7 Chronic Pain

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1 Summary

Introduction and statement of the problem

Chronic pain is conveniently defined as any pain that persists for at least three months despite sensible treatment. It ultimately affects almost half of all adults and is most likely to occur in older people. Chronic pain is known to have significant effects on health and well-being and is a major cause of lost work days. Prevalence data alone does not capture the burden of pain, or the disability which goes with the pain. For many conditions there is no certain remedy, so that health care needs have to consider prevalence, the burden of the pain (and disability), and just how treatable the pain is. In addition, health care needs for chronic pain extend from community through to hospital care. Patients with some chronic pain conditions, such as migraine, may manage with over the counter medications; others will require prescription medication and some will need other interventions. One organisational dilemma is the overlap of pain management between community and hospital care and the overlap between pain services and other hospital services. Between primary care and the pain service there are several groups of patients who may need referral. Between the pain clinic and other hospital services the reality is that patients who fail to respond to the best endeavours of the other services find their way to the pain clinic.

Sub-categories

The sub-categories used in this chapter are based on demand in a clinic which rarely refuses referrals and which has mature relationships with other services. The main categories of pain are musculoskeletal, cancer, face/head, neuropathic, vascular, chronic postoperative and medically unexplained painful syndromes. The most problematic growth in demand is for medically unexplained painful syndromes.

Prevalence and incidence

Chronic pain is common. One in two people report chronic pain lasting for three months or more, rising to two in three over 67 years. In a Primary Care Trust population of 100 000 people there would be about 5000 to 10 000 people with severe chronic pain. Roughly half the problems will be musculoskeletal, with back pain and arthritis predominant. Pain due to nerve damage and chronic postoperative pain are two of the other big categories. Musculoskeletal conditions have the most severe impact on quality of life.

Services available

Possible interventions include drugs, the conventional analgesics from paracetamol up to morphine, the unconventional analgesics for nerve pain, antidepressants and anticonvulsants, injections including continuous infusion devices, psychological behavioural management, and operations. Patients with chronic pain who fail to respond to the best endeavours of other services find their way to the pain clinic. The pain clinic may offer injection treatments, more expert handling of neuropathic pain medication and psychological expertise unavailable in the other services.

A total of 85% of Trusts provide a chronic pain service, which can vary from the 'spoke' provision with a single-handed consultant in a district hospital to the 'hub' in the university hospital with a multidisciplinary clinic offering a wider range of interventions. Limited cost data suggests a Primary Care Trust covering 100 000 patients should be budgeting between £100 000 and £200 000 per year for chronic pain services, allowing ten consultant sessions per 100 000 patients. Canadian data shows that users of speciality pain clinic services incur less direct health care expenditure than non users with similar conditions, about £1000 per patient per year. Without adequate provision for chronic pain management these people will bounce ineffectively and expensively around the health care system.

Effectiveness

There is a strong evidence base for pain management, for both efficacy and safety. Of the many interventions, pharmacological, non-pharmacological, invasive and non-invasive, from which to choose there is good evidence of effectiveness for many of the drug treatments, for behavioural management and for some of the invasive options. There is evidence that some of the alternative therapies do not improve pain, but may help patients cope better.

Models of care

The provision of chronic pain services should not be taken in isolation. Many treatments, drugs or procedures, are common to the different service providers; the additional expertise found in the pain service is prescribing expertise and the ability to do particular invasive procedures. The ideal promoted widely in the developed world is chronic pain services which are multidisciplinary. The medical components of such multidisciplinary services include rehabilitation, neurology, orthopaedic and psychiatric, together with clinical psychology, physiotherapy and pharmacy inputs as integral to the chronic pain service. The fact that 85% of Trusts surveyed had a chronic pain clinic is evidence that there is a perceived need for the service. There is little evidence as to what constitutes the optimal form of the service, and very little evidence on resource use and benefit gained. The current satellite and hub model of DGH and regional centre works to an extent, but there has been a dearth of organisational research into service provision. The need for good liaison with other specialities favours decentralised rather than centralised arrangements.

For the future, chronic pain, like other specialities, needs studies of complex interventions to show how to make the best of the interventions we have.

2 Introduction and statement of the problem

Chronic pain is conveniently defined as any pain that persists for at least three months despite sensible treatment, sweeping aside subtle distinctions between conditions which are always painful and conditions which are sometimes painful. Surveys that have examined the extent and significance of 'generic' chronic pain in the community have come to remarkably similar conclusions. Chronic pain ultimately affects almost half of all adults[1–6] and is most likely to occur in older people.

Chronic pain is known to have significant effects on health and well-being[7] and is a major cause of lost work days, from back pain[8] to migraine,[9] so it is important to define the extent of the problem systematically to specify health care needs. In 1999, The International Association for the Study of Pain published a book on the epidemiology of pain.[10] This should be referred to for greater detail on some of the conditions mentioned throughout the chapter.

Other publications have focused on the prevalence of chronic pain due to specific disease states, such as back pain,[8,11] fibromyalgia,[12] arthritis[13] and terminal and palliative care.[14] The aim of this chapter is to consider the prevalence and treatment options and thus the need for services for the pain conditions likely to be seen in chronic pain clinics.

