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**ANALYSIS OF THE INFLUENCE ON THE
COST AND INTERNATIONAL
COMPARISON OF THE NEW LOW BACK
PAIN GUIDELINE IN ESTONIA.**

Master's Thesis

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**ALASELJAVALU UUE RAVIJUHISE
KULUDE MÕJU ANALÜÜS JA
RAHVUSVAHELINE VÕRDLUS.**

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Author's declaration of originality

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

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Abstract

Background: Low back pain has been described to be a symptom rather than a disease which like many other symptoms can have a lot of causes that are a common health problem in both developed and developing countries. With the new clinical guideline for low back pain in Estonia, there is a need to find out what changes it brings. *Aim:* The aim of this thesis is to compare the clinical guidelines of Estonia, USA, and the United Kingdom and to analyse the implications of the new clinical guideline for diagnosis and treatments of low back pain in Estonia. *Methods:* A literature review comparing the clinical guideline for LBP in Estonia with three other countries, a retrospective registry-based cohort study, and semi-structured interviews were used in this study. Data from the Estonian Health Insurance Fund for 2011–2019 of patients diagnosed with low back pain was used to calculate the direct cost of LBP in Estonia. *Results:* Estonian clinical guidelines had similar recommendations with the other guideline as to their diagnostic and treatment methods but different in the use of imaging and referrals to specialists. There was a total of 736,370 low back pain patients from 2011 to 2019 that consisted of 59% females and 41% males with the largest age group between 40 and 69. The total cost of low back pain was 27.4 million euros which took 0.5% of the healthcare services budget of EHIF with the cost for consultation having the most impact and physiotherapy being the least. This cost comprised of 80% from indirect costs and the remaining 20% from the direct medical cost. There was also a 21% cost savings when a cost comparison was done. Interviews with physicians showed frequent use of imaging among family doctors and emergency room physicians. *Conclusions:* The new clinical practice guideline in Estonia is a supportive tool that will improve and standardize practice but some aspects have to be considered such as regular monitoring of the use of imaging for patients.

This thesis is written in English and is 58 pages long, including 5 chapters, 9 figures, and 10 tables.

Annotatsioon

Alaseljavalu uue ravijuhise kulude mõju analüüs ja rahvusvaheline võrdlus.

Taust: alaseljavalu on kirjeldatud pigem sümptomina kui haigusena, millel nagu paljudel teistelgi sümptomitel võib olla palju põhjuseid, mis on nii arenenud riikides kui ka arengumaades tavaline terviseprobleem. Uue Eesti alaseljavalu kliiniliste juhistega on vaja välja selgitada, milliseid muutusi see endaga kaasa toob. *Eesmärk:* Käesoleva lõputöö eesmärk on võrrelda Eesti, USA ja UK alaseljavalu ravijuhiseid ning analüüsida uue ravijuhise mõju alaseljavalu diagnoosimisele ja ravile Eestis. *Meetodid:* Selles uuringus kasutati kirjanduse ülevaadet, milles võrreldi LBP kliinilisi juhiseid Eestis kolme teise riigiga, retrospektiivset registripõhist kohordi uuringut ja poolstruktureeritud intervjuusid. LBP otsese maksumuse arvutamiseks Eestis kasutati alaseljavaluga diagnoositud patsientide andmeid Eesti Haigekassa aastatest 2011–2019. *Tulemused:* Eesti alaseljavalu ravijuhises olid reeglina sarnased soovitusel teiste juhenditega, kuid teatud erisused spetsialistidele suunamise ning diagnostiliste uuringute (visualiseerimise osas). Aastail 2011–2019 oli alaseljavaluga patsiente kokku 736 370, 59% naisi ja 41% mehi, kelle vanuserühm oli suurim vahemikus 40–69. Alaseljavalu kogukulud olid 27,4 miljonit eurot, mis moodustas 0,5% haigekassa tervishoiuteenuste eelarvest. Suurim kulude osakaal olid konsultatsioonikulud ja kõige vähiksem füsioteraapial. Need kulud moodustasid 80% kuludest ja ülejäänud 20% otsestest ravikuludest. Uute ravijuhiste rakendumisel tekkis arvutuslikult 21% -line kulude kokkuvõtte. Intervjuudes arstidega selgus, et kliinilises praktikas kasutatakse visualiseerivaid uuringuid enam kui ravijuhis soovitab. *Kokkuvõte:* Eesti uus alaseljavalude ravijuhis on üldiselt teiste maade ravijuhistega kooskõlas ning peaks tooma olulise rahalise kokkuhoiu, eeskätt vähenenud visualiseerimisuuringute arvel.

Lõputöö on kirjutatud inglise keeles ning sisaldab teksti 58 leheküljel, 5 peatükki, 9 joonist, 10 tabelit.

List of abbreviations and terms

CT Scan	Computerized Tomography
DALYs	Disability-adjusted Life Years
EHIF	Estonian Health Insurance Fund
ICD-10	International Classification of Disease 10 th Revision
LBP	Low Back Pain
MRI	Magnetic Resonance Imaging
NHS	National Health Services
NSAIDs	Non-steroidal Anti-inflammatory Drugs
WHO	World Health Organisation

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1 Introduction

This chapter gives an overview of low back pain (LBP) with details about its impact in the economy thereby giving the reasoning behind the choice of topic and its relevance.

1.1 Overview of LBP

LBP has been described to be a symptom rather than a disease which like many other symptoms can be caused by different factors [1]. It is a common health problem in both developed and developing countries with about 80-85% of people experiencing it during their lifetime which makes LBP the most important and common cause for short and long term disability [2]. The term ‘low back pain’ (LBP) can be described as pain at the lower back which is known as the lumbar region for certain duration. It is most times described as muscle tension, pain or stiffness restricted to below the costal margin and above the gluteal folds. Some of the risk factors of low back pain are age, fitness level, occupational factors, weight gain, pregnancy, and genetics [3].

1.1.1 Acute LBP

Acute low back pain (LBP) is mostly defined based on the duration of the pain which is up to six weeks. It is reported to be among the top five most common complaints that physicians encounter and sums up to more patients treated by family physicians than any specialist. As common as acute low back pain is, the specific cause most times is unknown, it is self-limiting and patients recover within a few weeks [4].

1.1.2 Sub-acute LBP

Sub-acute LBP persists for six weeks to twelve weeks. This stage is considered as an intervention window by research that found out that 78% of previously examined sub-acute patients had frequent pain and disability after six months and 72% after one year. The diagnosis and treatment process is similar to that of acute pain [5].

1.1.3 Chronic LBP

This is referred to as pain that has lasted for more than twelve weeks. Although the most common type of low back pain is the acute pain that lasts up to three months with frequent recurrent episodes, chronic low back pain tends to be more severe that can lead to disabilities which are both physical and psychological. There are the specific and non-specific causes of this pain which can range from trauma from an accident, infection or inflammatory disorder, osteoporosis with fractures to non-specific chronic LBP. Non-specific LBP pain has been seen to cause a major challenge in diagnosis and treatment which this research will focus on [6].

1.2 Global burden

The global burden of LBP from the work environment in 2010 was estimated at 21.8 million disability-adjusted life years (DALYs) with 38% being females and the remaining 62% as male [7]. 1 year incidence of people with low back for the first time is between 6.3% and 15.4% while 1 year episode for both first time and recurrent ranged from 1.5% to 36%. Recurrence within 1 year is between 24% and 80% [8]. The point prevalence is 11.9% with a 1-month prevalence estimate of 23.2% [9]. There have been different findings as regards prevalence, some relating it to age, gender, income earners, and economic effects. Results from Hoy, et al 2012 stated that LBP is more prevalent in females than males. The age-range 40 to 80 years had an estimated point prevalence of 11.9 for low back pain persisting for more one day and 23.2 for a one-month prevalence [9]. Another study estimated global mean point prevalence to be 18.3% and a one-month prevalence of 30.8% [1]. Also, the study confirms that LBP was more common in females than males between ages 40-69 in high-income countries but with no significant difference between rural and urban areas [1]. The top risk factors of LBP related to lifestyle were smoking, obesity and depressive symptoms [10], [11], [12]. Top risk factors related to the work environment were lifting heavy loads and number of lifts [13].

1.3 Cost of low back pain

The cost of LBP is high, 90 billion dollars was spent annually for back pain patients on health care in the United States in 2004, Australia spent 9.17 billion dollars and the United Kingdom, 251 million pounds was the cost from National Health Service(NHS) only [14], [15], [16].

In 2013, low back pain had the highest amounts of healthcare spending estimated to be \$100 billion in the USA [17]. In the Netherlands, the cost of low back pain grew from €4.2 billion in 1991 to €4.3 billion in 2002 but decreased to €3.5 billion in 2007. Overall, LBP costs were 0.9% and 0.6% of the gross national product (GNP) in 2002 and 2007 respectively [18]. Switzerland has reported that low back pain is the most prevalent health problem and a major cause for reduced work performance and disability with an estimated direct cost of €2.2 billion and an economic burden of between 1.6% and 2.3% of their gross domestic product (GDP) [19]. The total cost of back pain in Germany and Australia is €17.4 billion and \$9.17 billion respectively in 2003 with indirect cost contributing 88% of the total cost in Australia [20]. In Estonia, low back pain ranked the number one health problem that causes disability for ten years (2007-2017) with a change of 2.5% [21].

1.4 Statement of the problem

1.4.1 Guidelines

Clinical guidelines give recommendations on the diagnosis and treatment of a specific medical condition by experts in that field based on a systematic evaluation of scientific evidence [22]. It is a tool used by medical practitioners as a uniform way to diagnose and treat different medical conditions. The first guideline published on low back pain by the Quebec Task Force was based on the fact that scientific evidence used for making decisions were of low quality in 1987 [23], and since then a lot of LBP clinical guidelines have been published by different countries and professional associations [24].

