celebration of the discovery of the x-ray. Gagliardi highlighted the work of pioneer radiologist Preston M Hickey. In 1904, writing in the *Journal of the Michigan Medical Society,* Hickey standardised the naming of the x-ray film or roentgenogram as radiograph and introduced the term "interpretation" to describe the report as, a process involving specialised knowledge (Hickey 1904. In: Gagliardi 1995). At this time, there was no recognised method of transmitting the radiologist's findings to the clinician in a meaningful way. By 1922 (18 years later), Hickey found that the way most reports were worded it was still impossible to form a diagnosis or even relate the findings to the clinical problem. He suggested that the styles of reporting were so individualistic that they were characterised as "eccentric" and very few had a standard, analytical approach (Hickey 1922. In: Gagliardi 1995).

Hickey's aim was to encourage a standard approach to reporting radiographic findings so that a differential diagnosis might lead to a conclusion based on probabilities (Gagliardi 1995). Gagliardi also suggested that today's method of radiographic image interpretation is still basically the same as the one Hickey encouraged and he proposed that it may be time, with the introduction of sophisticated computer programmes and automated reporting systems, to revisit Hickey's report to ensure communication skills develop as rapidly as scientific ones. He suggested that ideally a report should comprise of an introductory section, summarising the examination technique and clinical history, a main body, consisting of a paragraph or more describing the findings and a brief overall section (Gagliardi 1995)

A review of radiology reporting carried out by Wallis and McCoubrie (2011) highlighted the importance of the radiology report in terms of structure and language. They suggested that, as the radiology report is the primary method of communication between radiologist and referrer, its clarity, brevity, pertinence and readability are important. In their review, they also highlight the findings of Hickey, referring to his recommendations that radiology reports should be standardised and evaluated for their clarity and diagnostic value. They observed that despite Hickey's recommendations, a hundred years on radiologists still receive very little formal training regarding reporting style, technique and the importance of the report as a medico-legal document (Wallis and McCoubrie 2011). They suggested that to improve the quality of reports, and ensure they meet the needs of referring clinicians, radiologists should aim to produce accurate and well-informed reports, which answer the clinical question and give pertinent advice regarding further management and follow-up (Wallis and McCoubrie 2011).

In 2011, Schwartz et al. carried out a study to compare the content, clarity, and clinical usefulness of conventional (i.e., free-form) and structured (CT) radiology reports at a single tertiary care cancer centre. Again, as identified by Gagliardi (1995) and Wallis and McCoubrie (2011), this study suggested that the style and format of radiology reports have generally remained unaltered, with most reports still containing free-form text dictated or typed by the radiologist. They found that despite the increase in complexity of medical imaging, some radiologists view the writing of a radiology report as an art and therefore resist attempts at standardisation. Despite the limitations of this small-scale study, both the referring clinicians and the radiologists found that the structured reports had better content and greater clarity than the conventional reports. As found with this research, Schwartz et al. (2011) identify that relatively little has been published regarding the interpretation of radiology reports by physicians (or patients).

Clinger et al. (1988) suggested that a radiology report represents a personal reflection of the attitudes, perceptions and abilities of a radiologist, as well as a legal document, forming a permanent part of a patient's record, and it is often the only means of communication between radiologists and referring clinician. Their study surveyed 251 physicians who referred their patients for imaging for their opinion of the radiology reports. The findings of this large survey (42% response rate) suggested that the majority of physicians (59%) thought that the reports were (usually) clear. Despite this, 49% stated that (sometimes) the reports did not sufficiently address the clinical questions and that (on occasion) they were confusing (40%). The findings of this study are important as they highlight the potential miscommunication, created by the report, between the radiologist and the referring physician.

Espeland and Baerheim (2007) also wanted to explore GPs' views of radiology reports. The qualitative study used focus-group interviews to ascertain the opinions of thirteen general practitioners from eleven different practices, with regard to clarity or readability of radiology reports of plain radiography for back pain. The study found that GPs would like the report to indicate more clearly, the meaning of radiological terminology, the likelihood of disease, the clinical relevance of the findings and or the need for further investigations. It was suggested that it could be a challenge explaining to patients what the report actually meant. The study was limited by the small sample size; nonetheless, it does demonstrate how qualitative methods were able to reveal the views of GPs and potentially help to improve GP-radiologist communication (Espeland and Baerheim 2007).

The study by Owen et al. (1990), described earlier, also identified poorly understood radiological terms used in radiology reports. For example, loss of a pedicle, or spondylosis; or terms with which GPs seem familiar, though possibly uncertain about the implications for patient management. For example, vertebral collapse or scoliosis (in someone over 18 years). It was suggested that radiologists should be more explicit when reporting radiographs and should avoid using specialist jargon unless qualifying its significance.

The referring physicians or other relevant health care providers share in the responsibility for obtaining results of imaging studies they have ordered (ACR 2010). Berquist (2009), in his article "Communication: the needs of the patient come first", raises the issue of communicating imaging results directly to patients. He suggested that patients want to know the results of imaging studies as soon as possible; despite this, most radiologists do not want to discuss image findings with patients and it was suggested that the referring physician may be better placed to provide a complete picture of treatment options along with the image findings. A breakdown at any of the key steps of the circle of communication, may lead to suboptimal patient outcomes, for example, a delay in receiving test results (Berquist 2009).

Berlin (2002) suggested that radiologists believed that their duty to communicate radiographic interpretations was fulfilled with the sending of the radiology report to the referring physician, with little attention given to whether or not the report was received or noticed by that physician. Since the mid 1980s and the introduction of the breast screening programme, malpractice lawsuits alleging failure or poor communication of imaging results, became more prevalent. In the UK, the Royal College of Radiologists also acknowledged that communication delays can have very serious consequences for patients (RCR 2016). Communication guidelines were issued to radiologists recommending that urgent, significant findings or unexpected findings should be communicated directly to the referring physician or his designated representative (Berlin 2002).

There is, therefore, evidence that despite the importance of the radiology report being highlighted for more than 100 years, this document still presents challenges, and may contribute to some of the communication difficulties between patients and physicians. The evidence considering the report itself is limited, in terms of the number and quality of studies; however, there is a consistent theme that these reports may not be easy for GPs to interpret. Although there is no current research related to this matter, this is likely to mean that communicating the findings to patients is likely to be similarly challenging. The evidence outlined in theme two indicates that clarity of communication is likely to be a key influence on patient outcomes. The possibility of the radiology report influencing the baseline from which GP to patient communication regarding LBP begins suggests that this is a particular part of the process of communication about LBP that may merit exploration.

4. Psychological factors have been shown to be predictors of disability.

A review article by Andersson (1999), discussed some of the epidemiological features of chronic low back pain. Evidence from his previous cross-sectional study (1997) identified an association between psychological factors such as, anxiety, depression and mental stress at work, and the occurrence of low back pain. In addition, Linton (2002) suggested that psychological factors, for example how pain is interpreted, beliefs and behaviours, emotional reactions, as well as ability to cope, are important to the transition from acute to chronic pain. A review article by Waddell and Burton (2005) also identified similar personal and/or psychological factors that were considered central to functioning and disability associated with common health problems. They suggested that, unlike severe medical conditions with permanent impairment, people with non-specific LBP can expect and are expected to recover. However, these same personal and or psychological factors can be obstacles to recovery and may contribute to the development of chronicity and incapacity (Waddell and Burton 2005).

In 2000, Vlaeyen and Linton presented a review describing the concept and theoretical underpinnings, the assessment methods and interventions and the existing evidence for the main predictions that originate from the fear-avoidance model. With regard to pain-related fear and self-reported disability, the evidence (six studies) suggested that, pain-related fear, not only leads to poor physical performance, as measured in the laboratory, but these effects also generalise to activities of daily life, including activities at the workplace. In addition it was suggested that fear-avoidance beliefs maybe an important predictor of pain episodes, early on in pain-free people. For some patients this fear of pain, (re) injury and avoidance is an essential feature in the development of a chronic problem and may be more disabling than the pain itself. The review suggested that there are still a number of unresolved issues, which merit further research. These include the origins of pain related fear and the role of illness information and feedback about diagnostic tests provided by medical specialists and therapists, as well as the early identification of individuals with pain-related fear (Vlaeyen and Linton 2000).

Fritz et al. (2001) carried out a quantitative study exploring the importance of fear-avoidance beliefs for individuals referred for physiotherapy with acute, work-related LBP of less than three weeks. The subjects were participants in a clinical trial comparing different physical therapy approaches. Sixty-seven subjects aged between 21-58 years were enrolled from this one department to the study. Fear-avoidance beliefs were assessed using the Fear-avoidance Beliefs Questionnaire (FABQ) (Waddell et al. 1993); an established tool for measuring this phenomenon. It was suggested that the study results support the hypothesis that fear-avoidance beliefs are established early in the course of a pain experience and are likely determined by the psychological context within which the injury occurred. In addition, higher levels of fear-avoidance beliefs, in the acute stage of a painful episode, do not appear to offer a protective benefit to patients and were related to more persistent disability and difficulty returning to full work status. The study suggested that interventions in the acute stage might be most useful in reducing fear-avoidance beliefs and promoting return to normal activity. However, the optimal treatment programme to address the specific psychological impairment of fear-avoidance beliefs had not been determined.

Another limitation of this study was that the FABQ was designed to be used for those with chronic conditions and as a result the fear-avoidance scores were higher in this sample than in previously published studies. This was thought to be due to the acuity of the subjects' LBP, the work-related nature of the injuries, or a combination of both factors. In addition, as the majority of patients with work-related LBP return to work within the first 1-2 months after injury and most as people with back pain improve or recover within 4-6 weeks, the conclusions drawn are somewhat speculative. The strength of this study was that it established that fear-avoidance beliefs are related to prolonged work absence and increased disability (Fritz et al. 2001).

Picavet et al. (2002) carried out a quantitative study to establish whether an excessively negative orientation toward pain (pain catastrophising) and fear of movement or (re) injury (kinesiophobia) are important in the aetiology of chronic LBP and associated disability. Questionnaires were sent to a population cohort aged between 25 and 64 years; of these 1,845 were eligible to be included in the study, gave informed consent, and were sent a follow-up questionnaire after 6 months. The follow-up response rate was 85% (1,571 subjects). The results identified a high level of pain catastrophising, or a high level of kinesiophobia, increases the risk of future chronic LBP and disability. The findings of this population-based study were thought to be consistent with the clinical studies of Fritz et al. (2001) as well as two studies by Vlaeyen et al. (1995) and one study by van Tulder et al. (2001). This consistency, in addition to the large sample size, provided confidence that these factors are causal and therefore provide insight into a prevention strategy. One of the limitations of the study could be with regard to the relatively high non-response rate. However, it was suggested that, based on general characteristics from the population register, respondents and non-respondents were similar (Picavet et al. 2002).

Linton (2005) suggested that, as there is some doubt as to whether the results of cross-sectional findings hold in longitudinal studies, he superimposed a prospective study upon a cross-sectional design, of the effects of psychological variables on back pain and function, to determine whether similar results could be obtained. This large study (1914 respondents, 69% response rate) found that the results were similar in character, suggesting that despite the associated biases, cross-sectional studies could provide “valuable information” compared with prospective studies. Individual psychological factors, such as fear-avoidance beliefs, catastrophising and work place factors such as workload, were found to be “highly” related to the development of back pain in the sample of workers from the general population, of which 372 had not experienced pain during the preceding year and 209 had experienced considerable pain problems. In addition, the study found that distress was a much stronger predictor than either fear-avoidance beliefs or catastrophising (Linton 2005). Despite the identification of these risk factors, the study suggested that patients generally only receive standard medical treatments such an analgesics and physiotherapy (Linton 2005).

Most episodes of non-specific LBP are self-limiting, but for some people it can develop into a long-term disability (Thompson and Carr 2007). Klaber Moffett et al. (2000) used quota sampling in their quantitative survey of 507 people, aged between 20 and 60 years. The survey was carried out using brief, structured interviews on the street. It found that public knowledge and understanding of back pain falls between the current advice of staying active and continuing with normal activities (including work) as normally as possible despite the pain and the traditional management of rest and inactivity. Despite the relatively small sample size and the simple unsophisticated methodology, the findings of this study were similar to other studies; nearly two thirds of those interviewed incorrectly believed that back pain is often due to a slipped disc or trapped nerve. Most expected to have a diagnostic imaging, though only around a third expected their GP to be able to tell them what was wrong with their back and about a third still believed in long periods of bed rest for the treatment of LBP (Klaber Moffett et al. 2000).

These studies have identified the pain beliefs that put patients at the greatest risk of a poor prognosis. They include fear avoidance, catastrophising, distress and poor expectations for recovery. Despite many of the studies having limitations, in sample size, or methodology, there is a consistency in their findings. This suggests that whilst communication between patient and physician, as outlined in the previous three themes, is important, the existing beliefs and tendencies of individuals is also likely to influence how they experience LBP and how their perceive the content of discussions with their doctors. In addition, existing beliefs are not necessarily in line with current thinking on the best management of LBP, creating a possible barrier to communication in terms of the expectations at the start of discussion varying between parties. This final theme, then, adds an important facet to picture of patients' experiences of LBP.

In conclusion

The Berrypicking model (Bates 1989) has been shown to be the ideal information-seeking model for this multi-facetted review, particularly due to the limited evidence available. This review has identified that low back pain can have a major impact on people's lives and in particular, the way they view themselves (Corbett et al. 2007). Back pain is very variable in its presentation and individuals will cope in different ways. The problem is that patients, particularly those who consult their GP with non-specific LBP, have explicit expectations; they expect an explanation for their pain, a clear diagnosis of the cause of their pain, including a referral for imaging. They want instructions and advice on back pain management, pain relief and sickness certification and, as a consequence of this misconception, are likely to be disappointed (Moffett et al. 2000). Espeland et al. (2001) and Verbeek et al. (2004) also identify this potential mismatch between expectation and reality with regard to diagnosis and treatment. Individuals find it difficult to gain closure in the process of accepting their pain and suffering and moving towards a re-definition of self (Corbett et al. 2007).

"Once I understood that pain does not equal damage, it freed my mind from the constant stress and worry, allowing me to actually start managing the pain and moving on with life" (Belton 2015).

A review of physician-patient communication, with patient health as an outcome variable, concluded that effective communication exerts a positive influence not only on the emotional health of the patient but also on symptom resolution, functional and physiologic status and pain control (Stewart 1995). The suggestion was, as with Kendrick et al. (2001), that patients were more satisfied with technically competent physicians and extensive diagnostics such as radiographs. When patients are satisfied with an encounter with the physician, they are more likely to comply and cooperate with treatment, thus promoting treatment effectiveness (Verbeek et al. 2004). Hall et al. (1998) suggested this because patients with better health receive more social conversation from their GP. This in turn, influences their rating of the physicians' psychosocial responsiveness, which affects satisfaction. Conversely, dissatisfaction in sicker patients (psychosocial or physical) appears to be, in part, due to a relative lack of social conversation received from their physician (Hall et al. 1998). Little et al. (1998) suggested that an inadequate explanation to patients is associated with dissatisfaction and desire for investigations (Deyo and Diehl 1986).

The research question this review sought to answer was, “Are radiology report findings effectively communicated to patients and does this influence the outcome for an individual?”

This review of literature has identified that, despite the fairly limited number of studies, the consensus is that effective doctor-patient communication can improve patient outcome. However, if the doctor-patient communication has not been effective, there is a potential for negative emotional consequences for a patient, which can result in a poor outcome for some individuals. In addition to this, the lack of a precise aetiology for non-specific LBP can generate different perceptions of a patient’s pain experience between professionals and patients (Hansson et al. 2011). It has been established that there is a potential for the language used in the radiology report to have different meanings for different people, resulting in a poor patient outcome. Studies have shown that for effective communication to exist, two or more interacting individuals must share the same pragmatic rules (Mwihaki 2004). The rules of conversation are often different across cultures, within cultures and within families, and it is important for a person to understand the rules of the person with whom they are communicating. Rather than being concerned with the exact, literal meaning of the words in a sentence, pragmatic usage focuses on the inferred meaning that the speakers and listeners perceive.

There is no definitive “test”, including radiographic imaging, that can identify the cause of most chronic pain, so patients are often made to feel that, since there is no injury, there should be no pain (Belton 2014). The problem, as identified by Deyo and Diehl (1986), is that there is no direct measure of the true adequacy of explanations provided to patients’. Berquist (2009) suggested, to improve patient outcomes, roles and responsibilities relating to communication are evolving and all aspects of communication, from requesting the appropriate radiologic study to communicating the results, needs to be reviewed.

This review has identified a gap in research evidence (AERA 2006) with regard to the impact the communication of the results of diagnostic imaging tests may have for some individuals’ subsequent health behaviour.