Organisation and perception

One common organisational dilemma is the overlap of pain management between community and hospital care, and a common source of confusion is the overlap between the pain service and other hospital services. Between primary care and the pain service there are several groups of patients who may need referral:

- patients who fail to respond to conventional analgesics and need active management of neuropathic pain, which may involve use of 'off-label' medication
- patients requiring injection procedures not available in the community
- patients who need large doses of opioids
- patients without clear diagnosis and who are difficult to manage
- patients needing services not available in the community, e.g. devices or specialist psychological input.

Between the pain clinic and other hospital services the reality is that patients who fail to respond to the best endeavours of the other services find their way to the pain clinic. The pain clinic may offer injection treatments, more expert handling of neuropathic pain medication and psychological expertise unavailable in the other services. Apparent overlaps are often minimised by local understandings. Out of back pain triage, for instance, orthopaedics may retain younger less disabled patients and refer the older and more disabled to the pain clinic. The argument that the pain clinic service could be subsumed by another service, for instance by an orthopaedic clinic, ignores the fact that the special skills of the pain clinic are of value across a variety of pain conditions which the orthopaedic clinic would not want to see. The learning, maintenance and governance of those special skills require critical mass and demand, both of which would be lost or diluted if the pain clinic was subsumed by other services.

There is a striking contrast between the standing of palliative care and that of chronic pain. Both began at roughly the same time, but palliative care, unlike chronic pain, has formal recognition and is seemingly better presented to health commissioners. A coherence has emerged about the clinical framework for palliative care which is less obvious for chronic pain. Both services are necessary, but presenting a more coherent case for chronic pain would be a great deal easier with better data. In this context it is fair to say that absence of data does not mean absence of benefit. The data needed is more management and audit rather than research.

3 Sub-categories

The pain classification in **Table 1** is the basis for the sub-categories of chronic pain used in this chapter. This was developed from the simple manoeuvre of auditing clinics for one month. This is a classification by demand in a clinic which rarely refuses referrals and which has mature relationships with other services, and joint clinics with psychiatry, neurosurgery and neurology. Cancer has been included because pain clinics commonly provide invasive options for cancer pain at the behest of the palliative care team. The classification does not use mechanism of pain, apart from the generic grouping of neuropathic pain, and is a static snapshot. The most problematic growth in demand is for medically unexplained painful syndromes.

Table 1: Pain classification.

Musculoskeletal	Back*	degenerative disc disease osteoporotic collapse stenosis facet joint post-trauma/surgery ankylosing spondylitis* no clear pathology
	Neck*	degenerative disc disease whiplash*
	Fibromyalgia*/myofascial	polymyalgia rheumatica*
	Arthritis	osteoarthritis, rheumatoid
Cancer	Breakthrough cancer pain*	neuropathic, movement related, poor control with oral morphine
MUPS (medically unexplained painful syndromes)		non-cardiac chest pain abdominal pelvic chest pain
Face/head pain	Migraine* Headache* Trigeminal neuralgia*	
	Dental	atypical facial*
Neuropathic		diabetic neuropathy* postherpetic neuralgia* multiple sclerosis* post stroke* repetitive strain injury reflex sympathetic dystrophy (CRPS1) traumatic
Vascular	Peripheral	claudication*/Raynaud's*
	Central	angina*
Chronic postoperative pain		pain after amputation (phantom* and stump) chronic postoperative breast pain* chronic postoperative thoracotomy pain* chronic postoperative cholecystectomy pain*

* Asterisk means prevalence and incidence discussed below.

4 Prevalence and incidence

Chronic pain overall

Chronic pain affects almost half of all adults (**Table 2**).[1–6] Not all of this chronic pain is severe, or the conditions disabling, but chronic pain is likely to occur in older people, and in the largest UK survey[6] half of those with chronic pain had severe pain or were moderately disabled.

This recent data[6] shows that the prevalence of chronic pain in the community is high. Particular population groups can differ significantly in the prevalence of chronic pain and severe chronic pain, though the importance for practice of such significant differences is not easy to perceive.[15] The causes of any variations include differences in sampling methods, diversity in disease definitions used and differences in populations studied. The main thrust of all the findings, though, is for the bulk of chronic pain to have musculoskeletal causes (**Table 2**), and to occur more frequently in older people.[6] Chronic pain may be particularly common in older people in nursing homes or long-term care institutions.[16] In a Primary Care Trust population of 100 000 people there would be about 5000 to 10 000 people with severe chronic pain.

Sub-categories of chronic pain

Information was sought on the prevalence and incidence of the pain conditions marked with an asterisk in **Table 1**, using the methods detailed in Appendix 1. The prevalence and incidence of the sub-categories of pain that have not been covered in depth elsewhere are presented.

Musculoskeletal pain

Musculoskeletal disorders are the commonest cause of chronic incapacity, and half are due to back pain.

Back pain

A health care needs assessment on low back pain is published in the Health Care Needs Assessment second series[13] but it is also considered here as it is an important cause of chronic pain.

Back pain is one of the commonest causes of disability and absence from work, particularly during the productive middle years of adult life.[8] Seven percent of UK adults consult their GP each year, and back pain costs the NHS more than £500 million a year.[8] While 90% or more of patients with back pain recover within three months, those that do not may recover slowly and their demand for care is high.

Most recent reports estimating the burden of low back pain have focused mainly on acute back pain. There is less reliable data for chronic pain. One of the reasons for this is the lack of agreement about definitions of chronic back pain, the different time periods used and the intermittent nature of back pain.