Clinical guidelines focus on clinical management, investigations and treatment of low back pain.

1.4.2 Clinical management

All clinical guidelines are similar in describing recommendations for the patient's first visit, such as getting the history of the patients and some physical examination but also considering the psychosocial aspect of the patients.

1.4.3 Investigations

Generally, investigations do not change overall treatment strategies of patients with non-specific LPB, especially acute LBP. During diagnostic process, the decision if any investigations are indicated is made individually. Also, if additional investigations are needed, the type of investigations used will depend on the suspected diagnosis, prognosis, the location in the body, cost and the radiation risk. Each diagnostic investigation has its benefits such as in the case of MRI which is known to give a no radiation exposure with better and more advanced imaging of soft tissues but requires more time. CT scan requires less of time spent but causes radiation exposure [25]. Research has stated MRI as the best test for suspected spondylolysis due to its early detection of high-signal changes and stress response in the pars interarticularis, with fluid-sensitive sequences that are radiation-free [26]. CT scan is also stated to have better sensitivity than radiographs in identifying early spondylotic lesions within the form of stress reaction, typically seen as sclerosis or expanded thickness within the pars interarticularis.

1.4.4 Management

Management of low back pain is aimed at reducing the pain with any underlying issue. Although clinical practice guidelines agree and disagree on various treatment types, the main management types consist of education, physical activity, non-pharmacological therapies, and pharmacological treatment.

It is expected that the patient is extensively informed of the nature of LBP with ways to promote recovery and prevent recurrences [27]. To clear misconceptions, clinicians are required to probe patients and answer all the questions which can also be helpful for recovery and returning to work. A review showed that only 20.5% of patients with new low back pain problems were educated and advised by their clinicians [28]. Education

and advice from the medical doctors or general practitioners (GP) were shown to have a better effect on patients than when it came from nurses and physiotherapists [29]. Exercise is another widely used way of treatment as all clinical guidelines recommend for patients to be physically active.

Non-pharmacological therapies include massage, acupuncture, spinal manipulation, yoga, motor control exercises, and multidisciplinary rehabilitation. It is not stated which therapy is more superior to the other, as such most guidelines recommend various therapies. Psychological therapies are also non-pharmacological therapies that include cognitive-behavioural, electromyography biofeedback and progressive relaxation therapy. Research shows that all these moderately improve pain intensity compared with wait-list control [22].

In pharmacological treatments, some medicines are more effective for acute, sub-acute, and chronic low back pain. Non-steroidal anti-inflammatory drugs (NSAIDs) have the ability to block cyclooxygenase enzymes and are usually recommended for first-line treatment for both acute LBP. They are good for short-term relief for the pain. Opioids, on the other hand, have a lot of controversy on safety [30]. Opioid use has been shown to be associated with risk related to addiction and abuse [31].

1.4.5 Estonian LBP new guideline

Clinical practice guideline in Estonia on the diagnosis and treatment of LBP in the primary level was recently approved in December 2019. This guideline contains different recommendations on the new approach for managing low back pain in Estonia. The major change in recommendations captures the need for specialist consultations. According to the guideline, LBP patients should no longer be referred to neurologists (as has been the common medical practice in Estonia), but also suggests that LBP be managed largely by family physicians and physiotherapists. LBP patients should be referred to pain doctors (anesthesiologists in Estonia) when the pain persists for a longer period despite the use of drugs (chronic LBP) and rehabilitation doctors or physiotherapists if necessary. Referral to neurosurgeon or orthopedic surgeon is recommended when there is a need for spinal surgery [28]. Some patients with LBP need referral to a clinical psychologist or psychiatrist. In addition to the change in specialist consultations, there are also changes in recommendations for imaging for the LBP included in the new guideline.

The pathway for low back pain patients is described on figure1. 80% of patients start this process on their first visit to the family physician. Rarely, they visit the emergency department, either through walk-in or by the ambulance. The last set of patients start this process at the occupational health doctor who may also refer to different specialists based on the nature of red and yellow flags. The flow chart below (Figure 1) illustrates this process;

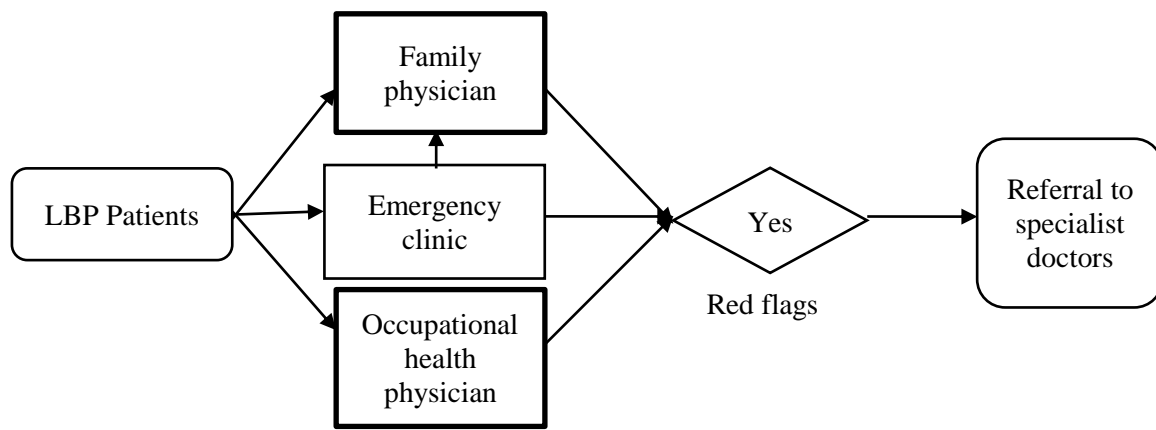


Figure 1. Process flow for LBP patients among medical specialists in Estonia

1.5 Aim and research questions

This research aims to compare the clinical guidelines of Estonia with Canada, the United States of America, and the United Kingdom and to analyse the implications of the new clinical guideline for diagnosis and treatment of low back pain in Estonia.

The research questions to help achieve the aims are as follows;

- How will the new guideline change the practice of family physicians and emergency care specialists?
- What is the direct cost of low back pain in Estonia?
- What are the implications of the new guideline as compared to previous practice?

2 Methodology

2.1 Choice of method

In this research, three methods were used in achieving the aim which is to compare and analyse the implications of the new clinical guideline for diagnosis and treatment of low back pain in Estonia. These methods are:

- Comparison of Estonian and international clinical guidelines of low back pain based on the published guidelines.
- A retrospective registry-based cohort study of patients with low back pain in Estonia from 2011 – 2019 based on data from the Estonian Health Insurance Fund (EHIF) to determine the direct cost of LBP, and
- In-depth semi-structured interviews to further examine the implications of the guideline to thereby develop a predicting model.

2.2 Comparison of low back pain guidelines

In order to select appropriate research materials regarding the diagnosis and treatment of low back pain, the focus was on keywords such as low back pain, clinical guidelines, diagnosis, treatment, and review. Relevant academic literature was gotten through online databases such as Google Scholar with emphasis on some journals such as Science Direct, The Clinical Journal of Pain, European Spine Journal, and Estonian Doctor (Eesti Arst).

The search was for literature published in English with exception to the Estonian Doctor Journal (Eesti Arst) which had articles in Estonian language but was translated using Google Translate. To get these articles from Google Scholar, the keyword ('Eesti Arst' AND 'Alaseljavalu') which means ('Estonian Doctor' AND 'Low Back Pain') was used from the year 2010 - 2019. This search gave 41 results from which was filtered to 3 articles by using the inclusion 'diagnostika ja ravi esmastasandil ravijuhend' that means 'diagnosis and treatment at primary level'. Keyword combinations for the English

language articles search were ('Low Back Pain' OR 'Lumbar Pain'), with the other keywords from the year 2010 - 2019. The articles were analysed based on their abstracts which gave a clear understanding of the aims, methods, and results used in the research.

The majority of the articles chosen had done some review on various clinical guidelines of low back pain and gave their report based on different factors. The first four articles reviewed clinical guidelines to compare the processes obtainable in different countries with a further review again after some years [20], [22], [24], [32], while some others were specific on the types of low back pain to review, either the acute or chronic [33], [34] and identifying the knowledge gaps among the guidelines [35].

2.3 Retrospective registry-based study

This method involved critically observing the retrospective database of low back pain in Estonia over the past 9 years to determine the direct cost (which are those directly connected to diagnosis and treatment of the illness) of LBP as regards the regular practice in the management of the patient and the clinical practice guideline. Crow Williams et al in two of his researches used this method in estimating the cost of acute low back pain and other illnesses [36], [37].

2.3.1 Description of data

The data used for calculating the cost of low back pain in Estonia was obtained from the EHIF database for patients with insurance and consisted of information related to diagnosis, demographics, and referrals to both specialists and diagnostic procedures.

EHIF manages the health insurance scheme in Estonia which is assigned to those who work or have worked and pay social tax together with their dependents and sums up to approximately 95% of the population [38]. This database consists of treatment invoices that contain patient information, diagnosis, treatment, referral to a specialist, and any other vital information related to the patient's health management.