All relevant references were saved to a file in Endnote web and hard copies of papers were filed in researcher file storage.

2.5. Aim of the study

The aim of this research therefore, was to explore the perspectives of working age adult patients with non-specific low back pain, referred by their GP for radiographic imaging of their lumbar spine, to establish how their experience affected self-reported symptoms, behaviour and perceived ability to cope.

Objectives

1. The radiographic referral process: to explore the process by which radiographic reports are requested and then learnt about.

    Why are patients referred for radiographic imaging and how did this make them feel?

2. The communication of the results: to explore similarities and differences between the meaning of what was written in the radiographic report and what the patient remembers hearing.

    How were the results communicated?
    What was said, what did it mean and how did this make them feel?

3. The outcome for the patient: to explore the relationship between what was heard and the effect on patients' current perceptions of LBP.

    Were they followed up?
    Do they still have symptoms?
    Are they able to cope?

Chapter 3. Methodology

This chapter details the research strategy, including the philosophical and theoretical perspectives, methodology and method. The ethical considerations and validity (trustworthiness) are also discussed.

3.1. Strategy of enquiry

The aim of this enquiry was to explore the perspectives of working age adult patients with non-specific low back pain, referred by their GP for radiographic imaging of their lumbar spine. The purpose of the study was to determine whether the radiology report findings, the words used in the radiology report by radiologists, suggesting the presence of degenerative changes, were effectively communicated. The intention was to establish how the experience affected self-reported symptoms, behaviours and ability to cope. The purpose was not only to explore the experience, but also to interpret meaning (Creswell 2009:8, Goldkuhl 2012), with the intention of influencing and improving practice (Goldkuhl 2012). Rather than just understanding (interpretive), knowledge should make a difference in action (pragmatism) (Dewey 1931).

3.2. Philosophical and Theoretical Perspectives

The traditional paradigms or worldviews, which are often seen as opposed, are those of positivism / postpositivism (quantitative research methods) and constructivism / interpretivism (qualitative research methods). A quantitative research approach would be used to test a theory or explanation, or to identify factors that influence an outcome. It would also be used to determine the best predictors of an outcome or the utility of an intervention (Creswell 2013:20). It involves collecting and converting data into numerical form so that statistical calculations can be made and conclusions drawn (Alzheimer Europe 2009). For example, medical research uses probability theories to develop therapeutic drugs because bodily systems function relatively autonomously from the mind (Somekh and Lewin 2011). A major criticism of this positivist approach is that it does not provide the means to examine human beings and their behaviours in an in-depth way (Crossan 2003). Creswell (2013:7) suggested that, as there is unpredictability in the behaviour and actions of human beings, “We cannot be positive about our claims of knowledge”.

In contrast to the positivists’ worldview, constructivists and interpretivists believe in the idea that there is no such thing as a single objective reality and that perceptions of the social world are subjective (Feilzer 2010). Interpretivism is based on the principle that knowledge is derived from human perception and therefore, research must take into account how human subjects understand the world (Saks and Allsop 2012:18-42). By focusing on people and their behaviour, social science research is concerned with philosophical questions relating to the nature of knowledge and truth, values and being, which underpin human judgements and activities (Somekh and Lewin 2011). Interpretivists believe that individuals seek to understand the world in which they live and work, and develop subjective meanings of these experiences; meanings directed toward certain objects or things. Sometimes the meaning is shared; sometimes it is not; sometimes it is clear and other times vague or contradictory. The intention is to make sense of, or interpret, the meanings others have about the world (Creswell 2013:8).

Mixed method research focuses attention on the research problem and presents an alternative to the quantitative and qualitative traditions. In some studies, quantitative and qualitative methods are used simultaneously. In others, first one approach is used and then the next, with the second part of the study perhaps expanding on the results of the first (Alzheimer Europe 2009). Creswell (2013:4) suggested that a combination of both qualitative and quantitative inquiry could provide a more complete understanding of a research problem. It is defined as “research in which the investigator collects and analyses data, integrates the findings and draws inferences using both qualitative and quantitative approaches or methods in a single study or programme of enquiry”; focusing on “what works” as the truth regarding the research question under investigation (Teddlie and Tashakkori 2009).

Researchers in health have a professional interest in continuing to refine methodologies and methods of enquiry to produce results that can be trusted (Saks and Allsop 2012). Therefore, rather than focussing on methods, by starting from a particular philosophical assumption or conviction and subscribing to either quantitative or qualitative data collection and analysis, the emphasis for this research was put on the research problem (Creswell 2013:10). A pragmatic approach would guide the questions this research sought to answer by providing the philosophical basis for the use of different forms of data collection and analysis (Creswell 2013:10). Pragmatism "opens the door to multiple methods, different world views and different assumptions, as well as different forms of data collection and analysis". Derived from the work of Peirce, James, Mead and Dewey (Cherryholmes 1992), as well as Murphy, Patton and Rorty, pragmatism arises out of actions, situations and consequences, and would therefore provide the philosophical underpinning for this multiple method (multiple perspective) study (Creswell 2013:10-11).

A pragmatic stance has no set methodological requirements, instead it advances mixing multiple sources (or methods) of evidence to attain and modify knowledge (Tashakkori and Teddlie 2010:132). The collection of only one type of data may not tell the complete story (Creswell and Plano Clark 2011:8); pragmatism enables the findings of one source of data to be used to verify or confirm the data derived from another (Small 2011), with the potential of providing support for inferences of cause and effect (Feilzer 2010). In addition to this, a pragmatic approach would acknowledge uncertainties and the "human element" of the research (Feilzer 2010), accepting that any knowledge produced through research is relative and not absolute, that even if there are causal relationships they are "transitory and hard to identify" (Teddlie and Tashakkori, 2009:93). Therefore, rather than using a mixed methods approach, in this research two strategies were used, combining interpretivism and pragmatism (Goldkuhl 2012). Within this pragmatic stance, a qualitative approach, collecting data from two sources, was adopted to explore and understand the meaning of an experience, as lived by a participant (Creswell 2009:6).

Littlejohn (2002) suggested that by developing an understanding of some of the theories of communication, we are able interpret events in a more flexible, useful and discriminating way. To help professionals predict and influence patient attitudes and behaviours and to achieve preferred outcomes, health communication researchers have used varied approaches to derive knowledge (Morgan 2007, Patton 1990, Tashakkori and Teddlie 2010). The literature review has identified that for effective communication to exist two or more interacting individuals must share the same pragmatic rules. The review also identified that communication can affect outcome. Therefore, to explore the impact of the language and the words used in radiology reports, this research had a pragmatic approach using qualitative data collection and analysis.

3.3. Research Design

The collection and analysis of multiple sources of evidence would enhance the understanding of the research problem. The data were collected and analysed in two main phases.

For the first part of the study, qualitative interviews explored the experience of the process of a referral for plain film imaging. The interviews were audio taped, transcribed verbatim, coded and analysed (Lapadat and Lindsay 1999).

The second part of the study would establish if the words used by the radiologist and the pragmatic codes of the radiology report, were communicated effectively, interpreted correctly and its meaning shared by the referring physician and the patient (Littlejohn 2002). By focusing on the implied meaning of the text rather than its explicit content, the intended, or actual, meaning of the radiology report was analysed (Denscombe 2010:286). Analysis of the discourse of the radiology reports would enable the exploration of how messages were organised, used and understood (Littlejohn 2002). The content of the radiology reports was also analysed to identify the radiographic terms used to describe degenerative changes. This analysis of the radiology report would provide a second viewpoint and a better understanding of the data (Denscombe 2010:348, LoBiondo-Wood and Haber 2014). The use of data from different sources added to the completeness of the findings.

It has been suggested that there is a potential for negative emotional consequences for the patient if the doctor-patient communication has not been effective (ACOG 2014 and Stewart 1995). Discovering the meaning that the participants hold (Creswell 2013:186) and the consequences or outcome of the consultation enabled the development of a better understanding of the impact of plain film imaging for non-specific LBP and demonstrated how the radiology report findings influenced the behaviour or outcome for the patient.

3.4. Sample strategy

To address the research question, the sampling decision needed to ensure that the individuals experienced the same event and condition and were informed about the topic area under investigation. Therefore, the sample was purposively selected to gain an in depth understanding of the individual experiences (Greenhalgh and Taylor 1997, Teddlie and Yu 2007), rather than on random probability, in which every element of the population has an equal and independent chance of being selected, or the power of large numbers, as in quantitative research. The sample selection criteria ensured that those recruited for interview had the experience important to the research question. The purpose of studying social phenomena was to reveal their unique qualities, focusing on the social practices and meanings of people in a specific context rather than whether they are normally distributed in a population (Lindlof and Taylor 2002).

The evidence has shown that musculoskeletal impairment due to back pain imposes a greater economic burden than any other disease in the UK, mainly due to incapacity to work (Maniadakis and Gray 2000). In addition to this Andersson (1999) suggested that the prevalence rises with increasing age up to 65 years, after which age it drops off for unknown reasons. Generally, the outlook for patients with back pain is excellent, with 60-70% recovering by 6 weeks and 80- 90% recovering by three months. However, recovery after 12 weeks is slow and uncertain, with recurrence being part of its natural history. Less than half of those disabled for longer than 6 months return to work and after 2 years the return-to-work rate is zero (Andersson 1999).

To reduce the personal, social and economic impact of low back pain, the NICE clinical guidelines: Low back Pain (2009) suggested that good communication between health care professionals and patients has the potential to reduce the number of people with disabling long-term back pain. Therefore, the purposive sample for this research was selected using the following criteria.

Inclusion Criteria

Included were adults of working age (18-65 years), referred by their GP for plain film imaging of their lumbar spine to a specific NHS Foundation Trust Hospital. The reason for the referral (the clinical history) stated on the radiographic imaging request form was “low back pain” with no specific cause identified.

Exclusion Criteria

Excluded were those with a clinical history other than non-specific low back pain, for example “low back pain following a fall” and those with any radiology report suggesting malignancy or infection.

Access to sample/recruitment

All patients referred by their GP to a specific NHS Foundation Trust Hospital for plain film imaging of their lumbar spine were identified using the Radiology Information System (RIS). The radiology reports were scrutinised and those fulfilling the inclusion and exclusion criteria were selected. The name and address of the referring GP was obtained from the radiology report. To ensure confidentiality, permission to contact those who fulfilled the inclusion criteria was obtained from the GP who made the referral for plain film imaging. A letter was sent to each GP explaining the purpose of the study (Appendix 2) and consent for their patients to be contacted. This ensured that the first contact with potential participants for the study was via someone with a legitimate right to identify them (Tod 2010:345-357.). If the GP was happy for their patient to be approached, s/he was requested to forward a letter of invitation to their patient to take part in the study (Appendix 3). The mailing included; two information sheets explaining the purpose and conduct of the study (Appendix 4) and two copies of the consent form (Appendix 5). The patient was instructed to keep one copy, sign and return the other copy to the researcher with a contact telephone number and a time when they could be called to make an appointment for the interview. The letter of invitation also provided the contact details of the researcher should the participant require any further information or have any questions prior to consenting to participate in the study. A pre-paid and addressed envelope was included in the mailing. Asking for a signed consent form to be returned provided evidence that I had obtained written informed consent from the participant to take part in the study.

The participants selected for interview were central to the research question and therefore all those who responded by returning their signed consent form were contacted to arrange a time for an interview. As this was a small-scale study, I used a cumulative approach. The sample size determined when "saturation" had been reached; that is the point where there was sufficient information and no benefit would be derived from adding any more to the sample (Denscombe 2010:40) and the point when more interviews would not result in any new concepts (or themes) with regard to the research question. This does mean however, that the size and composition of the sample could not be predicted (Denscombe 2010:48).

3.5. Data Collection - the telephone interviews

Lindlof and Taylor (2002) have suggested that, in the area of the social and human sciences, where human interaction is of interest to researchers, interviews are particularly well suited to explore experiences and perspectives. By asking questions and listening to others tell what they know, feel and believe, the interview encouraged the participants to freely articulate their interests and to explain what they thought and how they felt and how this affected their behaviour (Lindlof and Taylor 2002). The first part of the study explored the perspectives of the patients, referred for plain film imaging. A semi-structured interview enabled the researcher to elicit open-ended responses, whilst ensuring the main issues of the study were addressed and questions answered (Denscombe 2010:175).

The sample selected was all adults and, as the majority of people aged over eighteen years can now be contacted by telephone, the interviews were conducted by phone. There are disadvantages to conducting telephone interviews (Thomas and Purdon 1994), for example, it has been suggested that people might be less inclined to tell the truth. However, recent evidence indicates that people are as honest and open on the phone as they are when being interviewed face-to face (Denscombe 2010:15). Carr and Worth (2001) critically appraised the strengths and weaknesses of the telephone interview and concluded that it is a cost-effective, flexible means of data collection. They suggested that telephone interviewing produces data which are at least comparable in quality to that attained by face-to-face data collection. One of the advantages of a telephone interview is that it has the potential to reduce interviewer bias, for example from non-verbal responses from the interviewer such as an inadvertent nod of the head (LoBiondo-Wood and Haber 2014). Lindlof and Taylor (2002) suggested that a telephone interview could be as intimate and engrossing for the caller and ultimately as productive as interviews conducted in person.

One of the most frequent criticisms of telephone interviews is that they are impersonal and cannot be a substitute for a face-to-face interview. However, Cachia and Millward (2011) argued that semi-structured telephone interviews almost take the form of a managed conversation and are a well-established tool in qualitative research as they can be adapted to fulfil many different research aims. As the best results are achieved when participants are relaxed, it was important to ensure protected time for doing the interview, when outside pressures on the participants were low. In addition, when considering where to conduct the interview, the comfort and privacy of the participant needs to be considered, free from interruptions (Lindlof and Taylor 2002). A conversational approach sets the tone and makes the participant more at ease sharing intimate thoughts.

Telephone interviews should not be conducted as a “cold-call”. Therefore, to ensure the most appropriate time for the interview, the participants were asked to return their consent form with a contact telephone number, giving an indication of the best time to call to make an appointment. After contact had been established with someone at the number, it was important to confirm the identity of the participant. This could be difficult, as detailed information had to be extracted before secure rapport could be established (Thomas and Purdon

1994). Once the identity of the participant had been confirmed, the researcher introduced herself, reaffirming the aims of the study. To minimise the potential effect of the participants' perception of the interviewer (response bias), I decided to "play the role" of researcher (Boyd and Westfall 1970, Ghauri and Grønhaug 2005, Gill and Johnson 2002) rather than disclose my profession as a radiographer. This would ensure a rapport and encourage the participant to cooperate; helping them to feel that they could speak freely as I could have no opinion on their care. They were reminded about the letter from their GP inviting them to take part in the study and that consent had been given to be contacted. Then they were given an estimate of the length of the interview (Burke and Miller 2001), asked if they were prepared to be interviewed and that they had the time to talk.

The interviewees were asked a few general questions to put them at ease and consent and confidentiality were reaffirmed. The participants were also made aware that the interview was to be recorded for data-recording accuracy purposes and their consent for this was established prior to the interview. The interview was recorded using a micro-recorder attached to the telephone to ensure that the interview was "captured" exactly as it was spoken. The interview questions followed the interview guide (Appendix 6) and the participants were encouraged to talk freely and enticed to expand on his or her thoughts, for example, by repeating their response back to them.

At the end of the interview, the participants were thanked for their time and the interviewer reiterated the importance and usefulness of their participation. The participants were reminded of the confidentiality and protection of their anonymity and that any personal information disclosed during the interview would not be used when compiling and documenting the research findings. When the researcher was assured that the participant was content, the interview was terminated. The recorded interviews were anonymised and transcribed verbatim. This resulted in text that reproduced the discourse – not only what was said but also how the words or phrases were uttered (Lindlof and Taylor 2002). Replaying of the audiotape ensured the accuracy of the transcription (LoBiondo-Wood and Haber (2014). In addition, to enhance the rigour of the data, handwritten notes were used as a record of the interview (Creswell 2013:183). Prior to the interview, all the technical aspects of the recording equipment were checked (Lindlof and Taylor 2002).

Interview Guide

The interview guide (Appendix 6) ensured that similar, though not the same, questions were asked to all interviewees, whilst still allowing for spontaneous follow-up probes to clarify remarks or ask for elaborations (Lindlof and Taylor 2002). Unlike structured questionnaires that produce quantitative data, this semi-structured interview consisted of both closed and open ended questions to define the area to be explored, rather than leaving what gets covered up to the participant, as with the unstructured or in-depth interview (Britten 1995). The interview generally followed a similar order for each interviewee so that the responses could be directly compared across the entire sample (Lindlof and Taylor 2002).