Table 3 summarises the relevant reports. In addition, for self-reported low back pain in the community 6% of the population reported pain persisting for at least a year and 3% were still unable to work a year later.[11] In a primary care trust population of 100 000 people there might be as many as several thousand with back pain that is disabling and limiting.

Table 2: Prevalence of chronic pain.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Overall prevalence
Andersson 1994[1]	Prospective questionnaire	Random sample of 15% of the 25–74 population of two Swedish primary care districts	Chronic pain duration longer than 3 months	1,806 questionnaires sent, 1,609 responded (89%)	25–74	High prevalence, 50,000/100,000 in men and women, with high intensity pain about 30% of this. Greater in older population. Musculoskeletal had highest prevalence.
Brattberg *et al.* 1989[2]	Postal survey	Randomly chosen individuals in a single Swedish county	Obvious pain, longer than 6 months' duration	1,009 questionnaires sent, 672 responded (67%)	18–84	38 000/100,000 in men and 42,000/100 000 in women. Peak age 45–64. Musculoskeletal had the highest prevalence.
Birse & Lander 1998[3]	Cross-sectional telephone survey	Random sample of households, and of individuals within households, in Edmonton, Canada	Chronic pain was recurrent or persistent pain of at least 6 months' duration	592 individuals, 410 responded (69%)	Over 18	35,000/100,000 in men and 66,000/100,000 in women. Peak age younger and older women and older men. Musculoskeletal had the highest prevalence. Accidents and medical or surgical procedures were most common antecedants of chronic pain.
Bowsher *et al.* 1991[4]	Cross-sectional telephone survey	Random selection of households in Great Britain	Chronic pain defined as lasting on or off for more than the last 3 months	2,942, 1,037 respondents (35%)	Over 15	11,500/100,000 had chronic pain. This was higher in women than men (1.5 to 1). Prevalence higher in older age groups.
Chrubasik *et al.* 1998[5]	Cross-sectional postal survey	Every 71st person in a county in Baden-Würtenberg, Germany	Prolonged pain in preceding 6 months	2,127 questionnaires sent, 1,420 responded (67%)	18–80	47,000/100,000 reported prolonged pain, and in 87% it had lasted over a year, and in about half the pain was severe. In about 29% of respondents pain was severe or intolerable and had lasted more than a year. Musculoskeletal pain predominated.
Elliott *et al.* 1999[6]	Cross-sectional postal survey	Random sample of adults in Grampian region of Scotland	Pain or discomfort that persisted continuously or intermittently for longer than 3 months	5,036 questionnaires sent, 3,605 returned (72%)	Over 25	50,000/100,000 reported chronic pain (47,000/100,000 of general population). About half had severe pain or disability. Prevalence higher in older people. Musculoskeletal pain predominated.

Table 3: Chronic back pain.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Overall prevalence (per 100,000)	Occurrence
Cassidy *et al.* 1998[17]	Retrospective survey, PSAQ	General population, random selection residents of Saskatchewan province, Canada	Point prevalence data obtained by question 'do you have LBP at the present time?' Lifetime prevalence data by question 'have you ever had LBP in your lifetime?' Mannequin diagram for location of LBP Chronic pain questionnaire for 6 month period prevalence graded in severity PI (range 0–100) disability (range 0–6)	n=2,184 recruited, 55% (n=1,133) response rate	20 to 69	*Age-adjusted point prevalence: 28,400/100,000 (25,600 to 31,100) *Age-adjusted lifetime prevalence: 84,100/100,000 (81,900 to 86,300) *Age-adjusted 6 month period prevalence: Grade 1: Low intensity/low disability = 48,900/100,000 Grade 2: High intensity/low disability = 12,300/100,000 Grade 3 & 4: high disability/moderately to severely limiting = 10,700/100,000	
Davies *et al.* 1995[18]	Prospective 3 year survey, questionnaire and examination by physician at clinic consultation	Patients attending 10 pain clinics with back pain, North Britain	Consultant diagnosis of back pain	n=2,007, all reported on	median age 48.5 (IQR 40–60)		Occurrence: 35,000/100,000 complaining of pain in low back only Duration of pain: 73% > 2 years 27% > 10 years Pain intensity: 54% moderate, 18% severe, 40% unable to work (as stated by patient) Putative cause of pain: Degenerative: 56% Trauma: 21% Failed surgery: 16% No definite cause: 15%

Table 3: Continued.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Overall prevalence (per 100,000)	Occurrence
Thomas *et al.* 1999[19]	Prospective 1 year survey, questionnaire + clinical exam	Patients with low back pain, registered with two GPs, Manchester, UK	Persistent disabling low back pain defined as presence of both low back pain and disability Pain rated by VASPI 0–10% scale, disability rated by Hanover back pain activity schedule 0 to 100% scale	n=442, 67% (n=246) response rate, n=180 analysed	18–75		Occurrence: at 1 week after consultation: 73% at 3 months: 48% at 12 months: 42% Period prevalence persistent disabling low back pain at each follow-up visit: 34%

Abbreviations: PSAQ – postal self-assessed questionnaire; * age-adjusted to 1995 Saskatchewan mid-year population; LBP = low back pain; PI = pain intensity; IQR = inter quartile range; VASPI = visual analogue pain intensity; DHSS = Department of Health and Social Security.