The classification system ICD-10 (International Classification of Disease version 10) is being used in Estonia for coding the diagnoses of diseases which was initiated by the World Health Organization (WHO) in 1994 as the 10th revision with a general purpose of easy storage, retrieval, and analysis of health information that can be shared regardless of the country for universal health purposes [39]. In the classification, M00 – M99 are codes for diseases of the musculoskeletal system and connective tissues but for

this research, codes M51.0 – 51.9, M53.3 – 53.9 and M54.3 – 54.9 were used since these codes are diseases that relate to dorsopathies for 9 years (2011-2019). Also, data on the number of patients and case treatments of various healthcare services that manage LBP patients at different stages of the hospital were provided together with codes that represent various diagnostic procedures such as x-ray. MRI and CT scan. The EHIF variables used are:

- Demographic variables:
 - Age group
 - Gender
- Health care services
 - Emergency medicine
 - Neurosurgery
 - Neurology
 - Family medicine
 - Orthopedics
 - Rheumatology
 - Rehabilitation and Physiotherapy
 - General surgery
 - General medical care
 - Anesthesiology
- Data connected with diagnostic procedures
 - X-ray(selected codes)
 - MRI (selected codes)
 - CT scan (selected codes)

Diagnostic procedure codes selected for x-ray are 7906, 7907, 7908, for MRI are 79200 – 79203, 79250 – 79253, 79300 – 79303 and for CT scan include 7975, 7976, 7978, 7979. Data has a total of about 736,370 patients over the 9 years of review that were treated for diseases relating to low back pain in Estonia.

2.3.2 Data Preparation

The data from EHIF was in an excel format that contained the information on the number of patients and the number of cases of LBP patients as discussed in 2.3.1., the

medical specialty that attended to the patients, the diagnostic procedures, and the physical therapy as treatment. The cost was then calculated by obtaining prices of procedures from the EHIF price list of health services which corresponded with the codes of the procedures [40].

The cost for consultation of family medicine was calculated using EHIF health statistics general indicators which contained data on the amount spent on financing family health care with the number of appointments for each year (Table 1). This method was chosen because the pricing for family medicine is done using the head money system instead of a fixed price for a period. The price for consultation for other medical specialties was also gotten from the list of health care services with codes 3002 and 3004 which represents the cost for an appointment with a specialist doctor. This price was applied to all the specialists excluding emergency medicine which is classified differently in the list. The price of emergency medicine was the treatment of a patient in the green triage category (3107). The price for the patients in green triage was used based on interviews with emergency medical professionals that explained the classification of LBP patients and the triage system.

Table 1. Average cost of family physicians for 2019

Indicators	Figures
Total cost of family health care 2018 (Euros)	143,770,157
Number of Appointments	6,941,853
Average cost per appointment	20.7

2.3.3 Data analysis

Descriptive analysis of the data was done to determine the mean, median, and standard deviation of patients and their number of appointments.

To answer research question 1, the direct cost of LBP was calculated by summing up all costs related to the different healthcare services such as consultations, diagnosis, and physiotherapy. Since the number of patients and the total number of consultations and physiotherapy for each year broken-down into the respective medical specialties

responsible were given in the data from EHIF, the cost for each healthcare service made use of the data with the prices.

In answering the research questions 2 and 3, a cost comparison of the direct cost with and without the guideline.

The cost of medications used for the treatment of LBP was not analysed.

2.4 Interviews

Eight in-depth semi-structured face-to-face interviews with open-ended questions were conducted. The participants were healthcare professionals that frequently manage LBP patients in Estonia including family physicians, occupational health doctors, emergency room doctors, and a radiologist. The choice of participants was done using a snowball sampling technique but also taking into cognizance that these participants were evenly distributed across hospitals and health care centres in Tallinn. Based on the sampling technique used, the interviews stopped when no new information was received. The recently approved clinical guideline for diagnosis and treatment of low back pain in Estonia was used as an interview guide in the setting of how the questions were asked [22]. The period of the interviews was from January – March 2020 which was approximately a month after the approval of the clinical guideline with a timeframe of between 30 -40 minutes. All interviews were conducted in the English language. All the interviews started with an introduction of the subject matter by the interviewer, followed by the questions which were to find out the present practice in managing LBP patients and their opinion about the changes in the guideline. The process was recorded and then transcribed for future analysis. Analysing the responses included coding and grouping into relevant topics that were discussed and identifying the frequency in occurrence of the responses.

2.5 Ethical considerations

The data from EHIF contained no personal information of patients as it was anonymous with only aggregated data format, therefore, no approval from Estonian Data Protection Inspectorate was required. Also, considering the fact that first, the method was a retrospective registry-based study, there was no need for informed consent. All

collected data were processed by the author and will be deleted after this thesis has been completed.

3 Results

The results of all three methods which are the clinical guideline comparison, retrospective registry-based (quantitative) study, and the interviews (qualitative) are explained in this chapter.

3.1 Clinical guidelines - Estonia and other countries

Guidelines from the United States of America, the United Kingdom, Canada, and Estonia were compared. To find the guidelines of the respective guidelines, the following databases were searched; American College of Physicians (ACP), National Institute for Health and Care Excellence, and Accelerating Change Transformation Team. Clinical guidelines are:

- Non-invasive Treatments for Acute, Sub-acute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians - 2017 and Diagnosis and Treatment of Low Back Pain: A Joint Clinical Practice Guideline from the American College of Physicians and the American Pain Society- 2007 (United States of America) [40], [41].
- Low back pain and sciatica in over 16s: assessment and management - 2016 (United Kingdom) [42].
- Evidence-informed Primary Care Management of Low Back Pain - revised in 2017 (Canada) [43].

3.1.1 Clinical recommendations

All guidelines recommend starting with analysis of history and physical examination (signs and symptoms of LBP) (table 2). Also, analysis of psychosocial factors is recommended. Different approach is used for acute and sub-acute LBP but all guidelines' recommendations on clinical management are very similar (table 3).

3.1.2 Diagnostic methods of low back pain

There were little differences between guidelines in the recommendations for imaging. All guidelines (table 2) unanimously agreed not to use routine imaging for acute non-specific low back pain [41], [42], [43]. In the US and Canada, it is recommended to use MRI and CT scan only in sub-acute and chronic LBP if there are signs of radiculopathy or spinal stenosis, and when neurologic deficits are suspected (Table 3) [41] [43]. While in the UK, these images are only applicable to patients being referred to specialists [42]. X-ray studies are not mentioned, with the exception of Canadian guidelines where the use of X-ray is specifically not recommended (table 3).

Table 2. Diagnosis comparison of Acute Low back pain

Country	Patient Population	Diagnostic Process	Imaging
United States of America	≥ 18 years of age	History and physical examination Triage Psychosocial factors check	No routine imaging for non-specific LBP.
United Kingdom	≥ 16 years of age	History and physical examination Risk stratification with the STarT Back tool.	No routine imaging in a non-specialist setting.
Canada	≥ 18 years of age	History and physical examination. Triage Psychosocial factors check	No imaging test in acute LBP without red flags.
Estonia	≥ 15 years of age	History and physical examination. STarT questionnaire to evaluate pain. EEK-2 for psychological assessment.	No imaging for acute non-specific LBP.

Table 3. Diagnosis comparison of Sub-acute and Chronic LBP

Country	Patient Population	Diagnostic Process	Imaging
United States of America	≥ 18 years of age	History and physical examination Triage Psychosocial factors check	MRI and CT when neurologic deficits are present or suspected. MRI or CT for persistent low back pain and signs of radiculopathy or spinal stenosis
United Kingdom	≥ 16 years of age	History and physical examination Risk stratification with the STarT Back tool.	MRI and CT only when the patient is referred to a specialist if it will influence the management of the patient.
Canada	≥ 18 years of age	History and physical examination. Triage Psychosocial factors check	MRI and CT to rule out underlying pathology in the presence and absence of radiculopathy and if surgery is in question. Chronic: Standing AP and lateral plain film in the absence of MRI when a fracture is suspected. MRI used in the presence of red flags, radiculopathy or neurogenic claudication. *X-rays not recommended.

Estonia	≥ 15 years of age	History and physical examination. STarT questionnaire to evaluate pain. EEK-2 for psychological assessment.	Radiological examinations are advised not to be used when there are no red flags.
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3.1.3 Treatment of low back pain

Also, small differences between guidelines are observed in treatment recommendations. Tables 4 and 5 demonstrate that recommend the use of weak opioids in the treatment of LBP for a short term period, except that of the United Kingdom where opioids are recommended not to be used for chronic LBP, In the United States of America, it is recommended to use opioids only when other treatments have failed to work and the likely benefits surpass the risks together with the patient’s consent [40]. Tramadol is an analgesic with a weak affinity for opioid receptors used as a last resort for LBP when other drugs fail to relieve the pain especially in the United States [44].

Table 4. Comparison of treatment processes for acute LBP.

Country	Education	Non-pharmacological Methods	Pharmacology Methods	Referral
United States of America	Evidence-based information on the expected course, self-care, and advice on remaining active.	Massage, Acupuncture or spinal manipulation.	NSAIDs and SMRs based on patient preference and risk profile.	No referral
United Kingdom	Information on the nature of LBP and sciatica and advice to be active.	Spinal manipulation, Massage. Psychological therapy - Cognitive	Oral NSAIDs Weak opioids with or without paracetamol when NSAIDs is ineffective	No referral

		behavioural therapy only as part of a package.	No selective serotonin uptake inhibitors or tricyclic antidepressants, No anticonvulsants.	
		No acupuncture, No ultrasound, No percutaneous electrical nerve stimulation.		
Canada	Information on low back pain prevention and care, also workplace ergonomics. Recommend physical activity.	Acupuncture, Spinal manipulation, Herbal medicine, Massage therapy, Yoga	First line: Acetaminophen(paracetamol) Second line: NSAIDs, Ibuprofen, Diclofenac, weak opioids when acute pain not controlled by NSAIDs.	Refer to spinal care specialist when the patient has disabling back or leg pain or limitation in work-related activities within 2-6 weeks.