Many people, patients and professionals, incorrectly use the term x-ray (a photon of electromagnetic radiation, which cannot be seen by the naked eye) when referring to a radiograph (the resultant image after a patient is exposed to x-rays) (Gonzalez 2011). However, Figure 4. shows an example of one English Dictionary's definition of the word x-ray; that there is more than one use of the word.

Figure 4. The Oxford English Dictionary (OUP 2018) definition of "x-ray"

1. An electromagnetic wave of high energy and very short wavelength, which is able to pass through many materials opaque to light. (noun)

2. A photographic or digital image of the internal composition of something, especially a part of the body, produced by x-rays being passed through it and being absorbed to different degrees by different materials. (noun)
Example sentences

'the fracture was clearly visible on the x-ray'
'we'll take an x-ray'

2.1 An act of making an x-ray of someone or something. (noun)
Example sentences

'he will have an x-ray today'
'The doctor will take a history and perform a thorough physical exam, and may order a (chest) x-ray or blood tests to diagnose the condition'

3. Photograph or examine with x-rays. (verb)
Example sentences

'If arthritis of the neck is suspected, your neck may be X-rayed.'
'Any part of the body can be x-rayed for information, and they are particularly useful in looking at injuries or changes in bones'

To avoid ambiguity when it came to the interview schedule the participants were asked about their referral for x-ray imaging. The interviewer used the less formal, colloquial use of the term, rather than referring to 'radiographic imaging'.

The purpose of the first section of questions (Appendix 6a) was to establish the sociodemographic characteristics of the participant with regard to their background and current work situation. These questions enabled me to explore possible factors that might influence answers, interests and opinions and may help to explain differences in attitude and behaviour, if required (Frankfort-Nachmias and Nachmias 1992). The identification of possible subgroups would also enable comparisons to be identified and explain how experiences might vary between groups (Griffith et al. 1999).

The second section of questions (Appendix 6b) explored the plain film imaging referral process experienced by the participant. Firstly, to establish why people were referred for plain film imaging and secondly, how this made them feel. The purpose of these questions was to determine who had actually initiated the plain film imaging referral and to gauge their feelings about the referral.

The third section of the interview guide (Appendix 6c) established from the participants how the results of the radiographic examination were communicated to them. That is, how did they receive the results, what was said, what they thought was meant and how it made them feel.

To establish whether the plain film imaging referral process influenced clinical management and ability to cope; the last section of the interview guide (Appendix 6d) focused on the outcome for the patient, their behaviours and their symptoms.

The interviews lasted between 20 and 30minutes, depending on the responses of each individual participant.

Data collection - The Purposive Sample

A total of 204 radiology reports were selected from 500 consecutive plain film imaging requests for “lumbar spine plain film imaging”, made by GPs between July 2007 and December 2008, which fulfilled the inclusion criteria for the study. A total of 54 (27%) consent forms were returned. Ten of the returned forms were from the referring GPs not wanting their patients to be included in the study and two patients returned their consent forms stating that they did not wish to participate in the study. Unfortunately, nineteen patients who had returned their consent forms could not be contacted. Either the telephone number was not supplied or the telephone number was “not recognised” or the telephone was not answered when called. Several attempts were made to try to make contact with those who did not answer when called. Twenty-three patients were contacted and interviewed.

The sample interviewed (Appendix 7) included sixteen women and seven men, with a range of ages of between 47 and 65 years (average age, 57 years). The employment statuses of those interviewed were: 13 were working, either full time or part time, six were retired or were not working (unrelated to their back pain) and four people were not currently working due to back pain. Of those working, either full time or part-time, the majority had had either no time off work or just the odd day or two due to “back pain”. The longest anyone reported being off work due to back pain was nine weeks (retired, not due to back pain). The reason, *“in 1988…the suggested repair mechanism was to lie up”* (11:18).

Data collection - the radiology reports

The radiology reports of those contacted for interview were analysed for their implied (intended) meaning, rather than for their explicit content (Appendix 11. Example of a normal report). This was compared with the answers given by the participant to interview question, “What was said and what did you think this meant”? The aim would be to ascertain whether the terminology used by the radiologist in the report had been effectively communicated to the participant.

3.6. Data Analysis

The two fundamental approaches to analysing qualitative data are deductive and inductive. A deductive approach, based on an earlier theory or model (Elo and Kyngäs 2008), involves the researcher imposing their own theories, structure or predetermined framework on the data and using this to analyse the interview transcripts. The advantage of using this approach is that it is relatively quick and easy; however, it can limit the development of themes or theories. It can also be inflexible and may lead to bias as the coding framework had been decided in advance. In contrast, an inductive approach involves analysing data with little or no predetermined theory, structure or framework, using the actual data to determine the structure of the analysis. It is the most common approach used to analyse qualitative data, particularly when there is little or nothing known about the study phenomenon. This approach is more comprehensive; however, it can be time-consuming (Burnard et al. 2008).

The first stage of the data analysis involved inductive analysis of the qualitative interview transcripts with the aim of identifying the interactions and interconnections between the actions and consequences for each participant. However, since meaning can vary with context and communication can convey more than one meaning, analysis of the radiology report, focused on the implied meaning of the text rather than its explicit content, would ensure that the inferences or meanings derived from the analysis were valid. The purpose of the study was to establish if the “meaning” of the radiology report was conveyed effectively or whether communication “error” contributed to a poor clinical outcome.

Analysis of the interview transcripts

The aim of the analysis, as described by Braun and Clarke (2006, 2013), was to gain an understanding of people’s everyday experience. By focusing on identifying, analysing and reporting themes and patterns of living and behaviour (Aronson 1994), it would be used to gain an understanding of the process of diagnostic imaging for low back pain. For the purpose of generating inferences (Tashakkori and Teddlie 2010:137), analysis of the interview transcript (Appendix 9) established if there was consistency, repeated patterns of meaning (themes) and/or issues of potential interest (Braun and Clarke 2011), across the data set. For example (Appendix 10),

1. To explore the process by which radiographic reports are requested and then learnt about.

Why are patients referred for radiographic imaging - the theme (code) identified and used by all participants was ‘experiencing pain’.

How did this make them feel - the theme (code) identified and used was that they felt relieved or reassured, they generally felt positive with regard to the referral for imaging.

2. To explore what the patient remembers hearing from the clinician.

How did this make them feel - the theme (code) identified and used was that they felt positive – being reassured (pleased, happy, satisfied) or negative - not being reassured (withdrawn, despondent, unresolved).

A more in-depth analysis then explored the interconnections between meanings the individual participants held (Marks and Yardley 2004:66). Each data item, the individual interview transcript, was then analysed to explore "understanding". For example, were the participants able to decode (comprehend) the message, the radiology report findings, according to the rules and use of language and did this "effect an action" (Caron 1992:23-25) - did this impact on symptoms, behaviour and ability to cope?

Analysis of the radiology reports

The purpose of the second part of the study was to reduce the disadvantage inherent in the use of a single source, method and investigator. Analysis of the radiology report was focused on the implied meaning of the text rather than its explicit content (Denscombe 2010:287). Caron (1992:26) suggested that, "understanding discourse is not just understanding each sentence separately, it is also grasping the coherence and discerning the intention of the discourse". That is, whether the findings described in the radiology reports, describing "normal" age related changes were communicated effectively and understood by the participant (please see Appendix 8. Concordance between report and participant).

The analysis of the radiology reports was a means of approaching the topic from a different perspective. It was designed to confirm whether the words used to describe the plain film imaging findings described in the radiology report were effectively communicated to the participant.

3. To explore the relationship between what was heard and the effect on patients' current perceptions of LBP

The findings of the third section of the interview schedule, that is how the results of the radiographic examination were communicated - what was said and what the participants thought was meant, was compared with the radiology report. This triangulation of data, gathered from the participant and the radiologist via the radiology report, was a means of determining whether there was convergence or whether differences could be identified (Marks and Yardley 2004:17) which may have influenced the outcome for that individual participant.

To discover if the coherence and intention of the discourse has had an influence on the outcome for the participant, the final part of the analysis explored how the outcome for the participant, positive or negative, may have been influenced by the communication of the report findings. This synthesis across sources of data and participants enable me to build a composite picture from across the whole sample and make links between the codes, which led to the key issues for the study.

3.7. Validity

Validity, or adequacy (or credibility) is confirmed when the results are adequate if analytical interpretations fairly and accurately reflect the phenomena that investigators claim to represent (Hall and Stevens 1991, Long and Johnson 2000). Creswell (2013:201) suggested that as qualitative validity is based on determining the accuracy of the findings, it is comparable to quantitative validity. Others, such as Guba and Lincoln (1989) use the term trustworthiness in qualitative research. With regard to the analysis of the transcripts, the reliability of the codes or themes that have been developed were gained by applying the codes to the same piece of text on more than one occasion. Although the coding would have been influenced by similar subjective processes on each occasion, as Marks and Yardley (2004:62) identified, consistent coding at least indicated that the distinctions made between the codes were clear.

Alternative codes or themes, may have been identified if the transcripts had been analysed by others, however, this was not done. Long and Johnson (2000) suggested that the employment of multiple data sources, data collection methods or investigators is not to check whether the data in the first part is valid but is used to discover if the inferences from the data are valid. In addition, Creswell (2013:191) suggested that the process of examining the evidence from different data sets would enhance the validity of the study – this is what I did.

Triangulation of the findings

To ensure the reliability and objectivity and minimise the potential bias due to the expectations or influences of the researcher, the comparisons made between participants' understanding of the plain film imaging findings and the intended meaning of the radiology report, were corroborated by two independent investigators (as suggested by Denscombe (2010:347)).

To ensure rigor, the two independent researchers verified the findings by comparing the radiology reports and the responses. Morse et al. (2002) propose this would enhance the reliability and validity of the findings. The codes were cross-checked with aim of establishing intercoder agreement (Creswell 2013:203) or inter-rater reliability (Marks and Yardley 2004:16). (Appendix 8)

3.8. Research Governance

The local Research Ethics Committee – Ref.06/Q22101/128 (Appendix 12 a, b and c), agreed a favourable ethical review.

3.9. Consent

To ensure that informed written consent to be interviewed had been given, the patient was asked to sign and return one of the consent forms, supplying a contact telephone number and time when it was convenient to be contacted to arrange the interview. This allowed time for the potential interviewee to reflect on the implications of participation and not feel pressurised into taking part in the study (Tod 2010). In addition, participants were informed of their right to withdraw from the study at any time, without negative consequences. If when contacted, it was not convenient to be interviewed, arrangements were made for a more appropriate time. If the GP considered it inappropriate to include their patient in the study, the GP was to inform the investigator. These patients and those who did not return their consent form were not contacted further.

3.10. Anonymity and confidentiality

Anonymity was assured before and after the interview. Patients who returned the signed consent form were contacted by telephone. The purpose of the study was again outlined to them and consent was verified immediately prior to the interview. Participants were reminded that the information they provided would remain anonymous. It was important for the participant to be made aware that the interview would be recorded and informed consent was again established prior to the interview proper. Anonymity was assured before and after the interview.

Only the researcher had access to the tapes, transcripts and the researcher’s notes, which are stored in a locked cabinet and on password protected computers at the university.

3.11. Health and Safety

There was full compliance with the Health and Safety Policy and Procedures of the university. Risk assessments were undertaken for all these situations and any risks to individuals or the organisation or organisations involved were minimised as described above and recorded by the researcher.

Risk assessment

With regard to patient safety, including physical health and emotional wellbeing, it was not anticipated that asking patients about receiving the results of their plain film imaging would cause harm. However, if during the course of the interview the patient had become distressed, the interview would have been terminated immediately; the conversation would not have be terminated until the interviewee felt safe for this to happen. The participant information sheet for the study had outlined what was expected of the participant and it gave details of contact points for support. In terms of psychological safety, should there have been any disturbing experience; the researcher would have had access to a line manager or research supervisor or counselling services at Bournemouth University as appropriate. Any such experience would have been documented in the research notes by the researcher. No such problems were encountered.

3.12. Summary

The aim of this study was to establish how plain film imaging results are communicated and understood by patients by exploring how phrases like “degenerative disease” or “degenerative changes”, used by radiologists to describe essentially normal plain film imaging findings, affect patients. Caron (1992:162) suggested that to understand discourse, “is not just understanding each sentence separately, it is also grasping the coherence and discerning the intention of the speech” (Mwihaki 2004). It has been suggested that to make assumptions about the language we use every day may lead to misunderstandings between professionals, patients and their families, and this may unfortunately lead to the patient being excluded from the health care process (Marshall et al. 2011).

The purpose, therefore, was to develop a more complete understanding of the impact of communication with regard to radiology reporting. Qualitative research is particularly suited to study the human experience of health (LoBiondo-Wood and Haber 2014). However Goldkuhl (2012) suggested that there is an inseparable link between human knowing and human action and the key idea of inquiry is to create knowledge in the interest of change and improvement. The combination of interpretivism with a pragmatic stance enabled the use of multiple methods to meaningfully generate information to address inquiry questions (Tashakkori and Teddlie 2010:130).

Chapter 4. Findings

The aim of this research was to explore the perspectives of working age adult patients with non-specific low back pain, referred by their GP for radiographic imaging of their lumbar spine, to establish how their experience affected self-reported symptoms, behaviour and perceived ability to cope. The findings were presented in relation to the three main objectives, 1. The radiographic referral process: to explore the process by which radiographic reports are requested and then learned about. 2. The communication of the results: to explore similarities and differences between the meaning of what was written in the radiographic report and what the patient remembers hearing. 3. The outcome for the patient: to explore the relationship between what was heard and the effect on patients' current perceptions of LBP. The reader should remember that the findings are created by a radiographer with an interest in communication and so I will have interpreted the interviews and findings in a specific way and this needs to be taken into account when reading these findings.

Many patients with non-specific low back pain are referred for plain film imaging of their lumbar spine. Studies have shown that communication is important and poor communication may contribute to a poor outcome for some individuals (Benedetti 2002, ACOG 2014). Therefore, the communication of plain film imaging results may have an influence on outcome. To enable the exploration of an individual's understanding and the meanings they hold, with regard to the plain film imaging process, the qualitative approach provided "rich insight into human behaviour" (Guba and Lincoln 1994:163).

4.1. The radiographic referral process: the process by which radiology reports were requested on behalf of and then learnt about by working age adult patients with non-specific low back pain.

The referral process: Why were people referred for imaging.

The participants were asked who had suggested the referral for plain film imaging, eighteen of the twenty-three participants indicated that it was their GP who had initiated the plain film imaging request. Of the remaining, three people identified a physiotherapist as the originator of the referral and two people were referred by a chiropractor. The participants who were referred by either the Physiotherapist or Chiropractor only went to the GP for the actual referral documentation. None of the participants directly asked for the referral.

The main reason the participants gave for going to their GP (or Physiotherapist or Chiropractor) was that they were experiencing *"pain"*, persistent or unresolved, recurrent or increasing, in their back or legs. It was thought that the plain film imaging would find a cause or reason for the pain. *"To see what it was"*, *"get to the root of the matter"* (11:38), *"wanted to solve it"* (21:35) and *"worried about other causes"* (19:31-32), and the second was wanting *"treatment"*, *"what we were going to do about it"* (105:30-31) and that *"someone was actually taking me seriously"* (16:30-31).

The referral process: How did the referral make them feel?

All participants responded positively with regard to the referral. They felt reassured by being sent for plain film imaging, with the majority believing that this would give them a diagnosis or at least be *"a step along the way"* (104:54), and relief, *"hopefully sort it out"* (102:30). Three participants did question whether plain film imaging would be able to diagnose their problem,

> *"…x-rays never picked anything up. The only thing what was picked up was when I went through the scanner, picked up what was wrong with my back. So I don't think x-rays actually do a lot"* (106:40-42).

> *"MRI scan is probably more telling of a back injury than an x-ray. But, was I pleased"* (104:47-48).

> *"I had hoped for more, it obviously wasn't to be"* (100:42).

4.2. The communication of the results: the similarities and differences between the meaning of what was written in the radiology report and what the patient remembers hearing.

Communication of results: By whom and how the results were communicated

The majority of participants received the results of their plain film imaging from their GP, with eleven making a specific appointment to discuss the radiology report findings *"face to face"* (11:48). Five discussed the results during an appointment unrelated to their back pain.

"*Not a follow up appointment just for the results of the x-ray, but as part of other things – prescriptions, etc."* (10:54-55).

What were you told?

Participant: *"He (GP) said briefly that there were some changes to the back, relating to "wear and tear" etc. Nothing identifiable that could be giving me the problem that was basically it"* (10:62-64).

What did this mean to you?

Participant: *"Wasn't really unexpected, to be quite honest as they have not been able to find anything after all these years"* (10:67-68).