Ankylosing spondylitis

Disease prevalence

The prevalence of ankylosing spondylitis (AS) correlates with the prevalence of HLA-B27 antigen, and for the UK is estimated to be 1 to 2% of the population.[20] There are surveys using strict diagnostic criteria from Europe and North America (**Table 4**). The largest population-based survey was in Norway, based on 21 329 randomly selected subjects.[21] The prevalence of AS was 1100 to 1400/100 000, and was between four and six times higher in men than in women. In a prospective study of 273 blood donors in Berlin, the prevalence of AS was 900/100 000.[22] A large American population-based survey using retrospective record review of Minnesota residents between 1935 and 1989 found an age- and sex-adjusted incidence of 7.3 per 100 000 person-years (95% CI 6.1–8.4). The age-adjusted incidence was four times higher in men at 11.7 per 100 000 person-years (95% CI 9.6–13.8) than in women at 2.9 per 100 000 person-years (95% CI 2.0–3.9).[23]

Pain prevalence

Of 14 539 AS patients who completed a back pain questionnaire, 2907 complained of pain.[21] In a retrospective survey of 121 AS patients in Norway, 71 of the 100 responders reported daily pain and 60 used analgesics every day.[26] In the Minnesota study back pain was reported by 96% and neck pain by 27% at presentation.[23] Pain will therefore be a chronic feature for between 25% and 50% of AS patients. In a primary care trust population of 100 000 people there would be about 30 new cases of AS with pain a year.

Neck pain

Seven population-based surveys have examined the prevalence of self-reported neck pain in random samples of the general population (**Table 5**). With the exception of one Canadian and one British study, all were Scandinavian. There were no studies reporting the incidence of chronic neck pain.

The prevalence of chronic neck pain in adults was of the order of 5000 to 20 000/100 000, with most estimates about 10 000/100 000 (**Table 5**). There was some evidence that prevalence was higher in women than in men. Significantly disabling chronic neck pain affected 5000/100 000 in Canada.[28] In a primary care trust population of 100 000 people there would be about 5000 cases.

Whiplash

One nine-year prospective study of patients admitted to an accident and emergency department was conducted in the UK, to determine the prevalence and incidence of neck sprain following a road traffic accident (RTA).[32] Of 6149 patients admitted following injuries sustained in an RTA, 46% (2801) were diagnosed with neck sprain.

A 25 year retrospective medical record review in Holland determined the prevalence of neck sprain in all patients admitted to an accident and emergency department either due to an RTA[33] or due to injury from another cause.[34] Of 1374 neck sprain patients 51% (694) were sustained in a car accident and 49% (680) were not (NCA). For NCA, the five year period prevalence rates increased over time from 6.5 per 100 000 (1970 to 1974) to 28.5 per 100 000 (1990 to 1994). The age group at highest risk was 15 to 19 year olds with a prevalence of 39.2 per 100 000; accidental falls caused 25% and sports 24%. For neck sprain due to RTA, five year period prevalence rates increased over time from 34 per 100 000 (1970 to 1974) to 402 per 100 000 (1990 to 1994). The age groups at highest risk were 25 to 29 year olds with prevalence of 28.3 per 100 000, and 40 to 44 year olds with prevalence of 27.9 per 100 000.

There appears to have been a ten-fold increase over 25 years in the prevalence of neck sprain, particularly following RTA.

Table 4: Chronic pain due to ankylosing spondylitis.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Incidence	Overall prevalence	Male prevalence	Female prevalence
Braun *et al.* 1998[22]	Survey and prospective screening with questionnaire and physical examination	Blood donors resident in Berlin, HLAB27-positive age- and sex-matched with HLAB27 negative blood donors	AS diagnosis using modified New York criteria: radiographs showing bilateral changes in SI joints > grade II	n=320 recruited, n=273 (85.3%) responded to initial questionnaire	18–65 years		AS diagnosed in 9/140 B27-positive donors calculated prevalence in population Berlin = 860/100,000		
Carbone *et al.* 1992[23]	Retrospective review of medical records, 1935–1989	General population, residents Rochester county, Minnesota, USA	Modified New York criteria for AS: Radiographic evidence of sacroilitis with 1/3 clinical criteria (inflammatory back pain 3 month duration, limitation of movement of lumbar spine in sagittal and frontal planes, reduced chest expansion)	Population for Rochester 1930 = 18,931; 1990 = 69,995	All ages	Incidence rates calculated assuming the entire population is at risk: age- and sex-adjusted rate = 7.3/100,000 (6.1–8.4) Men: age-adjusted 11.7/100,000 (9.6–13.8) Women: age-adjusted 2.9/100,000 (2.0–3.9)			

Table 4: Continued.

Gran *et al.* 1985[21]	Prospective survey 1979–80, postal SAQ, clinical exam	General population, residents of Tromsø, Norway random selection (n=449, 56%) further selected for clinical examination	New York diagnostic criteria, definite AS defined as X-ray changes of sacroiliac joints	n=21,329 recruited, n=14,539 responded, (68.2%)	Adults aged 20–54		1,100 to 1,400/ 100,000	1,900 to 2,200/ 100,000	300 to 600/ 100,000
Julkunen and Korpi 1984[24]	Health examination surveys, part of mini-Finland health survey, clinical exam and X-ray	General population, three population samples in Finland Study 1 and 2 were random samples, study 3 includes 196 patients with back pain	study 1: diagnosis by X-ray 10 × 10 of chest study 2: normal-sized chest X-ray study 3: lumbar spine X-ray	study 1: n=6,176 study 2: n=750 study 3: n=580	study 1 = 30+ yrs study 2 = 30+ yrs. Study 3 = 30 to 64 yrs		study 1: 400/ 100,000 study 2: 1,600/ 100,000 study 3: 1,000/ 100,000		
Underwood and Dawes 1995[25]	Prospective study of patients presenting with back pain over 1 year	Suburban general practice in England	Short screening questionnaire, plus detailed diagnosis by one observer	6,600 patients	All ages	30/100,000 in 1 year (2 of 313 patients presenting with back pain)			