Estonia	Information on LBP and how to improve it. Advice to stay physically active.	NSAIDs Weak opioids with or without paracetamol. Muscle relaxants for acute LBP.	Refer to an oncologist when clinical signs show malignancy. Clinical psychologist or psychiatrist when pain is related to psychosocial factor (negative life event or stress for other reasons, anxiety, persistent mood disorder and, suspected mental disorder.
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Table 5. Comparison of treatment processes for sub-acute and chronic LBP

Country	Education	Non-pharmacological Methods	Pharmacology Methods	Referral
United States of America	Evidence-based information on the expected course, self-care, and advice on remaining active.	Exercise, Acupuncture, Motor control exercise, Multidisciplinary rehabilitation, Electromyographic biofeedback, Progressive relaxation, Spinal manipulation, Low-level laser	First-line therapy - NSAIDs. Second-line therapy - Tramadol or Duloxetine. Last treatment - Opioids.	Refer when surgery is needed and for functional deficit. Refer when failure to respond to opioids.

		therapy		
		Psychological therapy - Cognitive behavioral therapy.		
United Kingdom	Information on the nature of LBP and sciatica and advice to be active.	Spinal manipulation, Massage. Psychological therapy - Cognitive behavioral therapy only as part of a package. No acupuncture, No ultrasound, No percutaneous electrical nerve stimulation.	Oral NSAIDs No Opioids No selective serotonin uptake inhibitors or tricyclic antidepressants, No anticonvulsants.	Refer to a specialist when neurological deficit or cauda equina syndrome is suspected.
Canada	Information on low back pain prevention and care, also workplace ergonomics. Recommend physical activity.	Acupuncture, Spinal manipulation, Herbal medicine, Massage therapy, Yoga Psychological therapy - Cognitive behavioral therapy. No Lumbar discography, No EMG for chronic pain,	First line: Acetaminophen(paracetamol) Second line: NSAIDs, Ibuprofen, Diclofenac Third line: Tricyclics(TCA), weak opioids Fourth line: Tramadol.	Refer to the surgeon when the pain has lasted 6 months without relief. Refer to a multidisciplinary chronic pain program when no improvement.

Estonia	Information on LBP and how to improve it. Advice to stay physically active.	Therapeutic exercises only in chronic LBP.	NSAIDs Weak opioids with or without paracetamol. Tricyclic antidepressants for chronic LBP. No gabapentinoids.	Refer to the oncologist when clinical signs show malignancy. Clinical psychologist or psychiatrist when pain is related to psychosocial factor (negative life event or stress for other reasons, anxiety, persistent mood disorder and/or sleep disorder, suspected mental disorder. Physiotherapist or rehabilitation doctor, all patients with sub-acute and chronic LBP.
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3.2 Retrospective registry-based study

3.2.1 Demographics

There are a total of 736,370 low back pain patients recorded in Estonia with 1,210,476 treatment cases from the period 2011 to 2019. These patients consisted of 305,055 (41%) male and 413,315 (59%) female distributed across various diagnosis codes ICD 10 of which M54 (dorsalgia - back pain) and M54.5 (lumbar pain) account for 59% of patients and 55% of treatment cases. The number of low back pain patients increased by 7% over the last nine years under review with the highest number of patients seen in

2015 (86,074) which dropped to 6% by 2018 but began to increase again in the year 2019 by 2% (Table 6).

Table 6: Number of patients.

Year	Number of patients
2011	77,782
2012	71,375
2013	81,142
2014	84,859
2015	86,074
2016	85,942
2017	84,383
2018	81,508
2019	83,305

The largest age group among 736,370 patients was 50-59, accounting for 21.7%. The next age groups by frequency were 40-49 (17.8%) and 60-69 (16.48%) accordingly. The age group with the least number of LBP patients belong to 100- 109 (0.01%), followed by 0-9 (0.17%) and 90-99 (0.48%) respectively (Figure 2). The estimated mean age for the period of this study was 54.5.

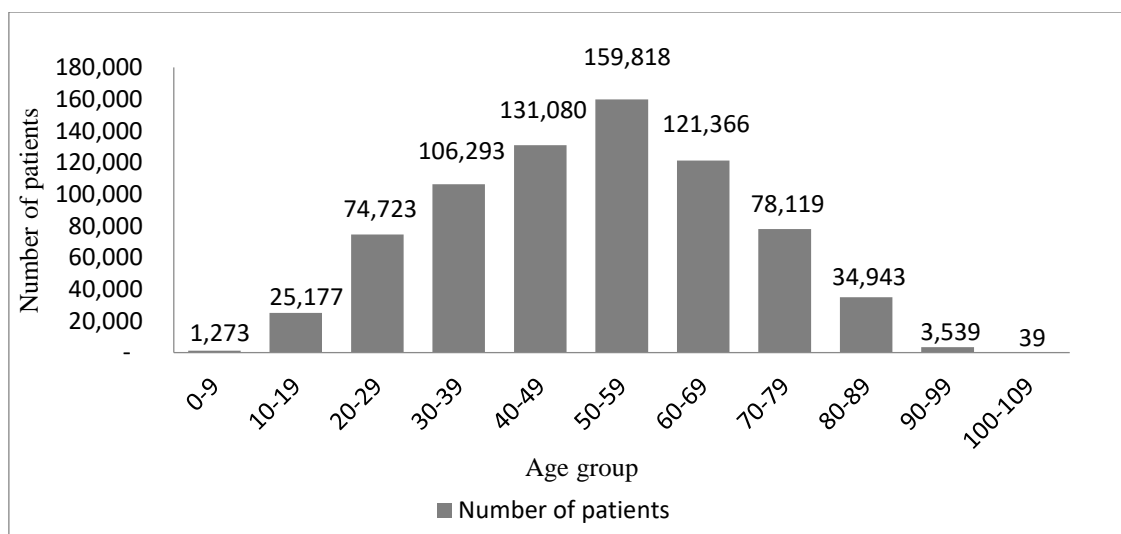


Figure 2. Age distribution of low back pain patients.

3.2.2 Cost of diagnosis and consultation

Low back pain patients are consulted by not only family doctors but a lot of other specialists through referrals (Table 7). The highest numbers of patients were consulted by family doctors (64.49%). Neurologists were consulted by 12.68% of patients which decreased consistently with a total percentage change of 27.99% from 2011 to 2019. Anesthesiologists (also known as pain doctors in Estonia) and emergency room doctors had an increase in consulted patients of 158% and 94% respectively over the last nine years, although this was 0.55% and 2.29% of the total patients.

Table 7. Number of patients consulted by various medical specialties

Medical specialty	Consultation 2011-2019	% change from 2011-2019
Anesthesiology	0.55%	159.15%
Emergency medicine	2.29%	93.82%
Family medicine	64.49%	9.46%
General medical care	4.44%	27.50%
General surgery	0.74%	-20.18%
Neurology	12.68%	-27.99%
Neurosurgery	3.28%	-24.05%
Orthopedics	2.43%	11.49%
Rehabilitation and Physiotherapy	8.45%	10.55%
Rheumatology	0.66%	29.34%

Figure 3 shows the yearly trend in the number of diagnostic investigations (x-ray, MRI, CT scan). Number of x-rays show decline although in comparison to the other imaging tests, the numbers are still very high. CT scan shows a steady increase over the years with no decline.

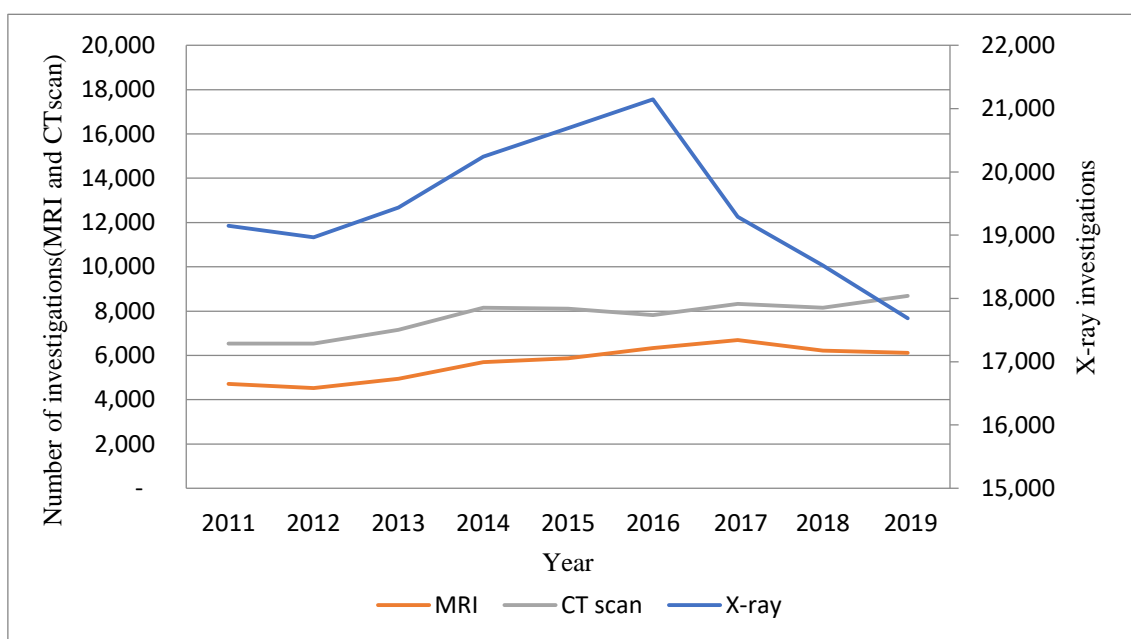


Figure 3. The number of x-rays, MRI and CT scans 2011 – 2019.