How did you feel?

Participant: *"Unsurprised really, just left high and dry, but I can't be critical; they've done everything they could…Happy enough with it, I know they've tried again"* (10:74-78).

How does your back pain affect your life now*?*

Participant*: "Drastically actually, the back but also the thigh, the two are related. The back varies; it has been really bad for about three weeks. One stage yesterday, I'd gone shopping and I could hardly walk. Every time I put a foot down, it set awful pains through my back. Anti-inflammatories help with it, but as*

I say, I have this thigh thing as well. GP signed me off on incapacity. Turned down, but on examination had to go to appeal, judged in my favour" (10:91-93).

Although a number of the participants heard the results of their plain film imaging directly from their GP, the way in which the results were presented varied. Some GPs tried to explain what the wording on the report meant, whilst others did not expand on the hospital report. For instance, one participant commented:

Participant: *"He just read the report from the hospital.*

Three participants received their results from their GP by telephone and the remaining four received their results during a hospital consultation (17, 20, 34, 106), rather than from their GP, though one of these was not really sure who had given them their results, *"not sure if it was the hospital or my GP to be quite honest"* (106:59).

Case example

A 55-year-old female who was, *"not allowed to"* work since an accident, 14 years previously, was referred for imaging by a physiotherapist in consultation with her GP. She did not see her GP for the results of the plain film imaging; she said she was given the results by a hospital consultant 4 months later, prior to having a facet injection. She said she had been told in the past that she had some degeneration and they wanted to see how much further it had progressed or not progressed. She said she was told, *"Mainly the hip areas - slightly bigger gap around my left hip, but no bone degeneration"* (17:50-51). She thought this meant that she had to be more careful with her hip as *"obviously"* as she got older her hip might start dislocating. The formal report described normal findings following L4/5 disc fusion with a posterior metal fixation (the plain film imaging of the pelvis was also normal). This participant described both fear avoidance and catastrophising behaviours. *"A lot I cannot do…used to like bowling and gardening…I am very restricted to what I can and cannot do"* (17:80-85).

This case example demonstrated how a breakdown in communication resulted in a poor outcome. Firstly, there was no clear pathway for this referral, as identified by “the circle of communication” (Berquist 2009). It was very difficult to determine whether the referral was made by the physiotherapist in consultation with the GP, or the GP following a clinical examination. As a result, there is no clear clinical question to be answered by the imaging request and subsequent report. In addition, the participant did not return to her GP to discuss the findings.

Communication of results: How was the radiology report communicated? What the radiology reports said

As in the previous study (Thompson and Carr 2007), the percentage of radiology reports, which contained a phrase indicating degenerative changes, was high (91%) with only two of the reports not describing radiological features associated with degeneration or OA.

“No complication is demonstrated”, following a spinal fusion of L4/5 discs and *“the remaining discs are well preserved; there is normal vertebral body alignment and no abnormality seen elsewhere”* (17).

“No further bone, joint or disc pathology is seen to involve the lumbar spine. The SI joints appear normal”. Previous surgery to L5/S1 vertebral bodies (106).

Osteoarthritis, also known as “degenerative joint disease”, is common and is usually referred to as spinal "degenerative change". The term spondylosis in a radiology report refers to the radiographic changes associated with the degenerative process affecting the discs and facet joints - joint space narrowing (decreased disc height, loss of joint cartilage), bony spurring of the joint margins (osteophytes) and subchondral sclerosis (thickening of bone) and cyst formation.

The explicit content of the radiology reports revealed that the majority contained words describing spinal changes associated with aging and/or degeneration. These include,

“Degenerative disc disease”, either slight / little / mild / marked

“Marginal osteophytes/osteophytic lipping” – mild / minimal / early
“Spondylosis” – mild / moderate / moderately advanced
“Degenerative changes” – mild / moderate / marked / significant
“Significant OA”
When a radiologist uses these terms in a report, they are essentially describing “normal” age related changes evident on the radiograph. Studies have shown that these findings do not correlate well with the degree of pain or disability in the individual. To determine whether the implied meaning of the report was communicated effectively, the radiology reports were compared with what the participants said they were told. Two independent observers would also compare the findings of the reports and the transcripts of the participants (Appendix 9).

For the majority of participants, concordance was found between what the participant said they were told and the implied meaning of the report, and essentially, there was agreement between the observers. For example,

What were you told?

Participant: *“There was some degeneration, my hips were OK and there seemed to be L5 and next one down were slightly slipped”* (21:49-50).

Report: “*Degenerative changes in the lumbar vertebrae with osteophytosis. There is reduction in the IV height between the L5/S1 vertebral bodies, which could suggest a prolapsed disc at this junction. The vertebral body heights are however maintained”*.

Unfortunately, for many of the participants, there was not concordance between the implied meaning of the radiology report and what the participant said they were told. For example,

What were you told?

Participant: *“He just read the report from the hospital. He had me quite worried when he told me”. “You’ve got arthritis in your hips”. “Asked what does that mean” “Arthritis in your hips, the onset of it now, and your back is crumbling”. “I* *didn't take a lot in at the time; I came away in quite a bit of a state. He's like that; he's straight to the point. Since, I've been told now that it is OK, they're not crumbling". "He (GP) kept saying not much could be done except hip replacements, because he has had them himself*' (15:48-66).

When asked, what did this mean to you? How did you feel?

Participant: *"Shock, I came home and thought, I have to have hip replacements and my back is crumbling away. Not very good"* (15:70-71).

Radiology report: *"Very early osteophytes are seen, with very slight loss of height in the lower two lumbar discs". "Degenerative features present at the left hip, with moderately severe loss of medial joint space, together with osteophytes…there is only slight right sided joint space loss".*

Fortunately, this participant was referred to a consultant,

> *"Went to see a consultant at the hospital for my hips and back. She read the report again; she explained it all to me… She said this wasn't the case; it was a long way off. Then she booked me into see a physio"* (15:59-61).

The outcome for this participant was good, "*It is better than it was… It doesn't stop me doing anything"* (15:82-83, 93).

The second example, where a mismatch was identified between what the participant said and the radiology report, was someone who had had been in an accident fourteen years previously, resulting in a L4/5 disc fusion. They had not worked since the accident,

> *"...Because my back, they put it down is unstable. Oh, I would love to go back to work, don't get me wrong. And I've applied for a desk job, but they say I am too big a liability"* (17:11-13).

The reason for the plain film imaging request was *"pain...no neuro deficit".* This participant did not go back to the GP for the results of the plain film imaging, instead they were told about the result of the plain film imaging, *"actually in there, on the day, having facet injection and they got the results for me"* (17:43-

44). When asked about any degeneration or changes found on the plain film imaging,

Participant: *"Told previously there was some degeneration there, previous to this x-ray, they wanted to see how much further it had progressed or not progressed"* (17:47-48).

What were you told?

Participant: *"Mainly the hip areas. Slightly bigger gap around my left hip, but no bone degeneration"* (17:50-51).

What did this mean to you?
Participant: *"Got to be a bit more careful with my hip because obviously as I get older it could start dislocating, which is what she said could happen because …Mainly be careful on how much I use that hip as to how I kneel on it, I can't because I have a knee replacement anyway. I have too much of a strain if I kneel down on the right leg"* (17:53-58).

Radiology report: L4/5 disc has been fused and there is posterior metal fixation. No complication is demonstrated. The remaining discs are well preserved. There is normal vertebral alignment. No bony abnormality seen elsewhere in the lumbar spine. Both hips appear normal and no abnormality is seen elsewhere.

Again, essentially this is a normal report and this breakdown in communication had resulted in a poor outcome for this participant.

Participant: *"…it has got a bit worse… A lot I cannot do... I am very restricted to what I can and cannot do. On a good day I might be able to do a little bit more, on a bad day it is just a case of resting it and taking more painkillers"* (17:76-87).

When asked, are you working? The reply, *"No, not allowed to"* (17:89).

Lastly, an example where there was there was concordance between what the participant reported they were told by their GP compared with the formal radiology report findings, however the outcome was poor.

Participant: *"I've had this particular leg and back problem, whether they are linked or not, for best part of 20 years. For some years, it was on and off and recent years it has got to the stage where it never goes away. Extensive investigations and treatment under consultants specialising in pain and rheumatology. They have done everything they could for me, but have never been able to resolve it. Had so much trouble, at this stage GP suggested another x-ray and see if we can find anything else"* (10:31-37).

Communication of results: What was said and what was meant

With regard to the radiology report, the participants were asked, "what were you told?" and "were you told about "degeneration or changes?" eleven participants did not mention the word(s) "degeneration" or "change(s)" when reiterating what they had been told with regard to the radiology report findings. Five participants suggested the term "osteoporosis", whilst the term was only used on three occasions in the reports; it was used in a report to describe a fracture, *"appearances would be consistent with a simple osteoporotic/traumatic compression fracture"* (16). In addition, *"the bones showed generalised osteopenia"* (31) and *"the bones are osteopenic compatible with age"* (34).

Osteopenia is the term used to describe radiographic bone density that is lower than normal peak density. When told they had osteoporosis, two participants expressed concern regarding the diagnosis and age, "*I am not that old to be getting something like osteoporosis"* (16:50-51) and *"I thought osteoporosis was associated with older age group"* (32:55). The report of the second participant made no mention of the terms osteoporosis or osteopenia.

Four participants said they were told that essentially their plain film imaging was normal or there was nothing to be found, "*nothing dangerous"* (20:44), *"nothing significant"* (101:64), *"couldn't find nothing wrong"* (106:77) and "*nothing really wrong"* (100:59), and three could not remember what had been said, *"can't remember now, quite a while ago"* (103:42).

When asked, “What were you told”, one participant said,

“Actually went with my hip. Hip was not worn out, something around the joint not right. Something in my back - he sent me down to physio. The physio thought it was my back more than a hip problem” (18:40-42).

Twelve patients recalled the words “degeneration” or “change”, or similar terms, such as “(osteo)arthritis” or “wear and tear” being used when they were given the results of their plain film imaging. For example, a 47-year-old female full-time sales assistant said that her GP just read the report from the hospital. She said she was told,

“You’ve got arthritis in your hips… and your back is crumbling… and not much could be done except hip replacements” (15:51-52, 65).

(The radiology report described early radiographic findings of OA).

Another participant recalled being told, *“…slightly bigger gap around my left hip, but no bone degeneration”* (17:51) (Radiology report was “normal”).

Also, *“…yes, well I mean…I have been suffering from a bit of muscular,* (possibly mispronounced but may have been what this participant meant to say) *degeneration, muscle degeneration and osteoporosis…I would probably make a good ice cream at the moment”* (105:58-61). (Radiology report described degenerative changes). Whilst the word “degeneration” had been used, it had not been in relation to degenerative changes with regard to their spine.

Three participants said they were told that the problem with their back was related to an injury. One was told, *“Osteoarthritis 4th and 5th facet joints aggravated by accident”* (33:46-47), the second said, *“He said there were actual signs of injury”* (13:63) and *“Some slight degeneration from a repetitive movement”* (19-44). Several references were made to “age” or “old”. For example, one participant said that the report findings suggested that, *“my bones were getting older”* (11:71) and another participant was given the diagnosis of “*old age, had a back problem for years”* (34:53-54). Only three participants said that their GP described the radiology report findings as age related. One was told that they had *"normal aging degeneration"* (101:58); another was told that they had *"degeneration equal to my age"* (21:47) and the last was told that they had *"…a fifty odd year old back"* (100:59).

When asked what the report findings meant, the responses were fairly evenly divided between those who used words and phrases with positive suggestive (connotative) meaning and those who expressed negative suggestive meaning. For example, there were those who were feeling "*pleased"* that the report meant that there was "*no major problem*" (19:47), "*nothing severe*" was found (20:53), or *"quite happy there was nothing significant"* (101:64) and "*pleased it* (their back pain) *was being sorted out. Right treatment right time"* (31:50-51), *"now we know what the problem is*" (13:77), "*knew what I was up to"* (11:79), *"try and put it right"* (14:59) *and "fair enough"* (100:64).

Those who used negative words and phrases, implying negative connotative meaning expressed words like, *" felt shock"* (15:70) or *"very worried"* (16:55) and *"surprised, thought osteoporosis was associated with older age group"* (32:55), *"not happy – not middle aged"* (33:54). In addition, *"they say there is nothing wrong with it"* (106:91-92); *"I don't really think it made any difference"* (104:77), *"you are lumbered with problems"* (105:66), *"Don't know really – you have got to live with it"* (103:46).

Case example

A 54-year-old female, currently working said, *"I have osteodema (sic), not full blown osteopercia (sic); this is the early staged one, the mild one".* It was difficult to determine whether they had actually meant osteopenia and osteoporosis or osteoarthritis. The radiology report described only minor/early degenerative changes. After a recent fractured ankle, she reported still having pain, *"the hopping started my back off again…picking things up or bending…interfering with my sleep"* (14).

This case demonstrated how terminology used by professionals could lead to confusion by patients.

Communication of results: How did you feel?

After receiving the report of their plain film imaging, the responses were fairly evenly divided between those who used words and phrases with positive suggestive (connotative) meaning and those who used words with negative suggestive meaning to describe how they felt. For example, the participants who implied positive feelings of relief and reassurance stated that they were, *"happy to have a concrete diagnosis…more satisfied"* (21:53-54, 56), *"pleased the x-ray showed something"* (13:75); *"reassured that it was just one of those things"* (19:55), *"pleased…good to know"* (33:61, 64).

A few participants however (n=3), who initially used words which suggested positive feelings, saying that they were *"quite happy there was nothing significant…pleased that there was nothing"*, then went on to express feelings of frustration *"probably slightly frustrated…getting backache and no real major cause for it" (101:64-69)*. In addition, *"unsurprised really, just left high and dry…they've done everything they could"* and then *"happy enough with it, I know they've tried again"* (10:74-78).

Just under half (n=12) of the participants used words with negative suggestive meaning to describe their feelings after receiving the radiology report findings, for example, feelings of " frustration",

> *"At the time, it was very frustrating because they weren't actually finding anything. It was a bit frustration, actually… to keep going on to something else and something else. I just wanted them to find out what was wrong, give me a tablet or whatever it is that I needed to sort it out, which didn't really happen. It sounds terribly simplistic, but we all have busy lives. I can't be doing with being ill, a bit of frustration really" (*(102:58-63).

Other negative words used were, "flummoxed" and "disappointing". One participant said that the referral was made by the GP *"via the chiropractor"* and there had been *"a slight difference of opinion"* in the radiology department, as the plain film imaging had not been taken as the chiropractor had requested. The results of the plain film imaging then left the participant feeling, *"More flummoxed, that the hospital kept their cards so close to their chest, not to have sight of the x-rays, not to allow us to have the x-rays in the fashion chiropractor…. That was all very disappointing, not be able to take them to the chiropractor … These guys have an awful long time in training, mostly funded by themselves, someone who is a professional in their field, who can make these qualified noises about what is what, didn't get a chance to look at them and that was disappointing. It was even more disappointing to get a bill to pay for the darn things done as we wanted them, a week afterwards"* (100:74-82).

Another said,

"I am sure that they said that they couldn't find nothing wrong with it. Since then I have had fosset (sic) injections, which I had done 6 weeks ago, which has sort of helped a little bit, but not too much. I am quite disappointed, because as far as I am concerned, the problem what I experience, still hasn't been solved" (106:77-81).

The findings of the interview transcripts essentially only provide a single source of data, the participant. As this research was seeking to explore the relationship between the communication of the radiology report findings to the GP and then to the patient; the analysis of a second data set, the written report, would establish if the intended meaning of the report had been communicated to the participant effectively and reduce the disadvantages inherent in the use of a single data set.

As identified previously, normal aging is usually associated with radiographic changes indistinguishable from degeneration (morbid structural change) and therefore do not correlate well with the degree of pain or disability for an individual. People with "degenerative" spinal changes can suffer from pain or not (Wilmink 2011).

4.3. The outcome for the patient: to explore relationships between what was heard and the effect on patients' current perceptions of LBP

The outcome for the patient: How were they followed up.

During the interview, several participants talked about the treatment(s) options offered to them. The transcripts were therefore analysed to establish if the participant underwent any treatment or therapy and whether this may have contributed to the outcome.

Treatment option - Pain relief

Almost half the participants said that they were given or offered pain relief for their pain; with about a quarter saying that they had taken pain relief, it was presumed this was orally, mostly referring to them as *"pain killers"*, or as *"anti-inflammatories"* by one participant. Two participants suggested that the pain relief was prescribed (by their GP),

"I could be prescribed very strong pain killers to kill the pain" (11:54),

"…he had given me really strong pain killers" (13:76).