Table 5: Chronic neck pain.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Prevalence (per 100 000)		
						Overall	Male	Female
Anderson *et al.* 1993[1]	Prospective survey, PSAQ with a drawing of neck	General population, random selection of patients registered with two primary health care districts, Sweden	Persistent or regular recurrent pain more than 3 months in the neck	n=1,806, 90% (n=1,624) response rate	25–74		14,500/100,000	19,100/100,000
Bovim *et al.* 1994[27]	Retrospective survey, PSAQ	General population, random selection of residents Norway	Questionnaire asked about troublesome neck pain within the last year, and duration Chronic neck pain was defined as lasting more than 6 months	n=10,000 sent questionnaire, 77% (n=7,643) response rate	18–76	13,800/100,000	10,000/100,000	19,000/100,000
Brattberg *et al.* 1989[2]	Survey, PSAQ	General population, random sample, Sweden	Any pain, or obvious pain > 6 months	n=1,009, 82 % (n=827) response rate	18–84	Point prevalence any pain > 6 months: 19,300/100,000 obvious pain > 6 months: 12,700/100,000		

Table 5: Continued.

Côté *et al.* 1998[28]	Prospective survey, PSAQ	General population, random selection of residents Saskatchewan province	Acute and chronic, neck pain described as pain between occiput and 3rd thoracic vertebra Chronic neck pain questionnaire used to classify severity of pain	n=2,184 recruited, 55% (n=1,420) response rate	20–69	High-intensity/low disability 10,100/ 100,000 (8,200 to 11,900) significantly disabling neck pain 4,600/100,000 (3,300 to 5,800) 5.4 % had pain lasting 90 to 180 days in last 6 months		
Jacobsson *et al.* 1989[29]	Prospective survey, questionnaire and physical exam	General population, random selection, residents of Malmo, Sweden	Neck pain with/ without brachalgia > 6 weeks	n=552, 81% (n=445) response rate	50–70	1 year period prevalence: 6,500/ 100,000 (4,200–8,800)	3,000/100,000	10,000/100,000
Mäkelä *et al.* 1991[30]	Prospective survey, questionnaire and clinical exam	General population, random selection, residents of Finland	Current or previous neck pain for > 3 months with physical signs	n=8,000, 90% (n=7,217) response rate	over 30		Point prevalence chronic neck syndrome: 9,500/100,000	Point prevalence chronic neck syndrome: 13,500/100,000
Takala *et al.* 1982[31]	Retrospective survey, PSAQ and clinical exam	General population, random selection residents, Finland	Neck ache, stiffness, soreness and frequency of symptoms	n=2,439, 93% (n=2,268) response rate	40–64		1 year period prevalence: < 50 years 13,000/100,000 > 50 years 20,000/100,000	1 year period prevalence: < 50 years 13,000/100,000 > 50 years 22,000/100,000

Polymyalgia rheumatica

The incidence and prevalence of polymyalgia rheumatica (PMR) has been determined in several hospital- or clinic-based prospective studies from Scandinavia, North America and Southern Europe, all using similar diagnostic criteria (**Table 6**). All of the studies concluded that PMR is a common disease of the elderly, rarely occurring under the age of 50. Prevalence and incidence figures vary rather a lot. For instance, prevalence estimates ranged from 30/100 000 for all ages to 2000/100 000 in an over-65 population. Incidence was also age-related. In a primary care trust population of 100 000 people there would be about 50 new cases a year, and about 500 at any one time.

Fibromyalgia

Fibromyalgia (chronic widespread pain) is a poorly defined complex pain syndrome characterised by chronic widespread pain and multiple tender points. It is the third commonest rheumatic complaint in Canada (23% of new patient rheumatology referrals).[43]

Four studies using American College of Rheumatology (ACR) criteria have been conducted to determine the prevalence of fibromyalgia in the general population (**Table 7**). All of the studies used a two stage screening process, an initial self-assessed questionnaire followed by interview, and clinical examination of tender points for those reporting chronic widespread pain. Chronic widespread pain appears to affect about 10 000/100 000 adults, though fibromyalgia may be diagnosed in 5–10% of those with chronic widespread pain. Trigger points are, however, poor indicators of fibromyalgia,[44] and trigger point numbers are unchanged by effective treatments.[45] It is perhaps better to think of the condition as a spectrum of musculoskeletal disorders, some of which will be severe.

In a primary care trust population of 100 000 people there would be about 10 000 cases of chronic widespread pain, with perhaps 200–1000 being defined as fibromyalgia by current criteria.

Cancer pain

Of every 100 patients with cancer some 60 will have moderate or severe pain. Most, some 80%, of these 60 will obtain at least moderate relief of their pain with appropriate use of the oral drugs on the pain 'ladder' (**Figure 1**), starting with simple analgesics and non-steroidal anti-inflammatory drugs (NSAIDs) and then using oral opioids, usually oral morphine.