Family doctors contributed the most to the total number of x-rays from 2011 to 2019, followed by neurologists (Table 8). In 2019 alone, family doctors ordered 14,622 x-rays which was 82.68% of all x-ray investigations followed by neurologists at 6.21%. The least contributing specialists to the total x-rays are anesthesiology and rheumatology with 0.16% and 0.70% respectively. The number of MRIs was largely influenced by orders from neurologists with a total of 3,614 (59.05%) MRI investigations for 2019 followed by neurosurgeons (17.37%) and orthopedic surgeons (12.63%). The number of MRI per neurologist visits in 2019 was 26% with every 4th consultation linked with request for MRI. The total increase of MRIs constituted 13% from 2011 to 2019.

On the other hand, CT scan numbers were highly contributed also by neurologists with 2,806 CT scans which was 42.09% of CT investigations in 2019. General medical care doctors and emergency room doctors were responsible for 22.92% and 20.91% respectively. The CT scans from the emergency room visit also showed the same increase pattern of 18% over the nine years from 30% in 2011 to 48% in 2019.

Table 8. Medical specialties contribution to imaging procedures 2011 - 2019

Medical specialty	X-ray	MRI	CT Scan
Anesthesiology	0.16%	1.30%	1.82%
Emergency medicine	1.45%	0.13%	15.75%
Family medicine	77.81%	0.004%	0.57%
General medical care	3.86%	1.47%	17.13%
General surgery	0.78%	1.71%	4.60%
Neurology	8.14%	58.22%	51.31%
Neurosurgery	1.55%	22.50%	5.01%
Orthopedics	4.47%	10.57%	2.70%
Rehabilitation and Physiotherapy	1.08%	1.14%	0.29%
Rheumatology	0.70%	2.96%	0.81%

Based on diagnostic procedures used, a total of 153,780 patients had x-rays at least once during the period with 42% being male and 58% being female. The age group with the highest x-ray done is between ages 16 to 49 with 53% while patients aged 50 and above with 47% (Figure 4). Within both age groups, low back pain females patients contributed to the highest number of patients to have an x-ray done. Although the difference between the patients aged 16 to 46 was insignificant, the second group had a significant difference of 32% between males and females of which females had 66%.

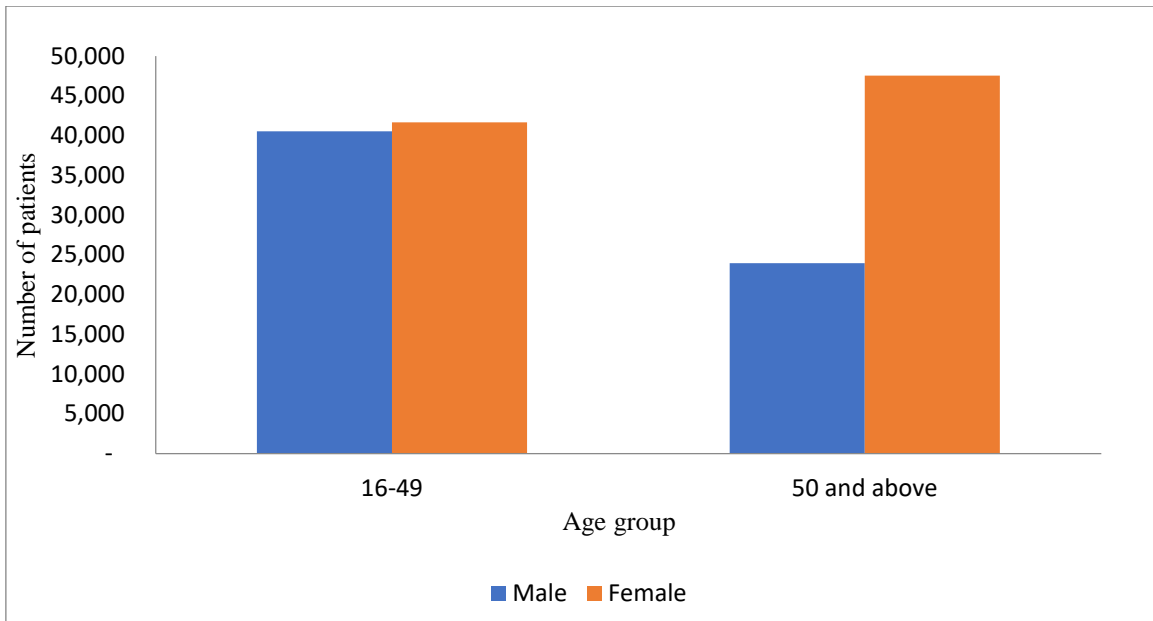


Figure 4. Low back pain patients with an x-ray.

Magnetic resonance imaging (MRI) for low back pain patients was performed in 53% of patients between the ages 16 to 49 and 47% for ages 50 and above with female patients as the largest group with 58%. Among the other age groups, patients between ages 16 to 49 had about the same number of males and females but the patients above 50 years of age had more females being sent to have MRI (Figure 5).

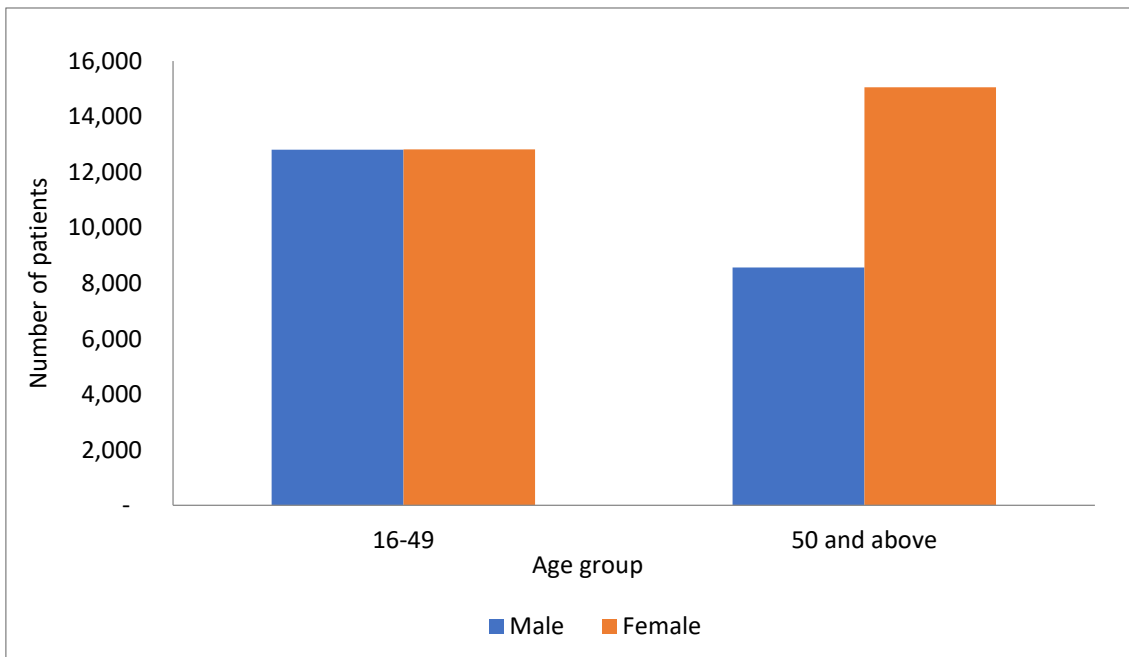


Figure 5. Low back pain patients diagnosed with MRI.

Older patients were sent to have a computed tomography scan (CT scan) and 60% of them were female. Also, a higher number of male patients within the ages of 16 and 49 had CT scan within the 9 years (Figure 6).

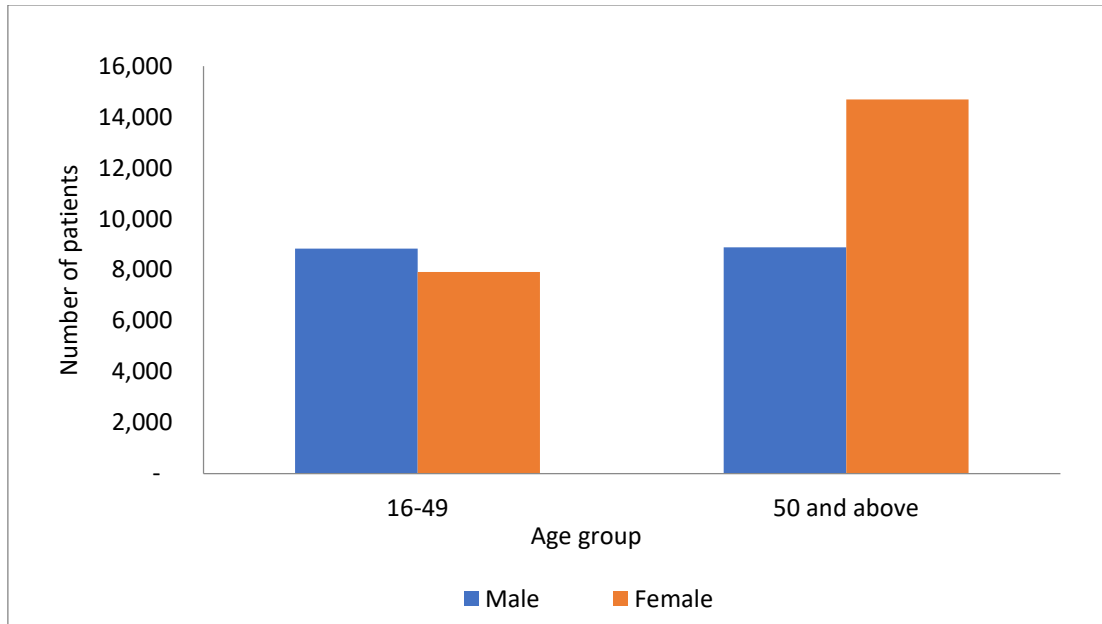


Figure 6. Low back pain patients diagnosed with a CT scan.