A few participants said that they had been given an epidural for their back pain and all felt very positive regarding the outcome; *"my back was really quite good"* (104:107-108), *"helped enormously"* (16:71) and *"worked lovely"* (34:55). A few were offered facet injections however; the outcome seemed not as effective. One person said the facet injection, *"has sort of helped a little bit, but not too much"*, the result *"…sometimes you feel a little bit down because you are in pain"*. Another suggested that the facet injection *"actually flared it up again* (the back pain)" (17:77) and initially felt "*…at least it was nothing severe", "happy, they found out what it was"* (20:53-54). It was suggested that a facet joint injection would help the pain, but unfortunately, they are still waiting for it and now have had to take early retirement due to ill health, *"related to the back problem and depression"* (20:8).

Treatment option - rehabilitation (Physiotherapist and Chiropractor)

This incorporated a range of treatments including exercise therapy, spinal manipulation and education. Again, almost half of those who responded were referred for physiotherapy; one was seeing a chiropractor prior to the plain film imaging referral and one person was referred for Pilate's exercises. Three people mentioned being referred to a *"back clinic"*. Generally, the outcome was good with the pain being reported as *"better"* or *"liveable with"*. Unfortunately, not everyone found an improvement,

"I was told I had to have physio on my back. They just gave me some exercises to do. I fractured my ankle in June/July and it was in plaster for 4 weeks. I think the hopping previously started my back off again. It is painful, in bed too, I can't get comfortable. It is interfering with my sleeping, definitely. I keep saying I must go back. Have another look, but I know there is not much they can do I think they said a disc was slightly worn" (14:55-88).

"I did have some Physio, a leaflet with exercises to do. Told me to get more active – I used to go to the gym quite a lot. I had to stop because I broke my arm– I have great problems with it" (21:70-73).

Treatment option - Others

Three participants were diagnosed and treated for osteoporosis as a result of their lumbar spine plain film imaging (16:57) (31:60) (32:52).

One participant was receiving treatment for fibromyalgia (101:83).

Finally, one participant did not actually mention if they had had any treatment or therapy, however their back pain had resolved, *"Will twinge now and again…just learn to live with it"* (103:63).

The outcome for the patient: Do they still have symptoms.

All participants, except one, reported still experiencing some degree of pain, though three indicated their pain was in their hips or legs, rather than their back. The participant who indicated that they were not in pain now, put it down to the fact that had *"not been doing very much"* (12:75), but when asked if their back pain was "better" the response was *"no"* (12:79). Of the remaining responses, the majority of the responses described their pain now as a, *"twinge occasionally"* (33:73), or *"niggling"* (105:78) which *"comes and goes"* (32:69), *"now and again"* (103:63)*, "on and off"*, (31:66) and that the pain was *"better"* (15:81), *"bearable"* (16:73), *"liveable with"* (13:91).

The outcome for the patient: Is your back pain better

Whilst almost all the responders indicated that they were still experiencing some pain, when asked if the pain was better than it was when they were referred for their plain film imaging, there was a fairly even split between those who thought their pain was better than before and those who were experiencing the same amount of pain or worse.

"*Episodes of pain, not continuous… Pain, pretty much the same"* (19:66-67).

"Same, sometimes it's worse" (21:68).

The outcome for the patient: How are they able to cope - does your back pain affect your life now

When asked how your back pain affects your life, again the responses were fairly evenly divided between those who used words and phrases with positive suggestive (connotative) meaning and those who used words with negative suggestive meanings. Those who seemed more positive, whilst still experiencing pain, seemed better able to cope.

"*I pretty much get on with life as before. It can be a bit of a nuisance, it can sometimes be a bit painful walking long distances, doing certain things…I wouldn't say it stops me doing things, because I just plough through it. But it certainly can be a bit of a nuisance. I am never quite sure when I am going to do something whether I am going to have a problem with it or not. I tend to assume it is OK and just get on with things"* (104:116-123).

"It is just a matter of being a bit careful, odd things happen – just sitting down rather awkwardly on a bench at a French railway station, on holiday. I

took some painkillers and had a bath and relaxed a bit – just carried on… I am aware, "oh, it's gone again… But, I have a confidence it will slowly get better and if I do the right things – remember to sit up straight, like my Granny told me. All those things help contribute; I can feel things changing, getting better over a period of a few days" (19:60-70).

The majority however, described how their pain had limited their activities (fear avoidance) and affected their ability to cope.

"*A lot I cannot do. I have three grandchildren and I cannot pick them up at all. I can't go to do shopping on my own; to carry heavy shopping that is out of the question. I used to like doing a lot of bowling and gardening, again it has restricted me a lot of them. I am very restricted to what I can and cannot do"* (17:80-85).

"I can't do things I use to do before. A lot of gardening – I cannot do the garden. I have had the garden altered so there is not so much weeding and stuff. I can't seem to walk far, I used to go for long walks, it hurts back now – I can't do that for long. I can still go for a walk, but not as much as I used to do before. Can't pick up things very easily – like furniture and stuff" (21:82-88).

Some described feelings of embarrassment or lacking confidence and frustration, feeling

"withdrawn" (32:72), or "*restricted"* (34:80).
"…It does get you down at times" (106:106).
"…It is interfering with my sleeping" (14:65-66).
"…I like to go out and socialise, but it gets a bit embarrassing when I go and sit down" (20:67-68).

The outcome for the patient: Are you working

The majority of responses indicated that they were employed or still active,

"*While not gainfully employed, I work seven days a week, though not all day"* (11:104).

Despite still experiencing pain, they expressed a positive approach, which has resulted in a good outcome.

“Keep very active” (11:105), *“try and go as normal as possible”* (103:71) *and “I wouldn’t say it stops me doing things, because I just plough through it”* (104:102).

For several participants however, this was not the case and they were unable to work due to their back pain, exhibiting both fear avoidance, and for a couple of participants, catastrophising behaviour(s).

“Early retirement due to ill health. Related to back problem and depression” (20:8); *“not allowed to” (work)* (17:89) and *“signed off on incapacity”* (10:92).

In the first example, the participant, when told, *“…there was nothing dangerous. It was the facet joints”* and an injection would help the pain, said they were *“happy, they found out what it was, at least it was nothing severe”* and *“…just wanted, hoping to get on and do something now”*. Unfortunately, they are still waiting for the injection, the back pain has remained the same and they are not working, having taken early retirement due to ill health, related to the back problem and depression (10:44-59).

Case example

A 59-year-old female, who was currently working, said she was told that she had *“some degeneration, that’s all”*, which actually agreed well with the report. However, she went on to say, *“Well I thought I either had a touch of arthritis or a touch of that osteoporasis* (sic) *or something like that”*. She said that her mother had bad arthritis and osteoporosis and she figured, “*such is life”*. She demonstrated both fear avoidance, *“not been doing very much…I tailor my time to sort myself out”* and catastrophising behaviours, *“just do what I can and swallow the painkillers…when it gets really bad I use a massage pad”* (12).

This case demonstrates how whilst the words used maybe the same, the affect as a result of meaning can lead to a poor outcome.

The findings of this research have identified that there are several areas of the circle of communication where poor communication has resulted in a poor outcome. The research has also shown that effective communication can result in a good outcome. This research has identified that individuals experiencing low back pain want imaging, either to find a cause for their pain or to exclude something more sinister like cancer for example. The majority felt that the referral was a positive thing and a step along the way to treatment. Unfortunately, when the imaging requests were ambiguous, by not asking a specific question of the imaging, the result was that generally the radiology reports only contained a description of the radiographic findings. The language and the terminology, used in the report often caused confusion. In addition, only a few participants made a specific appointment with their GP to discuss the radiology report in terms of how it might relate to symptoms and treatment options. This resulted in some individuals feeling that they were unable to do the things they wanted to and consequently continued to suffer. Both fear avoidance and catastrophising behaviours were identified, particularly from participants where the radiology report findings were not communicated effectively. They were unable to do gardening, go for long walks, or lift for fear of their pain returning. Others described added feelings of withdrawal, frustration and embarrassment, leading to a few being unable to work.

Chapter 5. Discussion

The aim of this research was to explore the perspectives of working age adult patients with non-specific low back pain, referred by their GP for radiographic imaging of their lumbar spine, to establish how their experience affected self-reported symptoms, behaviour and perceived ability to cope.

1. The radiographic referral process: to explore the process by which radiographic reports are requested and then learnt about.
    - Why were patients referred for radiographic imaging and how did this make them feel?
2. The communication of the results: to explore the similarities and differences between the meaning of what was written in the radiographic report and what the patient remembers hearing.
    - How were the results communicated?
    - What was said, what did it mean and how did this make them feel?
3. The outcome for the patient: to explore the relationship between what was heard and the effect on patients' current perceptions of LBP.
    - Were they followed up?
    - Do they still have symptoms?
    - Are they able to cope?

The key finding this research has identified is the importance of communication from the point of referral until results of the imaging have been communicated and beyond.

5.1. The referral process: Why are patients referred for radiographic imaging and how did this make them feel.

This research has found that, despite the evidence-based guidelines to the contrary, GPs do still refer their patients for radiographic imaging for non-specific LBP and the majority of patients thought that it would be a useful investigation to find the cause of their pain. They all felt reassured by the referral and thought it would be a step along the way to treatment.

This research sought to interview patients who had been referred by their GP for radiographic imaging of their lumbar spine. However, whilst the request/referral for imaging was apparently initiated by the GP, it was found that on occasion the request was made on behalf of a physiotherapist or chiropractor (17:27, 33:22, 100:17,101:31). It has been suggested that, radiological requests, made by doctors who have had no clinical contact with the patient, can leave significant room for error (Bosanquet et al. 2013). For example, when the GP made the referral on behalf of the chiropractor, the result was a breakdown in communication. Not only did the participant have an inappropriate investigation, the chiropractor had wanted the imaging to be done erect, instead it was done supine as per the radiology department protocol for a GP requested lumbar spine; then the results, the radiology report, went back to the GP as the "referrer" rather than to the chiropractor. As a result there was no discussion between the GP and the patient with regard to the appropriate follow up and treatment. The outcome for the patient was confusion and disappointment, not just with the referral but the process and as a consequence, they were still in pain.

This research also found that whilst none of the participants said that they had asked for the radiographic imaging, the majority thought that it would be useful in finding the cause of their pain. They all said they felt reassured as they wanted to *"get to the root of the problem"*, *"to know the nature of the problem"*, wanting to exclude more sinister causes for their pain. As in the research of Espeland et al. (2001), the participants in this research referred to their symptoms and clinical history when giving their views and for the majority, they thought that a referral for imaging was justified by referring to their pain as either a persistent pain, which was not resolving, or an increase in their pain. It was felt that a referral meant that they had been taken seriously and they were moving towards something, a diagnosis, which could then be resolved - a *"step along the way"* to treatment. This reflected both the research by Espeland et al. (2001) and Miller et al. (2002), in that patients commonly believed or hoped that

the radiological examination would identify the reason for their pain or aid the treatment of their condition"; being believed, feeling reassured, expressing satisfaction and giving them hope for a positive change. The benefit of a referral for radiographic imaging was that something would be done for their pain.
The main purpose of radiographic evaluation of the lumbar spine is to exclude the occurrence of LBP specifically caused by malignancy, fracture, infection, or inflammatory spondyloarthropathy (van Tulder et al. 2006). Findings of degenerative, congenital and postural abnormalities have been associated with non-specific LBP, but the reliability of these findings is poor, due to variability in methodological quality. An association has been reported between disc space narrowing and LBP however, there is no firm evidence for the presence or absence of a causal relationship between non-specific LBP and radiographic findings of osteophytes, endplate sclerosis and facet joint osteoarthritis (van Tulder et al. 1997, Raastad et al. 2015). Despite the fact that the prevalence of specific LBP in primary care is low, it has been shown that radiographs are frequently requested even when specific LBP is not suspected (van Tulder et al. 1997). The study carried out by Little et al. (1998) confirmed this by identifying that psychosocial reasons, such as patient satisfaction and reassurance, were as important as medical reasons for GPs to request lumbar spine radiographic imaging. Unfortunately for some patients, this referral for imaging was the first step in the breakdown of communication.

After the imaging has been done, the next stage of the circle of communication is the interpretation of the radiological image within the context of the clinical question, the clinical indication for imaging, as identified by the GP on the referral. As the radiology report is the primary form of communication between the radiologist and the clinician, as well as an important medico-legal document, it is important that its structure allow easy transfer of information. Ideally, the report should include a description of the significant radiological findings and include advice regarding further management and follow-up. It should also address the needs of the referring clinician by answering the clinical question. It is at this stage that the second breakdown of communication occurs. The majority of the reports only included a description of radiographic changes indicative of degeneration and unfortunately, as the clinical question had not been made explicit, it was rare for the report to positively exclude specific causes of LBP, or suggest the findings were normal and age related.

The next stage of the circle of communication is when the patient goes back to see their GP to discuss the report findings and establish a plan of treatment. It has been recognised that at this stage the pragmatic rules, the explanation and interpretation of the results within the clinical context, is very important. Also, as highlighted previously, a positive context can produce a reduction of symptoms and initiate active coping strategies, whilst a negative context can produce an increase in symptoms, which may lead to passive coping strategies (Benedetti 2002).

5.2. The communication of results: How were the results communicated; what was said, what did it mean and how did this make them feel.

This research found that the majority of the participants received the results of their imaging from their GP, though not everyone made a specific appointment just to discuss the report findings. When the communication of results was effective, whilst not necessarily happy to be told they have age-related changes, participants felt positive and reassured. However for some, there was confusion over the terminology used, not just the words used in the report by the radiologist but sometimes the explanation given by the GP. When reported changes indicative of degeneration were misinterpreted and the degeneration seen as “abnormal”, this often resulted in a poor outcome for these participants; they were left feeling unable to cope, unable to do things and their lives were restricted by pain.

A referral for an imaging examination is a request for a professional opinion from a specialist in radiology and involves the interpretation of a radiological image in the context of a specific clinical scenario. The outcome is presented in the form of a radiographic report intended to assist in the management of the clinical problem (RCR 2007) and is often the only means of communication between radiologists and referring clinician (Naik et al. 2001). The results of the imaging study are often only one link in a chain of events leading to diagnosis and treatment.

The RCR guidelines (2007) also state that a useful investigation is one in which the result, positive or negative, will inform clinical management and/or add confidence to the clinician's diagnosis. It is therefore very important that if imaging is requested and degenerative changes are reported, the findings are fully discussed and put into context of the clinical symptoms, and the treatment and management options discussed. The referring physician has the responsibility for the collection of all diagnostic information to justify the requested radiological examination (Triantopoulou et al. 2005). Therefore, it is important that the patient returns to that person for the results, as they are the one who have access to all the facts and is best able to draw conclusions and discuss treatment options.

In this research, the referring physician was the GP as they had generated the request/referral. The majority of the participants did receive the results from their GPs, though not everyone made a specific appointment just to discuss the findings. Some of the findings were discussed as part of another visit or appointment, some were given over the telephone and four participants received their results from hospital consultants.

Wallis and McCoubrie (2011) have highlighted that, as the report is the primary form of communication between the radiologist and the physician, the radiologist should consider the possibility of hidden meanings and avoid ambiguity, avoid jargon and be aware of pragmatic rules. A study by Espeland (2007) suggested that GPs may be uncertain of the clinical relevance of various radiographic findings and what they want to know is whether the findings corresponded to the clinical condition, are normal for age, or are significant or not. GPs want (need) clarification of clinical meaning, that is, terminology, disease likelihood, clinical relevance and further investigation. Whilst the focus of this research was on the patients' experience, their narratives suggested that there were difficulties at the stages at which the radiology reports were communicated from the radiologist to the GP, as well as from the GP to the patient. For example, one participant said that the GP had suggested that the report described findings related to an injury - the formal radiology report of the lumbar spine radiographs made no mention of the word injury – “no evidence of a structural abnormality”. However significant osteo-arthritis of the sacro-iliac joint was described.

In another example, the participant recalled the GP telling them that they had arthritis in their hips and their back was crumbling - the formal radiology report suggested a very slight loss of intervertebral disc height and joint space narrowing of the left hip; a relatively normal report. This participant said that she was left feeling *“shocked”.* Fortunately, a hospital consultant reassured her and following physiotherapy, her pain was now under control. Her outcome, whilst her pain had not completely resolved, when asked how does your pain affect you now she said it didn’t stop her doing anything. By demonstrating positive coping strategies, this participant was likely to have a good outcome.

This research has identified that for some, there does seem to be confusion over the terminology used, not just the words used in the report by the radiologist but sometimes the explanation given by the GP. In addition, there seemed to be confusion with regard to terminology by some participants. For example, one participant used the term *osteoderma (sic) and osteopersia (sic)* to describe the findings. It is possible she may have meant, osteopenia, a term used radiographically to describe demineralisation of bone, and osteoporosis. An indication that perhaps this participant may not have really understood the terminology (the pragmatic rules) used in the radiology report. Marshall et al. (2011) suggested that to make assumptions about the language we use every day, might lead to misunderstandings between professionals and their patients.