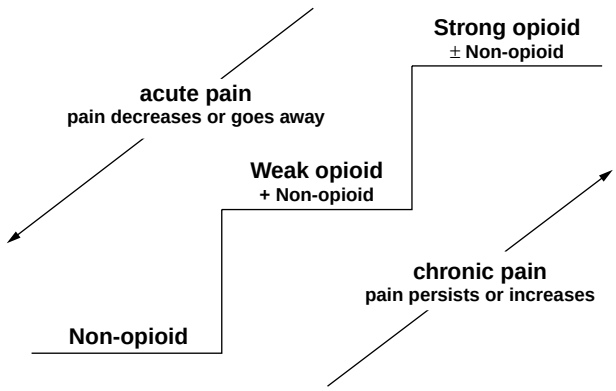

Figure 1: Pain treatment 'ladder'.

Table 6: Chronic pain due to polymyalgic rheumatica.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Incidence (per 100,000 95% CI)			
						Overall	Men	Women	Prevalence (per 100,000 population 95% CI)
Bengtsson and Malmvall 1981[35]	Retrospective review of medical records, 1973–75	Residents of a Swedish city referred to clinic or hospital	Diagnostic criteria: 1. Pain and/or stiffness affecting proximal muscle groups without evidence of inflammatory arthritis 2. ESR elevated 3. No evidence of other inflammatory or malignant disease 4. Prompt and persistent response to steroid therapy	n=126 patients identified and reported upon	51–87	PMR alone: 6.7/100,000 for all ages PMR plus GCA: 29/ 100 000 over 50s	PMR alone: 3.4/100,000 for all ages PMR plus: GCA 20/ 100,000 over 50s	PMR alone: 9.8/100,000 for all ages PMR plus GCA: 35/ 100,000 over 50s	
Boesen and Sorensen 1987[36]	Prospective study, 1982–85	Residents of a Danish county, diagnosed with PMR referred to the study cohort, GP or hospital referrals	Diagnostic criteria: 1. Pain and/or stiffness affecting proximal muscle groups > 2 weeks 2. ESR > 40 mm/hour 3. Age > 50 years 4. No evidence of other inflammatory disease 5. Prompt and persistent response to steroid therapy	n=31 PMR alone n=10 PMR + temporal arteritis (TA) total population approx. 200,000	50+	19/100,000 for all ages 68/100,000 over 50s	7.4/100,000 for all ages 28/100,000 over 50s	32/100,000 for all ages 108/100,000 over 50s	30/100,000 for all ages 104/100,000 over 50s
Elling *et al.* 1996[37]	Prospective, longitudinal study, 1982–94 using medical record data	Residents of 13 counties in Sweden, all incident cases of PMR recorded in 2 general hospitals reported to national patient register	States diagnosed using established criteria	n=10,818 analysed	50+	41/100,000 (30 to 67)			

Table 6: Continued.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Incidence (per 100,000 95% CI)			
						Overall	Men	Women	Prevalence (per 100,000 population 95% CI)
Gran and Myklebust 1997[38]	Prospective, longitudinal survey, 1987–94, retrospective review of medical records of referrals to different hospital departments	Residents of Aust Agder county, Norway that were referred to regional hospital suspected of having PMR	PMR defined as: 1. Age > 50 years, bilateral aching and morning stiffness (> 30 min) for at least 1 month 2. Involving 2 of the following areas: neck or torso, shoulders or proximal regions of the arms and hips or proximal aspects of the thighs 3. ESR > 40 mm/hour Patients who met two of the three criteria and who had a prompt response to corticosteroid therapy also included	n=256, all patients reported on Includes 32 patients retrospectively included following initiation of drug treatment Prospective patients included in study before treatment started	50+	113/100,000	83/100,000	138/100,000	
Kyle *et al.* 1985[39]	Prospective study, questionnaire, interview and clinical exam	All patients > 65 years registered with GP practice, Cambridge, UK	Diagnostic criteria: 1. Shoulder and pelvic girdle pain, primarily muscular 2. Morning stiffness 3. Duration > 2 months 4. ESR > 30 mm or C reactive protein > 6 μ/ml 5. Absence of inflammatory or muscle disease 6. Prompt and dramatic response to steroid therapy	n=5,500 patients registered, n=650 ± 65 years recruited, 89% (579) responded, n=32 studied further	± 65	About 230 per 100,000			Prevalence about 2,000 per 100,000

Table 6: Continued.

Northridge and Hill, 1995[40]	Retrospective review of medical records	UK general practice	Patients with presumptive diagnosis treated with steroids	13,600 in one practice 72,400 in other practices	All ages	35–70/ 100,000 in one practice 55/100,000 in other practices			550/100,000 in one practice 457/100,000 in other practices
Salvarani *et al.* 1991[41]	Longitudinal study (1980–88), by medical record review	All residents of Reggio Emilia metropolitan area (Italy) referred to the regional hospital	PMR defined as: 1. Age > 50 years, bilateral aching and morning stiffness (> 30 min) for at least 1 month 2. Involving two of the following areas: neck or torso, shoulders or proximal regions of the arms and hips or proximal aspects of the thighs 3. Erythrocyte sedimentation rate (ESR) > 40 mm/hour Included patients met two of the three criteria or had a prompt response to corticosteroid therapy	n=76 residents identified, all included in incidence data	All ages	4.9/100,000 all ages 12.7/100,000 over 50s	3.4/100,000 all ages 9.7/100,000 over 50s	6.4/100,000 all ages 14.9/100,000 over 50s	
Salvarani *et al.* 1995[42]	Longitudinal study (1970–91), medical record review (Mayo clinic)	Clinic-based population, all residents of Olmsted County, Minnesota, USA seeking medical care	PMR defined as: 1. Age > 50 years, bilateral aching and morning stiffness (> 30 min) for at least 1 month 2. Involving two of the following areas: neck or torso, shoulders or proximal regions of the arms and hips or proximal aspects of the thighs 3. ESR (Westergren) > 40 mm/hour Included patients met two of the three criteria or those that had a prompt response to corticosteroid therapy	n=245 residents met diagnostic criteria, all reported on and included in incidence data	50+	53/100,000 (46 to 59) in over 50s	40/100,000 (31 to 49) in over 50s	62/100,000 (52 to 71) in over 50s	Prevalence among persons > 50 years (1/1/ 92) = 627 (527 to 726)