3.2.3 Treatment – Physiotherapy

Physiotherapy, which is a common type of treatment for low back pain patients was analysed using the available data from 2013 to 2019. The total number of patients that were referred to physiotherapy in 2013 was 4,707 and 8,992 in 2019.

It increased over the years by 91% with the highest number of patients coming from physiotherapists and family doctors at 69.73% and 10.31%. The number of patients from family doctors increased by over 1000% in the nine years under review (Figure 7) but still the numbers are very low.

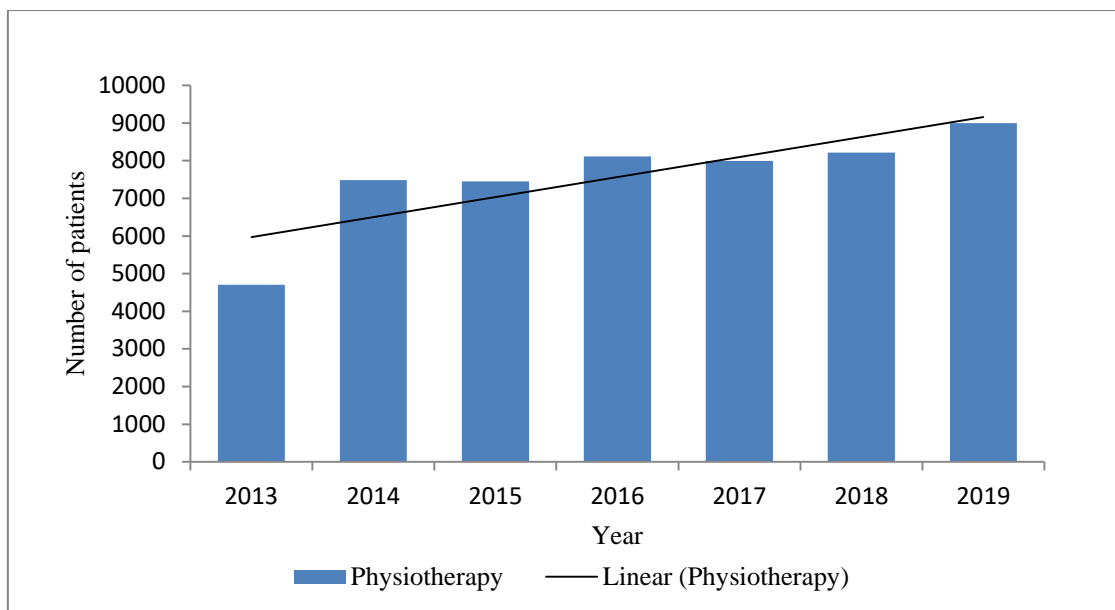


Figure 7. Number of patients referred for physiotherapy from 2011-2019.

3.2.4 The direct cost of low back pain

The price of each procedure was taken from the EHIF price list as stated in 3.2.2 and applied to all the number of examinations to get the cost for each diagnostic procedure. The direct cost of low back pain from 2011 to 2019 is €38,107,185.67 with a 113% increase from 2011 to 2019 but an average year-over-year increase of 10.57%. The average cost per year was 4.2 million euros with a median cost of 4.5 million euros. The highest contributor to the cost was the consultation of physicians being 51.5%. The next contributor to overall cost (35%) was the cost for diagnostic procedures (x-ray, MRI, and CT scan). The cost for investigations was the highest for MRI studies by contributing 66% to the total cost of diagnostic procedures (Figure 8).

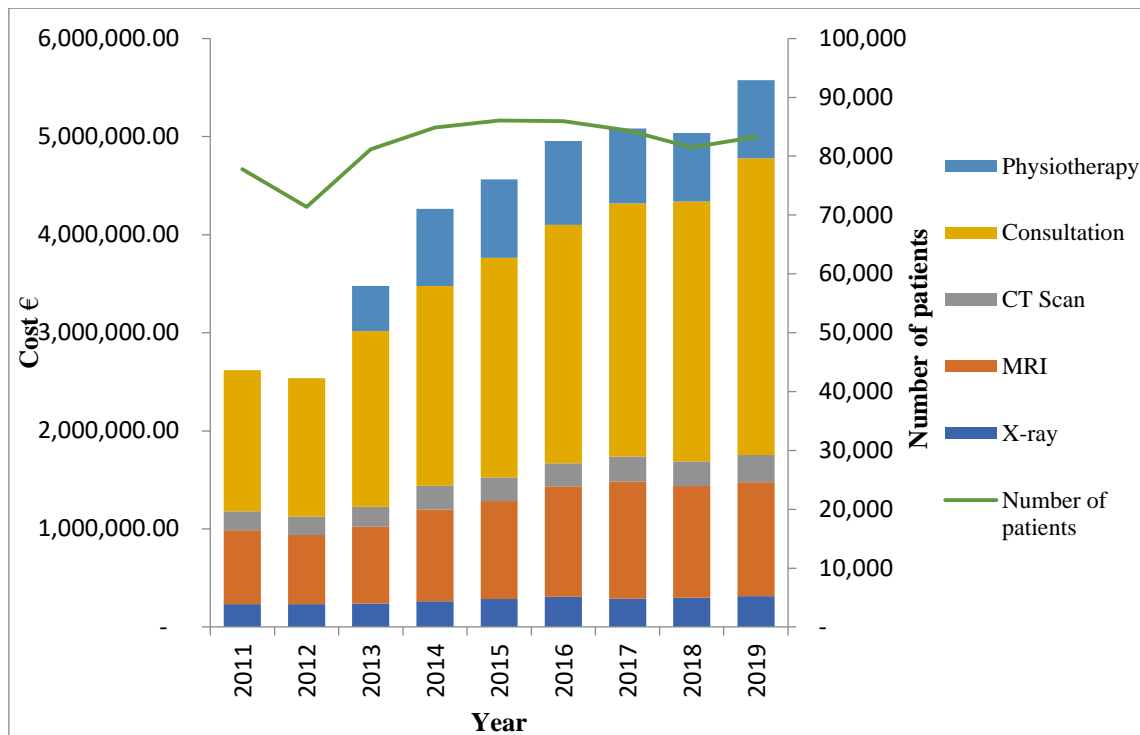


Figure 8. Healthcare cost of low back pain diagnosis, consultation, and non-pharmacological treatment

In comparing the direct healthcare cost spent on low back pain with the amount budgeted for healthcare services of the respective years, the diagnosis and treatment (physiotherapy) of low back pain patients cost 0.53% and 0.52% for 2018 and 2019 respectively (Figure 9). The healthcare services budget covers the cost of disease prevention, primary health care, specialized health care, nursing care, and dental care.

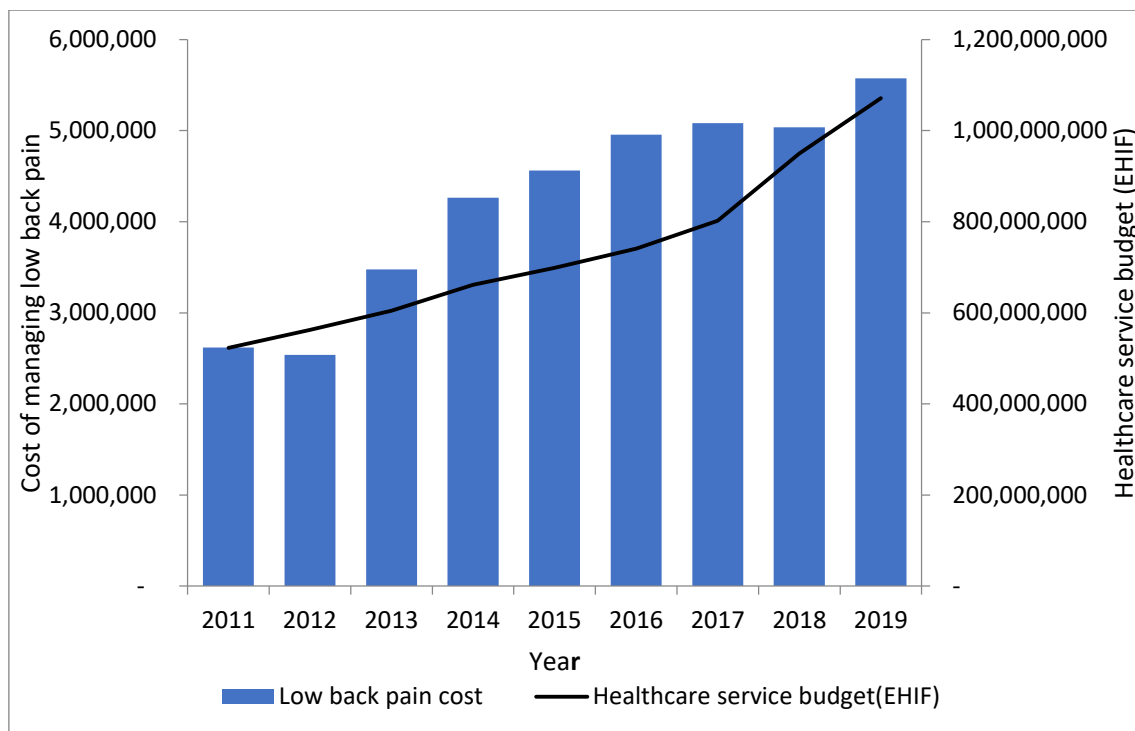


Figure 9. Healthcare cost of managing low back pain compared with the budget.