Roland and van Tulder (1998) suggested that when a term like “degenerative change” is reported by the radiologist to the physician and by the physician to the patient, it is often in a way that implies that the changes described are the cause of the pain. The patient’s schema “hears” that there is a long-term structural problem with their spine, or is given a diagnosis of arthritis. As a consequence, the patient takes care of their back and limits physical activity, which is contrary to current advice on the management of back pain. The pragmatic rules of the reported findings have resulted in promoting inappropriate behaviour and have potentially worsened the patient's disability.

This research identified that when reported changes indicative of degeneration were misinterpreted and the degeneration seen as "abnormal", this often resulted in a poor outcome for these participants; they were left feeling unable to cope, unable to do things and their lives restricted by pain.

5.3. The outcome for the patient: Were they followed up; do they still have symptoms and are they able to cope.

This research found that when the communication of the radiology findings had been effective, those interviewed seemed to understand that the changes described in the radiology report were age related normal changes, that were not specifically treatable, and they were able to cope. However, when there was a breakdown of communication, fear avoidance, as described by (Vlaeyen and Linton 2000), was expressed by almost half of those interviewed.

The majority of participants in this research returned to their GP to discuss the results. They felt positive, feeling reassured by the radiology report and conveyed active coping strategies by remaining active, seeming able to confront their pain (Fritz et al. 2001); motivated to lead as normal life as possible and had a positive attitude towards the outcome. The communication of the radiology findings had been effective and they seemed to understand that the changes described in the radiology report were age related normal findings, that were not specifically treatable and they were able to cope and get on with things. While not all were happy that they had age related wear and tear or degeneration; they were pleased there was nothing significant or dangerous and they could be treated.

However, when there was a breakdown of communication, fear avoidance, as described by (Vlaeyen and Linton 2000), was expressed by almost half of those interviewed. For example, they were unable to do gardening or go for long walks or lift for fear of their pain returning (fear avoidance) and they expressed negative feelings of frustration and disappointment, of being left high and dry.

They all felt that is was something they would have to live with, that there was no treatment and the reason for the pain had not been found, the problem not solved. Some added feelings of withdrawal and embarrassment, and felt unable to work. These individuals seemed to demonstrate the catastrophising traits identified by (Sullivan et al. 1995). As Espeland et al. (2001) suggested patients with back pain are often dissatisfied with the physicians' explanation of their pain as they commonly believe, or hope, that the radiologic examination would identify a reason for their pain or aid the treatment of their condition.
My study has shown that the expectation of the patient is to be imaged and as identified previously (Benedetti 2002), if the patient can be given a firm diagnosis and therapeutic assurance, the outcome is more likely to be positive. The main indication for radiographic evaluation of the lumbar spine is to exclude the occurrence of LBP, specifically caused by malignancy, fracture, infection or spondyloarthropathy. Despite the low prevalence of these specific causes, it has been suggested that the decision by a GP to request radiographic imaging is influenced by psychosocial factors as well as medical reasons (Little et al. 1998). GPs are aware of the guidelines recommending against radiographic imaging for non-specific LBP (Little et al. 1998) and they know that a specific cause for LBP is uncommon, however they also realise that the way consultations are conducted are crucial to recovery (Benedetti 2002). The GP must decide whether to request imaging for their patient and, if the decision is made to make the referral, the clinical problem (clinical history) needs to be identified. A common reason for referral is, "Low back pain, query cause". This is potentially the first stage of a breakdown in communication. The clinical problem is "low back pain", but the clinical question the GP should be asking of the referral is, "is there a specific cause". Both the patient and the GP want to exclude a specific cause for the pain.

Several studies have found that lumbar spine radiography is associated with patient satisfaction. It is not however, associated with improvement in other clinical outcomes, or reduced worry about the cause of back pain (Miller et al. 2002, Kendrick et al. 2001, Kerry et al. 2002). Kendrick et al. (2001) suggested that one reason could be that "radiography encourages or reinforces the patient's belief that they are unwell and this may lead to a greater reporting of pain and greater limitation of activities”. However, the problem, as highlighted in this research, is that patients want to be referred for imaging, primarily to exclude a serious cause for their pain. This may account for the “satisfaction” expressed by participants in this and other studies; patients want the reassurance that can only be confirmed by diagnostic imaging. The clinical question patients’ want answered by the radiographic imaging is, “is there a specific underlying condition which may be the cause of my pain”. For three patients, the diagnostic test (radiographic imaging) did identify a specific cause. Two participants were diagnosed with osteoporosis (osteopenia) (16, 31), one (16) with an osteoporotic/traumatic compression fracture, and were referred for treatment. However, the third participant (34) with the report suggesting that her bones were osteopenic (compatible with age) had not been referred for treatment and as a result was still experiencing pain and felt unable to do things.

This research found that everyone interviewed was still experiencing some degree of pain. However, as suggested by Keefe and Williams (1990), some seemed positive with regard to the outcome and seemed able to cope, whilst the others seemed less positive and less able to cope. It was commonly thought that, for the majority of those with back pain, the prognosis was good (May et al. 2011). The NICE Guidelines (2009) state “Low back pain is a common disorder. Nearly everyone is affected by it at some time. For most people affected by low back pain, substantial pain or disability, is short lived and they soon return to normal activities, regardless of any advice or treatment they receive”. However, Andersson (1999) suggested that as the recurrence rate of low back pain is so high, it could be considered to be part of its natural history and for many, the experience of back pain is persistent or episodic (May et al. 2011).

The current guidelines regarding the diagnosis and treatment of non-specific LBP have not changed substantially compared to those included in old guidelines and scientific literature about a decade ago (Pillastrini et al. 2012). All the guidelines explicitly underline the importance of educating and providing patients with information on LBP with regard to their expected course and the possibility of effective prevention and self-care options. In particular, the importance of remaining active and as far as possible, continuing with normal activities (Pillastrini et al. 2012).

The participants in the study believed that diagnosis, treatment and cure would directly follow on from each other. However, after initially feeling positive, following the referral, a break in the circle of communication left some feeling that their problem was unresolved. For example, one participant, who initially said they felt happy that nothing serious had been found, was, at the time of the interview, still waiting for a facet injection. As he had not yet received the treatment he was expecting, his back pain remained unchanged and as a result he was not working (early retirement) due to back pain and depression. This participant had not gone back to his GP and had received the results from a hospital consultant, who had suggested the facet injection. As he was still waiting for the referral, this suggests a possible a break in the circle of communication; neither the consultant nor his GP have referred him on for treatment.

Another example was a participant, who initially felt happy to have a diagnosis and hoped that treatment would stop the pain, was referred to a physiotherapist, to *"get more active".* Unfortunately, she then broke her arm and has now found exercising difficult due to pain. As a result, she is unable to do things and does not know if she should go back to her GP or to the private physiotherapist. As a consequence, this breakdown of communication has resulted in dissatisfaction with the outcome. The experience of the participants in these two cases corresponds with the study by Corbett et al. (2007). They depict their lives as oscillating between hope and the belief of recovery and despair shaped by pain, limitations and dependence, (Corbett et al. 2007).

Englbrecht et al. (2012) suggested that, quality of life is influenced, not only by the symptoms, but also by a patient's coping strategies to handle these symptoms. Keefe and Williams (1990) suggested, that patients who demonstrate "active" coping strategies to decrease pain, report lower levels of depression and pain, whilst patients who display "passive" coping strategies, relying on "fear avoidance beliefs" or catastrophising behaviours, had higher levels of depression, psychological distress and pain. People may have a mix of patterns of coping and recent studies have questioned whether coping should be regarded as an activity or as an outcome (Englbrecht et al. 2012, McCracken and Eccleston 2003). The problem is that, some individuals are able to cope with chronic pain effectively, are emotionally well adjusted and lead an active and full life, while others cope poorly, are significantly depressed and psychologically distressed and lead very sedentary and restricted lives (Keefe and Williams 1990).

This research has identified that communication is the essential element of the referral process, including the effective feedback of results. A number of the participants did not have their information needs met; their existing beliefs (schema) remained unchanged. They did not feel reassured after receiving the radiology report and this led to a negative effect on pain intensity and ability to function, resulting in a poor outcome. The findings of this research suggested that there were several reasons for this; when a radiology report describes degenerative changes, without suggesting these changes may in fact be normal age related “wear and tear”. When the report does not positively exclude the serious conditions the participant may have actually been worrying about, for example, cancer or infection and when the radiographic findings were not communicated effectively or timely and treatment options not established; any break in the circle of communication.

5.4. Implications for practice

For all radiographic referrals, the communication needs to be improved at every stage of the process including the dissemination of results and follow up treatment

- The reason for referral, the clinical question to be answered, needs to be explicit to avoid ambiguity and misinterpretation by everyone involved, including the patient
- The radiological report needs to answer the clinical question
- The patient must be followed up to ensure that the patient understands the radiological findings and how they may impact on clinical symptoms, and

- Treatment options for those symptoms must be discussed

5.5. Limitations of the Study

The purpose of this research was to explore the referral process from the perspective of the patient. One of the problems with asking the patient what they were told by their GP, is that they are reporting only what they remember or what they thought the GP had told them. This was particularly relevant in this case as it was approximately a year between the radiographic examination and the interview. Broderick et al. (2006) suggested that, recall can be influenced by the time lapsed and that what is remembered is possibly the affect and not the actual experience (Gedney and Logan 2006). However, as the purpose of this research was to explore outcome, it was important to allow for possible resolution of symptoms. In addition, what the GP actually said and what the patient said they said might have been different – if that information could have been collected directly from the GP, the results could have been triangulated (Polit and Hungler 1999) and possibly a more accurate account of what the GP said established. This however would be difficult to achieve without influencing what was said – distorted behaviour (Polit and Hungler 1999). This is beyond the remit of this research, but may be beneficial in future research.

It would have been helpful to include interpretations of the interviews by others in the data analysis process, in order to explore if there were alternative interpretations. However, measures were adopted to mitigate against this limitation. One of the objectives of this research was to explore similarities and differences between the meaning of what was written in the radiographic report and what the patient remembers hearing. Therefore it was important to establish if there was concordance between the radiology report and what the participant said they were told. It was at this point that the two independent researchers were used to explore alternative interpretations and ensure the validity of these findings (as described previously in the section on validity).

It was during this process that one of the independent researchers wrote,

> *"…my initial impression was that the task being asked was impossible because of the different languages being used…I think it is impossible to be sure whether what the patient said is what the report showed. To me this says that there needs to be a drastic change in the way radiographic images are reported in order for them to be meaningful to patients, who will be gaining increasing access to their reports in time to come."*

Low response rate

A total of 204 letters were sent to local GPs, who had requested radiographic imaging for patient(s) with low back pain, asking for their consent for their patient to take part in the study. Less than a third (27%) of the consent forms were returned. Studies have suggested that low response rates can introduce bias into a study (Templeton et al. 1997) as perhaps, only those who have something to say, return their forms (Polit and Hungler 1999). In addition, Groves (2006) suggested that those interested in a subject, or those whose response might influence the survey, are more likely to respond. This possible response bias could have be overcome by gaining verbal as well as written informed consent from all patients who fulfilled the sample parameters (Polit and Hungler 1999), rather than having to request consent from their GP. Groves (2006) however, has identified that a low response rate does not necessarily produce high nonresponsive bias and exclusively focusing on extended efforts to increase the response rate may introduce other forms of bias, since varying follow-up approaches may differentially appeal to participants (Cummings et al. 2001). Also, as this research is mainly based on qualitative data, bias is less likely.

Sample size

Of the forty-two returned consent forms, twenty-three patients were contacted and interviewed. The aim of this research was to gain insight; an understanding of the patient's individual experience, an in depth understanding, rather than the largest sample possible, that is required for quantitative research (Greenhalgh and Taylor 1997). For qualitative research, it is not necessary to have a large sample (Polit and Hungler 1999) as generalisability is not an issue. Fittingness of the data and transferability is more important than representativeness of subjects (LoBiondo-Wood and Haber 2014). Data saturation was achieved; as the questions were very specific and so only a narrow range of possibilities were available.

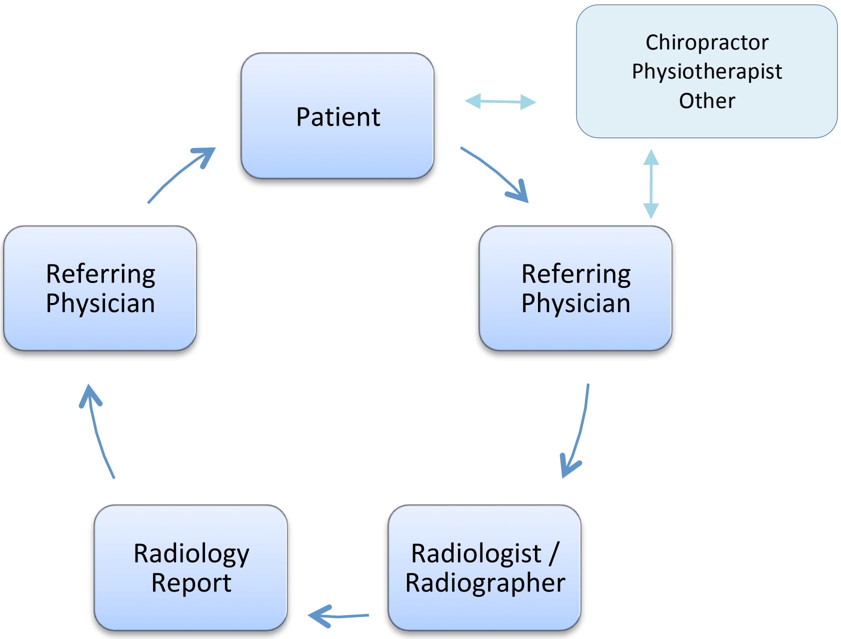
Age and Gender

The ratio of men to women who responded was just over 1:2. Miller et al. (1988) and Battié et al. (2004) have suggested that 97% of all lumbar discs demonstrate some evidence of degeneration, which results in a reduction of intervertebral height. It first appears earlier in men than for women; however, the differences between men and women are not significant in the fourth and fifth decades. As the age range of those interviewed (47-64years) falls within this, the analysis was carried out with men and women combined (van den Bosch et al. 2004).

Chapter 6. Conclusions and Implications

The aim of this research was to explore the perspectives of working age adult patients with non-specific low back pain, referred by their GP for radiographic imaging of their lumbar spine, to establish how their experience affected self-reported symptoms, behaviour and perceived ability to cope.

The purpose was also to investigate the reported process by which radiographic reports are requested and then learnt about. The circle of communication among health care professionals and patients, adapted from Berquist (2009), identifies each stage of the referral process. To minimise the risk of communication errors, all aspects of communication from requesting the appropriate imaging study to the communication of the results have to be both effective and timely.



For any given referral for radiographic imaging, ideally, the first stage of the process is that a patient has visited their physician, looking for an answer to their clinical problem (Berquist 2009). As with other studies (Verbeek et al. 2004, Kerry et al. 2002, Espeland et al. 2001), those interviewed in my research were experiencing low back pain and they wanted to know the reason for the pain. They were looking for reassurance that nothing “sinister” was going and for a diagnosis and treatment. A referral suggested to them that they were being taken seriously, believed and as a consequence, felt satisfied with the care of their doctor. The clinical problem to be investigated, from the patients’ perspective, could therefore be identified as, “Is there a serious underlying condition which may be causing my pain”.

The clinical concern identified by the participants in this research was that they wanted to be reassured that the pain they were experiencing was not as a result of a specific cause and whether, with treatment, their lives could be improved. For the majority, who went back to the GP for the results, the clinical question was not fully answered. It was rare for a radiology report to actively exclude any of the specific causes for LBP and the majority did not put the “findings” into a clinical context by stating they were normal and age related changes, which may or may not account for symptoms. In addition, my study found that patients, and possibly some GPs, misinterpreted the terminology used in the report to describe degenerative changes. Espeland (2007) suggested that GPs might be uncertain of the clinical relevance of radiographic findings described in the radiology report; however this research can only suggest misinterpretation, as it was the patient who was asked what was said. Despite this, the patients did not have their information needs met, contributing further to the breakdown in communication.