Abbreviations: ESR = erythrocyte sedimentation rate; PMR = polymyalgia rheumatica.

Table 7: Chronic pain due to fibromyalgia.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Prevalence (%)	Men	Women
Croft *et al.* 1993[46]	Cross-sectional survey, SAQ	General population, two general practices in Cheshire, England	ACR definition of chronic widespread pain more than 3 months	n=2,034, 66% response rate (1,340)	18–85	Age- and sex-adjusted point prevalence: 11,200/100,000	Crude point prevalence: 9,400/100,000	Crude point prevalence: 15,600/100,000
Forseth and Gran 1992[47]	Survey, SAQ and clinical exam	General population, random selection female residents in Arendal, Norway	ACR diagnostic criteria; widespread pain, and tenderness in at least 11/18 sites	n=2,498 women, response rate 81.5% (2038) 217 agreed to clinical exam	20–49			Point prevalence of fibromyalgia 10,500/100,000 (95% CI 6,400 to 14,600)
Prescott *et al.* 1993[48]	National Health Interview Survey, interview and clinical exam	General population, random selection, Denmark	ACR diagnostic criteria; widespread pain, and tenderness in at least 11/18 sites	n=1,595, 1,219 interviewed, (76% response rate)	18–79	Point prevalence fibromyalgia: 660/100,000 (95% CI, 280 to 1290)		
Wolfe *et al.* 1995[12]	Prospective survey, PSAQ, sub-sample interviewed and examined	General population, random selection residents of Wichita, Kansas, USA	ACR diagnostic criteria; widespread pain, and tenderness in at least 11/18 sites	n=2,582 households, 74.8% response rate, n=3,006 persons n=392 categorised as having chronic, widespread pain	over 18	Point prevalence chronic widespread pain: 10,600 (95% CI 9,500 to 11,700) Point prevalence fibromyalgia (age- and sex-adjusted): 200/100,000 (96% CI 140 to 270)	Point prevalence fibromyalgia: 50/100,000 (95% CI 0 to 100)	Point prevalence fibromyalgia: 340/100,000 (95% CI 230 to 460)

Abbreviations: ACR = American College of Rheumatology, SAQ = self-assessed questionnaire.

Particular problems in the 20% who do not achieve relief with this regime are found with neuropathic (nerve damage) pain, and with incident pain. Incident pain is a bad term, but encompasses movement-related and neuropathic pain. Even more confusing is the American term 'breakthrough pain', which is used both to describe incident pain and pain in patients whose oral morphine dosing is inadequate.

Breakthrough cancer pain

There are relatively few studies describing this phenomenon. On the whole these studies report the number of patients experiencing breakthrough pain, but it has either not been evaluated as a primary outcome, or it has not been defined in detail. Two studies provide the most reliable evidence for the occurrence of breakthrough pain in cancer patients (**Table 8**).[49,50] The first, a prospective study, reports on 63 adult patients admitted to a hospital pain service. On admission to the study, all patients had well-controlled baseline pain (moderate intensity or less). Breakthrough pain that occurred in the previous 24 hours, defined as temporary flares of severe or excruciating pain with stable opioid dose, was reported by 63% (41) patients. In a later study by the same authors, a cross-sectional survey of 178 in-patients with cancer was conducted.[50] Of the 164 who met the inclusion criteria for controlled background pain, 51% (84) experienced breakthrough pain during the previous day. In both studies the characteristics of the breakthrough pains were varied, and were experienced many times during the day (median 6; range 1–60) lasting from seconds to hours. Precipitating factors were often identified, but pains occurred without warning half of the time. Bruera *et al.* described observations on the occurrence and nature of incident pain in 118 cancer patients enrolled in an open uncontrolled trial.[51] They identified 19% (23) with severe incident pain defined as spontaneous or provoked acute exacerbations of pain occurring against a background of good opioid pain control. Movement was the precipitating factor in all of the cases.

Face or head pain

Migraine

Numerous epidemiological studies have been published reporting prevalence rates of migraine headache. These rates vary widely from study to study depending on the disease definition used and the age and gender composition of the study population.[52] Only population-based studies that met standard International Headache Society (IHS) diagnostic criteria for migraine headache, were conducted in European or North American adults, and that reported prevalence rates of migraine for men and women separately, were included here.