3.2.5 Cost of low back pain in 2019

The direct cost for 2019 was 5.57 million euros with 54.32% of the cost from consultation and the remaining 31.44% and 14.21% from diagnosis and physiotherapy respectively (Table 9). The 2019 EHIF budget for healthcare was 1.07 billion euros with about 99.6% of that amount spent in that same year at 1.06 billion. The means that the proportion of the healthcare budget and expenditure spent on LBP in 2019 was 0.520% and 0.522%.

Table 9. Total cost of low back pain in 2019.

Cost items	Amount in Euros (000)	% of total cost
Consultation	3,027	54.32%
Investigations	1,752	31.44%
Physiotherapy	792	14.21%
Direct costs	5,573	
% of direct cost to healthcare expenditure	0.522%	

3.2.6 Cost comparison

In order to determine if there will be a cost-saving or not after the implementation of the new clinical guideline, a cost comparison is calculated using the healthcare cost of 2019. The major change implemented was in the limitation to referrals of patients to neurologists which will also impact the use of MRI and CT scans. There was a total difference of €1,193,422.18 (Table 10) which is 21% cost savings overall was observed with the highest cost being saved from MRI and CT scan at 59% and 50% respectively. The other processes of diagnosing and treating patients (physiotherapy, consultation, and x-ray) were not significantly affected by the immediate change in the guideline with the least being physiotherapy at 3%.

Table 10. Cost comparison of the existing practice with the clinical guideline with no referrals to neurologists of one year (2019).

Investigations	Existing practice	Clinical guideline	Diff. in total cost to exiting practice	Cost Savings %
X-ray	314,547.38	295,967.20	(18,580.18)	-6%
MRI	1,163,042.73	475,177.07	(687,865.66)	-59%
CT Scan	274,854.48	138,505.87	(136,348.61)	-50%
Consultation	3,027,867.94	2,702,890.46	(324,977.48)	-11%
Physiotherapy	792,994.41	767,344.17	(25,650.25)	-3%
	5,573,306.95	4,379,884.77	(1,193,422.18)	

3.3 Interviews

The face-to-face in-depth semi-structured interviews comprised of eight physicians of whom there were three family doctors, two emergency room doctors, two occupational health doctors, and one radiologist who also works with the emergency department. The results from the interview showed that all the physicians consulted with LBP patients at least three times a week and at most every day in a week.

All physicians gave similar practice on the process of managing patients which involves probing for the history and details of the pain, physical examination such as Lasègue test to identify red flags where possible and different diagnostics procedures.

Seven out of all the eight physicians interviewed most especially the family doctors and occupational health doctors, stated x-ray as one of the first diagnostic procedures used when attending to LBP patients. Although, for patients with pain for less than two weeks, no tests or procedures are carried out. It was also stated that since family physicians can only order spine x-ray and not MRI or CT investigations, it is easier to refer patients for an x-ray as the first investigation. Most of these family physicians have also raised a concern on the increase in the use of x-ray by 10% - 20% because they cannot refer patients to neurologists any longer according to the new guideline.

Two occupational health doctors and one family physician stated that they regularly refer LBP patients for MRI through neurologists. Occupational health physicians who work closely with neurologists stated their main reason for referring almost every LBP patient for MRI was to rule out other diagnosis. One of the family physicians pointed out that private neurologists are being consulted as an alternative, if needed, after stopping referrals to neurologists.

CT scan was stated to be used by the emergency department physicians and they claimed CT investigations to be done only if any red flags are suspected or the pain has lasted more than two months.

One radiologist elaborated on the use of routine imaging for LBP patients in the emergency room. He explained that routine imaging does not improve the clinical outcome, exposes patients to ionizing radiation, and contributes to cost if CT scan examinations in the emergency department are used.

In terms of treatment, all physicians stated the use of non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen, ketoprofen, dexketoprofen and muscle relaxants for

the first-choice treatment in low back pain, especially in acute pain. In the case of chronic pain, weak opioids such as tramadol and codeine together with paracetamol are used as their second choice for prolonged and severe pain. These are pharmacological treatments.

Non-pharmacological mode of treatment is also used which is why all the physicians agreed to patients being referred to physiotherapists. They also stated that physiotherapists are the most frequent specialists that LBP patients are referred to, except for the physicians from the emergency clinic that have to refer these patients to family physicians first before being referred to a physiotherapist if needed. Three of the family physicians stated that there is a long waiting time (up to three months sometimes) for patients to secure an appointment with physiotherapists which can be tiring and but due to this challenge, they have resulted to referring patients to physiotherapists as early as after the first visit since they know the patient will take some time before an appointment is set. Also, it was stated that the cost for a physiotherapist is not fully covered by the EHIF and thereby making it a little expensive to patients.

3.3.1 Change in Estonian guidelines

90% of all physicians interviewed were not aware of the presence or approval of the clinical guideline and one even stated that the awareness and distribution of information about the guideline are poor which implies that doctors will still be following the general practice instead of the practice guideline. The only physician that was well informed about the guideline assisted in the process.

Five out of the eight physicians (family physicians and emergency room physicians) agree partially with the clinical guideline that LBP patients should not be referred to neurologists. They still accept that sometimes they refer these patients because of the access to MRI that requested by the patients themselves. It was also stated that it will take some time before this aspect of the guideline will take effect fully.

All family physicians agreed to the increase in workload if they have to manage all LBP patients throughout the process as stated in the guideline.

4 Discussion

This chapter provides a detailed explanation for results from the all methods used.

4.1 Low back pain

Low back pain has always been a health problem globally with the most common being the non-specific LBP because there is no specific cause [1]. Research on global disease burden for twenty-seven years showed that LBP has been the leading cause of years lived with disability since 1990 with a 30% increase from 1990 to 2007 and an additional 17.5% increase from 2007 to 2017 leaving a total of 64.9 million years lived with disability as at 2017. This result was for 126 out of 195 countries globally [45].

In Estonia, the number of LBP patients in 2019 was about 6.3% of the total population which is an increase of 2.2% of the previous year.

4.2 Cost of low back pain

There is a high cost of managing LBP as shown in the amount spent on healthcare and productivity in different countries such as USA that spent 100 billion dollars in 2013 and some European countries such as Switzerland where LBP accounted for 2.3% of their GDP [17], [19]. In Estonia, the total cost for LBP based on our research was 5.57 million euros in 2019 which is 0.052% of the EHIF healthcare expense for the same year.

4.3 Clinical Guideline – Current practice and predictions

The recommendations in the new low back pain guideline in Estonia have a lot of similarities with other guidelines around the world.

4.3.1 The clinical guidelines comparison

The clinical guidelines used in comparison in this study were from Canada, USA and UK. The common diagnostic methods in all guidelines include taking the history of patients, physical examinations, and the use of a psychosocial assessment. Also, in the Estonian new guideline, it is recommended that a comprehensive history and physical examination of patients be documented.

4.3.2 Diagnostic investigations

Radiological tests are recommended not to be used for acute non-specific LBP as investigations do change management or treatment efficiency. This recommendation was based on three quality controlled trials (DJA 2005, Kerry 2002, Kendrick 2001) and two observational studies (Jarvik 2015, Kerry 2002) showing no positive effect of x-ray, magnetic resonance imaging (MRI) and computerized tomography (CT scan) examination on low back pain and patient performance. These and many other studies have demonstrated no effect of investigations on diagnosis or treatment of LBP. Also, the harmful effect of ionizing radiation exposure with spine X-ray, CT scan (carcinogenic effect), and useless increase in financial expenses MRI have been underlined [46], [47], [48].

In conclusion, all guidelines recommended no imaging for non-specific LBP. USA and Canada recommended MRI and CT investigations only in sub-acute or chronic LBP when neurologic deficits are suspected or there are signs of radiculopathy. UK guideline recommends MRI and CT when the patient is referred to a specialist and if the result will likely change management.

Treatment methods include educating patients, non-pharmacological therapies and pharmacological methods such as the use of NSAIDs. The difference noticed in the treatment methods was that the use of opioids in the UK is not to be used for chronic managing low back pain. When it comes to referring patients, different guidelines recommend referral based on different factors such as the nature and duration of the pain or the clinical signs identified.

4.3.3 EHIF data analysis

The comparison of healthcare costs spent in 2019 with and without the guideline showed a 21% cost savings of 1.19 million euros for the EHIF. The highest savings came from the change in guideline that no longer recommends referral to neurologists. As a consequence, the savings consisted mostly from MRI and CT investigations not done that were previously ordered by neurologists. It is worth pointing out that there are no guidelines (including new Estonian guidelines) allowing/recommending the use x-ray investigations in LBP. Although, X-rays are not recommended in the management of LBP anywhere in the world a high proportion of LBP patients in Estonia is still referred to this investigation, mostly by family physicians. In 2019 for instance, family medicine contributed 83% of the current x-ray cost and 66% of consultation cost. Although the guideline recommended specific changes for cost savings, the effect on patient management in real life will be fully observed after implementation.

4.3.4 Interview data analysis

Currently, during the process of managing acute LBP, family doctors order x-rays very often. Also, emergency room doctors order CT scans for acute low back pain, although it is not recommended by guidelines.