It has been shown that diagnostic tests are often requested because of the tensions and conflicts that physicians face as they attempt to meet conflicting role obligations. Most guidelines advise that imaging studies should be reserved for patients with a progressive neurological deficit, or when serious underlying causes are suspected. Diagnostic triage, by means of history and examination, would distinguish the small proportion of the patients with specific underlying conditions or nerve root pain from the vast majority with non-specific low back pain (Airaksinen et al. 2006). As with other studies, my study has also identified that when used without these indications, imaging does not improve clinical outcomes and there is a risk of labelling patients with an anatomical diagnosis, which is not fully understood and may not be the actual cause of symptoms whilst reinforcing existing inappropriate beliefs (schemas).

The last part of the study was to establish how the referral process affected symptoms and ability to cope. This research has shown that communication is a significant feature of the process and for some, good communication resulted in a good outcome. Unfortunately, this research has also identified that for others, a disruption of the continuity of the circle of communication and a breakdown in communication contributed to a poor outcome. Firstly, the referring physician was not always the GP; on several occasions, the referral was made indirectly from a chiropractor or physiotherapist. For one participant, this led to a dispute with regard to the imaging requested and as a result, the report did not answer the clinical question. The outcome for the patient was frustration, possibly inappropriate irradiation, costs in both time and money and no resolution of symptoms.

On several occasions, the radiology report was discussed, either over the telephone or during an appointment *"as part of other things"*. When time is limited, the intended meaning of the report, the terminology, the jargon (pragmatic rules) used by a radiologist, may not have been fully explained. When the phrase "degenerative changes", was misinterpreted or misunderstood, the outcome for an individual was often fear avoidance behaviours and for a few, catastrophising traits were identified. It was also suggested that the misunderstanding or misinterpretation might have been made by the GP. In addition, several participants did not go back to their GP for the results and so there was no opportunity to discuss the report findings within the clinical context, nor treatment options. As Berquist (2009) found in his research, perhaps effective communication could be better achieved if the participants were given the results directly from the radiologist, at the time of the procedure, rather than have to make another appointment with their GP, regardless of the findings.

This research has found that the participants believed that diagnosis, treatment and cure would directly follow on from each other. They described the physical "ups and downs" of back pain and its effect on their capacity to carry on with their daily lives. As identified by other studies, this multi-layered uncertainty can lead to diverse forms of hope ranging from, just hoping that the pain would get better at some point to hope that specific courses of action would lead to a positive outcome. Similarly, different forms of despair were also expressed including, despair and hopelessness that no cure would ever be found and a future with back pain would be inevitable. This research also found, that a greater acceptance of chronic pain was associated with less pain, less disability, less depression and pain-related anxiety, higher daily uptime and better work status; good communication can lead to a good outcome.

There has been a considerable volume of research investigating the many aspects of LBP with the hope of relieving the health and economic burden posed on not only the individual, but on society (Maniadakis and Gray 2000). The full impact of low back pain for an individual is often neglected and it has been shown that those with musculoskeletal pain suffer as much as other long-term disease groups compared with healthy controls; for example, significantly lower income, increased out-of pocket expenses, feeling tired and worried and activity hindrances (Linton 1998). It has been suggested that psychological risk factors play an important role in the development of chronic pain and disability and early identification of these risk factors may lead to more effective management (van Tulder et al. 2001). However, the present study has shown that communication is an important factor and this may affect patients' attitudes and beliefs.

Evidence-based guidelines are an important device for attempting to minimise the consequences of low back pain. However, despite the progress made in the past two decades in developing, updating and adapting guidelines on a national basis, uptake by health-care providers is not optimal (Koes et al. 2010). Therefore, any attempts to elicit a change in beliefs about low back pain and its treatment should target all users of and providers within the health-care system, and should include employers (Waddell and Burton 2005, van Tulder et al. 2006). This inclusive approach would prevent mixed messages from contradicting the positive effects of any campaigns that might otherwise lead to a better-educated patient or worker.

The problem with evidence-based guidelines is that they do not consider the individual and when there is a breakdown of communication, the suffering for an individual can be at a high cost. When it comes to imaging for low back pain, all aspects of communication need to be improved. Radiologists too need to understand the influence they can have on the outcome for an individual and therefore, from referral for imaging to the communication of the final report, needs of the patient should come first.

The conclusions from this research have the following implications for practice:

- All heath professionals, including GPs, Radiographers, Radiologists, Chiropractors, Physiotherapists and Nurses, need to make communication a priority throughout the process of referring people for imaging.
- This should include the reason for the referral, the clinical question to be answered, being explicit and understood by all parties, including the patient.
- The report needs to answer the clinical question.
- The referrer has a responsibility to ensure the effective communication of the findings to the patient; therefore the person communicating these findings should be familiar with what the results mean and understand the implications and treatment options available for the patient
- This is likely to enable the expectation which each party has of the role that the imaging will play in the trajectory of their back pain and its management to be clear.

Suggestions for Future Research

- Qualitative research exploring the congruence between what GPs believe they have said and what patients perceive them to have said would be beneficial.
- There is a need for further research exploring the effectiveness of the radiographic report in answering the clinical question. This might include the perspectives of radiographers, medical staff and service users.
- Longitudinal research following up of patients after diagnostic tests is recommended to address the question of whether tests affect clinical outcomes.

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Appendix 1. Search Terms

1. Patients who have radiographic imaging are more satisfied but report worse pain and disability.

Patient Patients People Clients	Radiographic imaging X-ray X-rays Radiograph	Satisfaction Satisfied

2. Information transmitted and interpreted can influence outcome.

Information Communication Discussion	Research Study Studies	Outcome

3. The radiology report: a description of radiological findings.

Radiology X-ray Radiograph	Report	

4. Psychological factors have been shown to be predictors of disability

Psychological factors Fear avoidance Catastrophising	Disability Ability	

Appendix 2 – Letter to GP

Dr, name
Address

Date

Dear
RE: Study 'How people interpret information about their back x-rays'
We are conducting this study which has received Dorset Research Ethics Committee approval and would like to undertake a short telephone interview with your patient who has recently been referred for a lumber spine x-ray.

Name/Date of Birth (DOB)/Address

This study builds on an earlier project looking at the 'content' of x-ray reports and the sorts of words used and information included. We know that patients with medium term back pain want x-rays and are more satisfied when they have them but we hypothesise that words such as 'degenerative arthritis' in the reports might be misinterpreted and lead to negative outcomes. In order to study this further we would like to ask patients some questions in a telephone interview. These will examine; why they had an x-ray; what they remember being told about their x-ray; and what they now think about their back. All information will be confidential and data will be made anonymous before analysis.

If you are happy for your patient to participate please: (A) photocopy the enclosed letter inviting them to participate onto your headed notepaper and; (B) send it in the pre-paid envelope with the patient information sheet, consent form and SAE.

If you are not happy for this patient to be sent the invitation and information, please (C) return this letter in the SAE with any comments. I appreciate your time in reading this and thank you provisionally for your support.

Yours sincerely

Comments

Appendix 3 – Letter to patient

Patient name

Address

Date

Dear Patient name

Re: Study – 'How people interpret information about their back x-rays'.

I am writing to invite you to take part in a scientific study about back x-rays. You have been chosen because you have had an x-ray of your spine taken within the last year.

The study is being carried out by Sarah Gallimore on behalf of Professor Paul Thompson and Dr Eloise Carr of Bournemouth University and has been approved by the Dorset Research Ethics Committee and the Research Governance Committee at Poole Hospital.

Please find enclosed an information document, consent form and stamped addressed envelope. Please read the information carefully.

If you are happy to take part in the study please sign one of the consent forms (the second one is for you to keep) and fill in the contact telephone number and best time of day to contact you and return it in the stamped address envelop to Sarah Gallimore.

If you wish to have more information, please contact Professor Thompson or Dr Carr at the addresses shown on the information document. Please do not contact the Surgery.

If you do not wish to take part you do not need to do anything and you will not be contacted again.

I do hope you are able to help in this important work.

Yours sincerely

Dr GP Name

Appendix 4 - Information sheet 1

How people interpret information about their back x-rays

Part 1.

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Talk to others about the study if you wish.

Part 1 tells you the purpose of this study and what will happen to you if you take part.

Part 2 gives you more detailed information about the conduct of the study.

Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the study?

Back pain is a common problem and many people visit their GP's each year. Usually the back pain disappears after a few weeks but sometimes it becomes persistent. Normally the pain will go away with simple painkillers and gentle activity, after about 4-6 weeks. Unfortunately for some, the pain and discomfort continues and a GP may arrange for the patient to have an x-ray of their back. We are interested in asking patients, who have had an x-ray, what they remember being told about the x-ray and whether this information has made a difference to how they think about their back pain.

Why have I been chosen?

Your name has been identified because your GP referred you for a back x-ray. Your GP, who made the referral, was sent a letter about the study from the radiology department. He/she was happy for you to receive information about the study they sent the envelope enclosed to you. We are hoping to invite 120 patients who have been referred for a back x-ray in the past month, aged 18-65. There is an upper limit of 65 years because we are concentrating on people of normal working age.

Do I have to take part?

Not at all. It is entirely up to you to decide whether or not to take part. If you do, please keep this information sheet and sign a consent form. On the consent form we would like you to leave your contact telephone number and return both these pieces of paper in the s.a.e. provided. You are free to withdraw at any time and without giving a reason. Should you decide to do so then we would not use any of the data provided. A decision to withdraw at any time, or a decision not to take part, will not affect the standard of care you receive.

What will happen to me if I take part?

As soon as we have received your signed consent form and contact telephone number we will call you to make a time to conduct the telephone questionnaire. The researcher will call you at the agreed time and ask you some questions about your back pain and also the x-ray result. Questions such as 'what do you remember being told about the x-ray' and 'what do you now think about your back and what is wrong' as well as some general questions about your back and how you might respond to the pain. The telephone questionnaire should take between 15 – 20 minutes. We would like to tape the telephone call as it allows the researcher to concentrate better and provides us with an accurate record. Everything you tell us is confidential. None of the comments you make can be identified to your name as when you consent to be involved in the study we will allocate you a unique number.

Expenses and payments*:*

Unfortunately we do not have the financial resources to pay you for taking part in the study. We will of course telephone you to ensure you do not incur telephone costs.

What do I have to do?

By agreeing to take part in the study we expect that you will be available, at a convenient time to you, to take part in the telephone questionnaire survey. The researcher will telephone you briefly to arrange a time to complete the questionnaire survey. He/she will then ring back and ask you a series of questions about your back and the x-ray. This should take between 15-20 minutes.

What are the other possible disadvantages and risks of taking part?

We do not foresee any disadvantages or risks with taking part in this study.

What are the possible benefits of taking part?

Participation in the study will not directly benefit you but the information we get might help improve the treatment of people with back pain who have an x-ray.

What happens when the research study stops?

The study will stop when we have 120 patients who have participated in the telephone questionnaire survey.

What if there is a problem?

Any complaint about the way you have been dealt with during the study or any possible harm you might suffer will be addressed. The detailed information on this is given in Part 2.'

Will my taking part in the study be kept confidential?

Yes. All the information about your participation in this study will be kept confidential. The details are included in Part 2.'

Appendix 4 - Information sheet 2

How people interpret information about their back x-rays

Part 2

What will happen if I don't want to carry on with the study?

You are under no obligation to continue participating in the study should you change your mind. You are free to withdraw at any time and without giving a reason. Should you decide to do so then we would not use any of the data provided. A decision to withdraw at any time, or a decision not to take part, will not affect the standard of care you receive.

What if there is a problem?

If for any reason you are unhappy about the way you have been treated in this study you should contact Eloise Carr (telephone 01202 962163). If you remain unhappy and wish to complain formally, you can do this through the NHS Complaints Procedure.

Will my taking part in this study be kept confidential?

All information which is collected about you during the course of the research will be kept strictly confidential. If you consent to participate in the study we will assign you a special number to you. This means that our data collection records do not contain personal data with your name and address. Instead you will be, for example, 'participant 31'. The overall data sheet with your name and telephone number will be kept in a locked filing cabinet accessible only by the researcher. The data will be stored on a password protected Bournemouth University computer. After the study all the data will be stored for 5 years and then destroyed. Occasionally, Bournemouth University or Poole Hospital Research Departments may need to review our files and the conduct of the study for the purposes of monitoring the quality. They would of course keep all information confidential. The procedures we have used for handling, processing, storing and destroying your data are compliant with the Data Protection Act 1998.

Involvement of the General Practitioner/Family doctor (GP)

Your GP referred you for a back X-ray. We then sent him/her a letter explaining our study and asking permission for them to send to you our letter and information about the study.

What will happen to the results of the research study?

When the study is finished we would like to publish it in journals and present the findings at conferences. You will not be identifiable, even if we use quotes, as we would use the unique number assigned to you. We are more than happy to send you a summary of the findings when the study is complete (we will ask you if you would like this when we conduct the telephone questionnaire).

Who is organising and funding the research?

The research is being undertaken by Professor Paul Thompson (Poole Hospital, who are sponsoring the study) and Dr Eloise Carr (Institute of Health & Community Studies, Bournemouth University).

Who has reviewed the study?

This study has been reviewed by the Research Committee at the Institute of Health & Community Studies. It was also given a favourable ethical opinion for conduct in the NHS by the Dorset Research Ethics Committee (Poole Hospital NHS Trust).

Thank you very much for taking the time to read this information sheet and considering whether or not to take part in this study.

Appendix 5 – Consent Form

CONSENT FORM

Title of Project: How people interpret information about their back x-rays

Name of Researcher: Professor Paul Thompson/ Dr Eloise Carr

Please initial box

1. I confirm that I have read and understand the information sheet dated 10/10/2006 (version 2) for the above study. I have had the opportunity to consider the Information supplied in the patient information documents. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. ☐
3. I understand that relevant sections of any of my medical notes and data collected during the study, may be looked at by responsible individuals from regulatory authorities or from the NHS Trust, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records. ☐
4. I agree to my GP being informed of my participation in the study. ☐
5. I agree to take part in the above study. ☐

________________________	________________	____________________
Name of Patient	Date	Signature
________________________	________________	____________________
Researcher	Date	Signature

When completed, 1 for patient; 1 for researcher site file; 1 (original) to be kept in medical notes

My telephone number is:
The best time of day to contact me is:

Appendix 6 - Interview Guide

Semi-Structured Interview

a) Demographic data
Age
Employment (job) – Do you work?
Related to your back problems?
Education
Sex

b) Reason for x-ray
Did anyone suggest you should have an x-ray? Who?
Did you suggest that you wanted an x-ray?
When were you told that you were to have an x-ray?
Have you had a previous back x-ray?
Were you reassured that you were to have an x-ray?
Where did you have your x-ray?

c) Receiving the report of your x-ray
Who told you the result of your x-ray?
How were you told about the result of your x-ray?
Were you told about any degeneration or changes found on the x-ray of your back?
What were you told?
What did this mean to you?
Were you shown the x-ray?
How did you feel?
When you left the consultation how did you feel?

d) Currently
Have you pain now?
How painful is it that you normally have to live with?
Is your back pain better? How does your back pain affect your life now?
Are you managing to do any work at the moment?