In the case of sub-acute and chronic pain, family doctors order of x-rays. Family physicians are unable to order MRIs, and CT scans for their patients. This situation has led to a frequent referral to neurologists earlier to enable the patients to gain access to an MRI. Most of the family doctors supported the new LBP clinical guideline on the 'no referral to neurologists' recommendation but were also of the opinion that a lot of these patients need to have an MRI anyway. Although, since the approval of the guideline, there has been limited access of LBP patients to neurologists in government-owned hospitals some family physicians have started referring patients to private neurologists. . According to new LBP guideline in Estonia, non-specific LBP patients are to be treated by the family doctor and referral to the following specialists are based on the duration of the pain (moderate to chronic pain) its ability to affect the patient psychologically and in the case of failed treatment; physiotherapist, rehabilitation doctor, pain doctor, and clinical psychologist or psychiatrist. It is also predicted that due to the limited access to neurologists, the use of x-rays in managing LBP (all types) will increase.

Emergency room doctors still make use of CT scans for sub-acute and chronic pain patients before referring them back to their family doctors or other specialists. Occupational health doctors still hope to refer every low back pain patient to neurologists as they think it is an effective way of managing these patients.

Based on the interviews with eight physicians that consult with low back pain patients, the first feedback noticed was that almost all the physicians were not aware of the new clinical guideline for low back pain in Estonia which they are supposed to be working with. This clearly showed that the guideline had not been effectively disseminated among doctors.

5 Conclusion

This thesis aimed to analyse the implications of the new clinical guideline for diagnosis and treatment of low back pain in Estonia based on the cost and to make recommendations on the implementations.

In 2019, low back pain management direct cost was 0.5% of the healthcare services budget of EHIF with the cost for consultation having the most impact and physiotherapy being the least. Also, various medical specialists played their part not only in this cost but also in the use of imaging, especially the family doctors, neurologists, and emergency room doctors. There were cost savings of 21% when the guideline was implemented with regards to its cost and compared with the current practice.

Results from the face-to-face interviews supported the data that showed continued and projected increased use of x-rays and CT, although not supported by guidelines. The concerns on investigations were voiced by family doctors and emergency room doctors.

Finally, based on all the findings in this research, it can be concluded that the new clinical practice guideline for the diagnosis and treatment of low back pain in Estonia is very similar to international recommendations and will improve and standardize practice. However, some caution with changes in real practice, especially concerning the X-ray use should be taking into account.

Recommendations on the implementation of the guideline

- Estonian LBP guidelines are very similar to international guidelines
- More information to family doctors and other specialists that manage low back pain patients is needed about the new LBP guideline.

- LBP costs 5.57 million euros annually (2019 data). However, with implementation of the guideline with restricted access to neurology consultations the costs should decrease by 21%.
- EHIF may consider handling full cost for physiotherapy with the projected increase in referrals. Also, waiting time for an appointment with physiotherapists should be addressed with a system that can manage these patients virtually before the appointment.
- New guidelines on specifically do not recommend the use of investigations for LBP. Regular monitoring of the use of imaging for patients with LBP, especially with the projected increase of x-ray scans is recommended
- Monitoring of the use of CT scans for LBP patients in the emergency room to limit the exposure to radiation is recommended.

5.1 Limitations

The data from the Estonian Health Insurance Fund does not include any information from the population of Estonia that is uninsured (either with private insurance or uninsured), which accounts for about 5% of the population [38]. The cost analysis did not include all the cost of treatment such as the cost for drugs and cost for medical devices. It also did not include the cost for other laboratory blood tests which was difficult to differentiate the results for LBP patients from others that were recommended to undergo the same tests.

To analyse the total cost for LBP, the indirect cost may have to be determined with was not present in this study because the cost from the EHIF report only represented the time lost from work for employees that spent more than eight days since the employers are expected to pay sickness benefits from the fourth to the eighth day of illness and thereafter the EHIF begins to pay. Also, the first three days of absence due to sickness is unpaid and the cost for those days is unlikely to be tracked.

5.2 Further research

Based on the scope of this research, there are areas for further research to give more insights on low back pain. Further research is needed a year or more after implementation of the guideline to get the full impact of the guideline on both patients and physicians. The research should take note of the limitations of this study to provide as regards the data in analysing LBP.

Further research should also be done to determine the cost of uninsured or privately insured low back pain patients and the impact on the economy.

Acknowledgment

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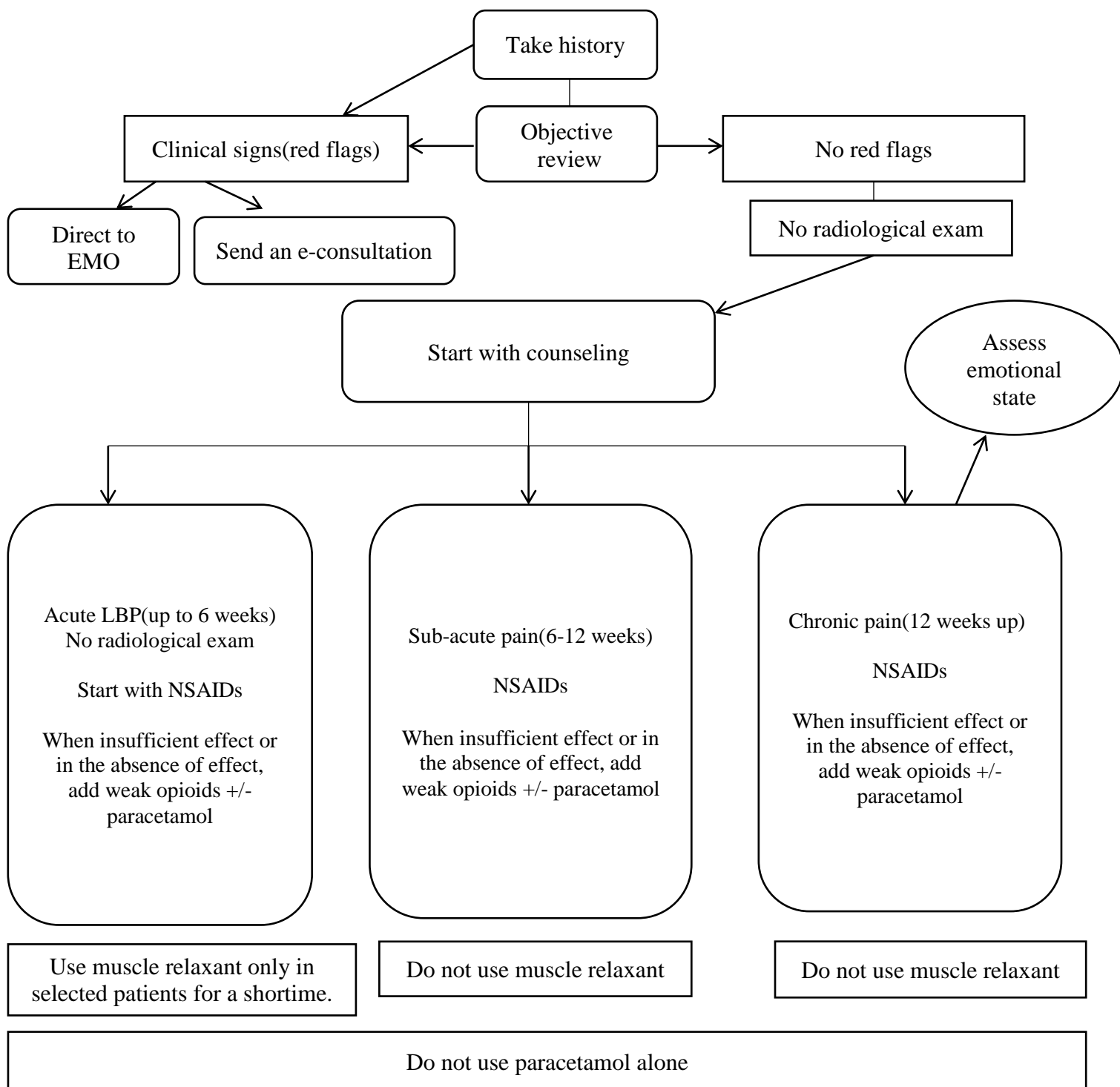
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Appendix 1 – Recommended patient algorithm



Source: LBP clinical guideline.

Appendix 2 – Interview Guide

INTRODUCTION

- Introducing the topic and aim of the thesis
- Determine their knowledge about the guideline and give a background on it.

MAIN INTERVIEW

Topic 1: The frequency of low back pain

1. How often do you come across LBP patients weekly?

Topic 2: Diagnosis of LBP

1. What is the general practice in managing the different types of LBP patients i.e. acute, sub-acute, and chronic pain?
2. What are the diagnostic procedures used?
3. What is your view on imaging (x-ray, MRI, and CT scan) when managing LBP?
4. What type of imaging is used the most, how often, and what findings are you hoping to get from the results?
5. Based on the recommendation in the guideline on imaging, what changes will it bring to the management of LBP patients?

Topic 3: Referral to Specialists

1. Which specialists do you refer LBP patients to and why?
2. The guideline recommended that patients should no longer be referred to neurologists..., what is your opinion?
3. Do you still refer patients to neurologists? If yes, why?

Topic 4: Treatment of LBP

1. What are the methods of treatment for the different types of pain?
2. What drugs are used and at what stage of the pain?

Topic 5: Impact of the guideline

1. Will the new guideline increase your workload (For family doctors) since you are required to manage these patients fully except when red or yellow flags are identified?

In the end, the doctor is asked for any other comments and thanked for their assistance.