Appendix 7 - Demographics of Participants

Participant	Study Number	Gender	Age	Employment status	Communication of report findings	Radiology report outcome
1	10	Male	63	Early retirement - partly due to back pain	Face-to-face GP - not a follow up appointment specifically for the results	Normal Degenerative changes
2	11	Female	64	Retired	Face-to-face GP - Appointment made specifically for the results	Normal Degenerative changes
3	12	Female	59	Working	Face-to-face / Telephone GP - not a follow up appointment specifically for the results	Normal Degenerative changes
4	13	Female	55	Working	Face-to-face GP - Appointment made specifically for the results	Normal Degenerative changes
5	14	Female	54	Working	Face-to-face GP - not a follow up appointment specifically for the results	Normal Degenerative changes
6	15	Female	47	Working	Face-to-face GP - Appointment made specifically for the results	Normal Degenerative changes
7	16	Female	59	Working	Face-to-face GP - Appointment made specifically for the results	Osteoporosis Compression fracture
8	17	Female	55	Not working - due to back pain	Face-to-face Consultant at the hospital	Previous surgery - no complication Normal
9	18	Female	57	Working	Face-to-face GP - Appointment made specifically for the results	Normal Degenerative changes
10	19	Male	50	Working	Face-to-face GP - not a follow up appointment specifically for the results	Normal Degenerative changes
11	20	Male	50	Early retirement - ill health (back pain)	Face-to-face Consultant at the hospital	Advanced Degenerative changes
12	21	Female	64	Retired	Face-to-face GP - Appointment made specifically for the results	Normal Degenerative Changes
13	31	Female	60	Retired	Telephone consultation GP	Osteoporosis Degenerative changes
14	32	Female	54	Working	Telephone consultation GP	Normal Degenerative changes
15	33	Female	60	Working	Face-to-face GP - Appointment made specifically for the results	Normal Degenerative changes
16	34	Female	65	Working	Face-to-face Consultant at the hospital	Normal Degenerative changes
17	100	Male	52	Working	Face-to-face GP - Appointment made specifically for the results	Normal Degenerative changes
18	101	Female	51	Housewife	Face-to-face GP - Appointment made specifically for the results	Normal Degenerative changes

19	102	Female	51	Working	Face-to-face GP - possibly not a follow up specifically for the results	Normal Degenerative changes
20	103	Female	61	Not working	Face-to-face GP - Appointment made specifically for the results	Normal Degenerative changes
21	104	Male	58	Not working	Telephone consultation GP	Normal Degenerative changes
22	105	Male	61	Part-time Consultancy / Retired	Face-to-face / Telephone GP - Appointment made	Normal Degenerative changes
23	106	Male	60	Early retirement - ill health (knee and back)	Face-to-face Consultant at the hospital	Previous surgery - no complication Normal

Appendix 8

Concordance between report and participant

Study number	What told	Report	Researcher	Independent Researcher 1	Independent Researcher 2
10	Some changes to the back relating to wear and tear	Normal Degenerative changes	Yes	Yes	Match
11	A degenerative problem rather than anything that could be cured by anything magic. Disc narrowing – 'stuff' that comes with degeneration, my age	Normal Degenerative changes	Yes	Yes	Match
12	Some degeneration in the spine and hips and things	Degenerative changes - marked degenerative change lower facet jnts	Yes	Yes, to a degree	Match
13	The x-ray showed the problem - an injury to the right hand side, 'archway' bit Actual signs of injury, without knowing it you've probably injured your back those years ago and now arthritis has set in a bit of arthritis, the other side probably because you are not walking properly from the problems on the right hand side	Degenerative changes - significant OA of sacroiliac joint	~	Yes, to a degree	Mis-match
14	I have osteodema, not full blown osteopercia; this is the early staged one, the mild one	Normal Degenerative changes	No	Very slightly	Mis-match
15	You've got arthritis in your hips and your back is crumbling. Not much could be done except hip replacements	Normal Degenerative changes (Moderately severe joint space narrowing, left hip)	No	No	Partial match. Hip arthritis accurate but back not crumbling
16	Spinal fracture. Some compression. Osteoporosis	Degenerative changes Compression fracture	~	Very slightly	Mis-match
17	Mainly the hip areas Slightly bigger gap around my left hip, but no bone degeneration	Previous surgery No complication Normal (Normal pelvis/hips)	No	No, not at all	Mis-match

18	Hip was not worn out, something around the joint not right. Something in my back I was walking funny, that was causing my hip - 2 problems	Normal Degenerative changes (Normal pelvis/hips)	No	No	Mis-match
19	Some slight degeneration, from a repetitive movement	Normal Degenerative changes	Yes	Not very much	Match
20	Nothing dangerous. It was the facet joints. At the base of spine, it is slightly out, the discs	Advanced Degenerative changes	~	Slightly	
21	Degeneration, equal to my age probably.Some degeneration L5 and next one down were slightly slipped	Normal Degenerative changes	Yes	Yes	
31	Nothing broken, it would right itself Due to osteoporosis	Osteoporosis Degenerative changes	Yes	Slightly	
32	Major problem – osteoporosis	Normal Degenerative changes	~	No	
33	Osteoarthritis 4th and 5th facet joints – aggravated by accident	Normal Degenerative changes	Yes	Yes	
34	Degeneration of the spine. Slight curvature	Scoliosis Normal Degenerative changes	Yes	More or less	
100	Nothing really wrong, it was a 50 odd year old back	Normal Degenerative changes	Yes		
101	Normal aging degeneration, nothing significant	Normal Degenerative changes	Yes		
102	X-ray wasn't desperately conclusive	Normal Degenerative changes	~/ Yes		
103	I know it's not going to get better, you have got to live with it	Normal Degenerative changes	Yes		
104	I don't remember	Normal Degenerative changes	~		
105	Polio, mascular and muscular degeneration. Osteoporosis	Normal Degenerative changes	No		
106	They couldn't find nothing wrong	Previous surgery No complication Normal	Yes		

Appendix 9 - Interview Transcript (example)

Patient 12

Demographic data

Age
59

Employment (job)
Shop assistant

Are you currently working?
Yes – off sick at the moment, not due to back – caught this bug

Did you have time off for your back pain?
No, usually manage. Keep going

Education
15

Sex
Female

Reason for x-ray

Did anyone suggest you should have an x-ray? *Who?*
GP

Did you suggest that you wanted an x-ray?
No, had anterior/posterior repair. I thought back ache would get easier afterwards, but it didn't, in fact it was as bad if not worse

When were you told that you were to have an x-ray?
She (GP) suggested I go for an x-ray, just to have a look

Were you reassured that you were to have an x-ray?
Yes

Where did you have your x-ray?
Hospital

Receiving the report of your x-ray

Who told you the result of your x-ray?
GP

How were you told about the result of your x-ray (face to face, telephone, not told, other)?
Can't remember whether I just spoke to them on the phone or whether I was there for something. No appointment made specifically for results.

Were you told about any degeneration or changes found on the x-ray of your back?

Yes, some degeneration in the spine and hips and things

What were you told?
Some degeneration, that's all

What did this mean to you?
Well I thought I either had a touch of arthritis or something or a touch of that 'osteoporasis' or something like that.

How did you feel?
That's life, getting older.
Mother had bad arthritis and towards the latter years realised she had 'osteoporasis' as well
I figured – such is life

Were you shown the x-ray?
No

When you left the consultation how did you feel?
Well that is life. Just do what I can and swallow the painkillers.
When it gets really bad I use a massage pad at home, when I get the opportunity and that helps quite considerably

Currently
Have you pain now?
No – not been doing very much

Is your back pain better?
(If yes) How does your back pain affect your life now?
No – depending what I am doing to the degree of pain. During the day at work I get considerable more pain. If I am at home I tailor my time to sort myself out

Are you working?
Sick leave

Appendix 10 - Examples of codes

1. The radiographic referral process: Why are patients referred for radiographic imaging

Experiencing pain – increasing, recurring, not resolving, referred

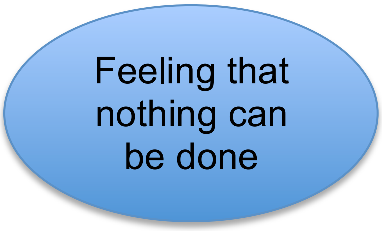
How did the referral make them feel?

Relieved – something is going to be done, being taken seriously, resolution

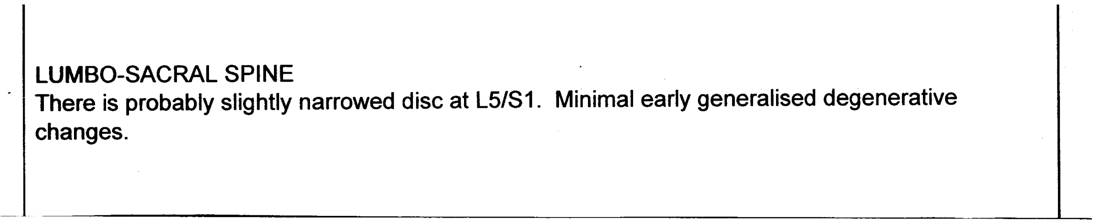
2. The communication of the results: how did this make them feel?

Pleased
Happy
Good
Satisfied

Withdrawn
Despondent
That's life
Shock



Appendix 11 - Example of a normal radiology report



LUMBO-SACRAL SPINE
There is probably slightly narrowed disc at L5/S1. Minimal early generalised degenerative changes.

Appendix 12a

RESERCH PROTOCOL FOR DORSET RESEARCH ETHICS COMMITTEE.
Ref: 06/Q22101/128

How people interpret information about their back x-rays.

Researchers

Paul Thompson MD FRCP
Consultant Rheumatologist
Poole Hospital NHS Trust.
Poole
Dorset BH15 2JB.

Eloise Carr BSc RGN PGCEA RNT MSc PhD
Reader
Institute of Health and Community Studies
Royal London House
Bournemouth University.
Dorset BH1 3LT.

Background

"Think about the things we tell patients with ordinary backache. Take the example of normal, age related changes on lumbar spine x-rays "You have wear and tear in your spine" or even worse, "degenerative disc disease". To patients, this means serious deterioration; it is irreversible, and will get even worse as they get older. If I'm like this now what will I be like in 10 years? Will I end up in a wheelchair? It is no use saying: "But it is nothing to worry about!" The damage has been done. We have labelled them with a disease that will make them ill". [1]

Post-mortem studies have demonstrated morphological changes in lumbar spine segments are more common in men, found more frequently in the lower lumbar segments and are positively correlated with age [2]. These morphological changes can be detected on lumbar spine x-rays and MRI scans and are frequently summarized as degenerative changes. Degenerative appearances on x-rays correlate with pathological changes seen at autopsy [3] and increase in prevalence with age, in one study rising from 20% under 35 years to 71% in 65 to 74 age group [4].

A systematic review of published observational studies showed that degeneration defined by the presence of disc space narrowing, osteophytes and sclerosis was only weakly associated with back pain while spondylosis was not. Nor was there a relationship between the reported severity of the degeneration and symptoms [5]. The authors concluded that, 'There is not firm evidence for the presence or absence of a causal relationship between radiographic findings and nonspecific back pain'.

National guidelines advise that routine lumbar spine x-rays are avoided for simple low back pain [6], yet patients with back pain want x-rays even though they rarely pick up serious pathology and expose people to radiation [7]. Most GPs order x-rays to reassure their patients. Patients who have spine x-rays are more satisfied with their treatment than patients who do not have x-rays but report more pain, lower overall health status, no difference in disability and consult their doctor more frequently [8].

Clinical studies suggest that an excessively negative orientation toward pain (pain catastrophizing) and fear of movement/(re)injury are important in the etiology of chronic low back pain and associated disability [10]. These findings are consistent with a cognitive-behavioral perspective that underscores the importance of maladaptive interpretations of bodily sensations. Could it be that the way in which x-ray reports are communicated has an effect on the outcome of an episode of back pain, particularly in those individuals who tend to 'catastrophize'?

In a formal content analysis of 120 GP requested lumbar spine x-ray reports [9] we found that 89 (74%) contained at least one phrase containing words that indicated the presence of degenerative changes and it was rare for a radiologist to comment that the changes were normal for age. The information is open to misinterpretation as to the cause of the back pain with potential negative consequences for the patient.

Aims

The purpose of this study is to determine why people have lumbar spine x-rays, how they receive the information about their x-ray, how they interpret that information, weather they tend to catasrophize and how these factors might influence symptoms.

Methods

We will identify a sample of 120 men and women between 18 and 65 years who have had a lumbar spine X-ray, following a referral by their GP, at the radiology department at Poole Hospital. A letter will then be sent to their GP explaining the purpose of the study. We will not be contacting patients directly.

Provided the GP is happy for the patient to be approached, details of the study will be posted by the GP in a pre-paid envelope using a emplate letter provided by us. The posting to the patient will include a letter of invitation, a patient information leaflet and consent form. The patient will be asked to sign and return the consent form to us and supply a contact telephone number and a time when they could be contacted. A pre-paid envelope will be included for this. Patients who the GP did not want to approach and those who do not reply will not be contacted further. For them the only information that will be recorded is their age, sex and reason for x-ray taken from the GP request form. These data will be anonymised and used to assess any selection bias.

Patients who return the signed consent form will be contacted by telephone and a semi-structured questionnaire style interview will be undertaken by a trained interviewer. To limit interviewer error and expedite the data collection pre-coded answers to 'closed' questions will be entered the programme Access in Microsoft's 'Excel' database programme. Responses to open-ended questions will be typed in verbatim. An estimate of the tendency to 'castrophizing' will be made using Sullivan's scale [11].

Quantitative and qualitative analysis will be undertaken to assess the demographics of the sample, reasons for referral for x-ray, by whom and how the x-ray information was relayed to the patient, how the patients' interpreted that information, how the patient reacted to the interpretation and any relationship to back pain outcome

The results will be written up for publication in a peer reviewed journal. A short report will be distributed to the Clinical Director of Radiology, participating GPs and the Research Governance Committee at Poole Hospital.

Duration

12 months

Start date

1st January 2007

Costs

There will be no costs to Poole Hospital NHS Trust other than printing out 120 x-ray reports. Costs of printing, stationary and postage will be covered by the Rheumatology Research Fund. We have applied to BackCare (registred charity: 256751) for a grant to cover the costs of the study. This proposal was short-listed for funding in January 2006. Feedback indicated a favorable review subject to Research Ethics Committee approval. The funding available would be £9,600 to employ a researcher to collect and analyse the data.

References

1. Waddell. G. The Back Pain Revolution. Churchill Livingstone. London. Second Edition. 2004. Page 235.
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9. Fritz JM, George SZ, Delitto A. *Pain* 2001;94:7–15.
10. Carr EC, Thompson P. A content analysis of lumbar spine x-ray reports. 2005. Poster presented at the 11th World Congress on Pain. Sydney. Abstract 1677.

22nd August 2006
Version 1.

Appendix 12b

Dorset Research Ethics Committee (REC)
Poole Hospital NHS Trust
D Block [Eddie Hawker Wing], Room 20
Longfleet Road
Poole, Dorset
BH15 2JB

Tel: 01202 442 737
Fax: 01202 442 954

02 November 2006

Dr Paul Thompson
Consultant Rheumatologist
Poole Hospital NHS Trust
Rheumatology Department
Longfleet Road,
Poole BH15 2JB

Dear Dr Thompson

Full title of study: **How people who have GP ordered lumbar spine X-rays receive and interpret information about their X-ray and how their interpretation might influence symptoms.**

REC reference number: **06/Q2201/128**

Thank you for your letter of 10 October 2006, responding to the Committee's request for further information on the above research.

The further information was considered at the meeting of the Committee held on 26 October 2006. A list of the members who were present at the meeting is attached.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation.

Ethical review of research sites

The Committee has designated this study as exempt from site-specific assessment (SSA. There is no requirement for [other] Local Research Ethics Committees to be informed or for site-specific assessment to be carried out at each site.

Conditions of approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Application	5.1	22 August 2006
Investigator CV		
Protocol	1	28 August 2006
Covering Letter		22 August 2006
Questionnaire: Sullivan Scale		
GP/Consultant Information Sheets	2	10 October 2006
GP/Consultant Information Sheets	1	28 August 2006
Participant Information Sheet: Part 2	1	28 August 2006
Participant Information Sheet: Part 1	2	10 October 2006
Participant Consent Form	1	28 August 2006
Topic Guide for the telephone questionnaire	2	10 October 2006

Research governance approval

You should arrange for the R&D department at all relevant NHS care organisations to be notified that the research will be taking place, and provide a copy of the REC application, the protocol and this letter.

All researchers and research collaborators who will be participating in the research must obtain final research governance approval before commencing any research procedures. Where a substantive contract is not held with the care organisation, it may be necessary for an honorary contract to be issued before approval for the research can be given.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

06/Q2201/128	**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project

Yours sincerely

Ms Stephanie Wheeler
Chair

Email: caroline.hemsley@poole.nhs.uk

Enclosures: *List of names and professions of members who were present at the meeting and those who submitted written comments*

Standard approval conditions

Copy to:
Mrs Mary Burrows
R & D Department
Poole Hospital NHS Trust
Longfleet Road
Poole.

Appendix 12c

SL31 Minor amendment to non-CTIMP
Version 3, June 2005

National Research Ethics Service
Dorset Research Ethics Committee (REC)
Poole Hospital NHS Trust
D Block [Eddie Hawker Wing], Room 20
Longfleet Road
Poole, Dorset
BH15 2JB

Tel: 01202 442 737
Fax: 01202 442 954
Email: caroline.hemsley@poole.nhs.uk

01 October 2007-10-01

Dr Eloise Carr
Bournemouth University
School of Health & Social Care
Bournemouth University
Royal London House
Christchurch Road
Bournemouth BH1 3LT

Dear Dr Carr

Study title: **How people interpret information about their back x-rays**
REC reference: **06/Q2201/128**

Thank you for your letter of 12 September 2007, notifying the Committee of the above amendment.

The Committee does not consider this to be a "substantial amendment" as defined in the Standard Operating Procedures for Research Ethics Committees. The amendment does not therefore require ethical review by the Committee and may be implemented immediately, provided that it does not affect the research governance approval for the research given by the R&D Department for the relevant NHS care organisation.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

06/Q2201/128	**Please quote this number on all correspondence**

Yours sincerely

Margaret Younger
Asst. Committee Co-ordinator

E-mail: Margaret.younger@poole.nhs.uk

Copy to: Professor Paul Thompson