Twelve studies meeting these criteria were identified, none in the UK (**Table 9**). Ten reported prevalence and two incidence. Migraine prevalence was higher in women (14 000 to 22 000/100 000) than in men (5000 to 8000/100 000, though one small study of older adults in Italy recorded no men with migraine). In five studies investigating a range of age groups, migraine prevalence was highest in 30–45 year old women and men. These findings are consistent with those reported in a meta-analysis of 18 studies of all ages and from all countries.[53]

The incidence of migraine headache has been estimated from two large population-based surveys in the USA. Medical records of 6478 patients with a diagnosis of headache were surveyed to determine the incidence of clinically detected migraine (IHS criteria) in 629 patients.[54] Age-adjusted incidence was 137 per 100 000 per person-years in men, and 294 per 100 000 per person-years in women. Incidence of migraine peaked in women (20–24 years) later than in men (10–14 years). Using a cross-sectional telephone interview of 10 169 subjects and estimated migraine incidence using reported age of onset, migraine with aura peaked in men at around five years of age, and without aura between 10 and 11 years.[55]

Table 8: Breakthrough pain in cancer patients.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Occurrence
Bruera *et al.* 1992[51]	Open, uncontrolled trial, pain assessment	Cancer patients admitted to a palliative care unit, Canada	Incident pain defined as pain under good control with opiate analgesics while resting, and severe acute exacerbations that occurred spontaneously or on movement	118 patients admitted	63 ± 8 years	23/118 (19%) reported incident pain
Portenoy and Hagen 1990[49]	Prospective survey, questionnaire	Cancer patients attending pain service at a cancer hospital, USA	Breakthrough defined as pain > moderate intensity following pain of moderate or less intensity for > 12 hours/day in previous 24 hours, and stable opioid dose for > 2 days Pain intensity rated on 5 point categorical scale (none, slight, moderate, severe, excruciating)	63, all patients reported on	15–81 years	Occurrence of breakthrough pain 41 (63%) in 24 hours preceding the interview Tables in paper report pain frequency, type of onset and duration Gives data on incident and spontaneous pain
Portenoy *et al.* 1999[50]	Cross-sectional survey, questionnaire and interview	Hospital inpatients with cancer, randomly selected, USA	Breakthrough pain defined as one or more episodes of severe or excruciating pain in patients with controlled background pain The number of breakthrough pain episodes was recorded in addition to location, quality, and precipitating factors	178, 92% (164) included in analysis, 14 (7.8%) excluded due to uncontrolled background pain	26–77	84 (51%) reported breakthrough pain on preceding day

Table 9: Migraine.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Prevalence per 100 000		
						Men	Women	Overall
Breslau *et al.* 1991[57]	Survey, face-to-face interview	HMO population, random sample, USA	IHS	1,200 84% (1007) response rate	21–30	Lifetime prevalence: 7,000/100,000 1 year period prevalence: 3,400/100,000	Lifetime prevalence: 16,300/100,000 1 year period prevalence: 12,900/100,000	Lifetime prevalence: 12,800/100,000
Franceschi *et al.* 1997[58]	Longitudinal study, clinical exam	Elderly population, random sample, Italy	IHS	312	65–84	1 year period prevalence: 0/100,000	1 year period prevalence: 2,000/100,000	
Göbel *et al.* 1994[59]	Survey, face-to-face interview	General population, random sample, Germany	IHS	5,000 8,1% (4,062) response rate	18 +	1 year period prevalence: 7,000 (6,000 to 9,000)	1 year period prevalence: 15,000/100,000 (13,000–17,000)	1 year period prevalence: 11,000/100,000 (10,000–13,000)
Henry *et al.* 1992[60]	Survey, face-to-face interview	General population, stratified quota with random element, France	IHS	4,204	15 +	Lifetime prevalence: 4,000/100,000	Lifetime prevalence: 11,900/100,000	Lifetime prevalence: 8,100/100,000 (6,200–10,000)
Linet *et al.* 1989[61]	Survey, telephone interview	General population, residents of Washington County, Maryland USA	IHS	10,000	12–29	1 year period prevalence: 5,300/100,000	1 year period prevalence: 14,000/100,000	
Michel *et al.* 1996[62]	Survey, PSAQ	General population, France	IHS	6,000 households 80% (n=9,411) response rate	18 +	3 month period prevalence: 8,000/100,000	3 month period prevalence: 18,000/100,000	3 month period prevalence: 15,000/100,000 (12,000–14,000)
O'Brien *et al.* 1994[63]	Survey, telephone interview	General population, random sample, Canada	IHS	4,235 66% (2,922) response rate	18 +	Lifetime prevalence: 7,800/100,000 1 year prevalence: 7,400/100,000	Lifetime prevalence: 24,900/100,000 1 year prevalence: 21,900/100,000	

Table 9: Continued.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Prevalence per 100 000		
						Men	Women	Overall
Rasmussen *et al.* 1991[64]	Prospective survey, clinical exam	General population, random sample, Denmark	IHS	1,000 75.9% (740) response rate	25–64	Lifetime prevalence: 8,000/100,000 1 year period prevalence: 6,000/100,000 (4,000–9,000)	Lifetime prevalence: 25,000/100,000 1 year period prevalence: 15,000/100,000 (12,000–19,000)	Lifetime prevalence: 16,000/100,000 1 year period prevalence: 10,000/100,000 (8,000–13,000)
Stewart *et al.* 1992[65]	Survey, PSAQ	General population, random sample, USA	IHS	20,468 63.4% response rate	12–80	1 year period prevalence: 5,700/100,000	1 year period prevalence: 17,600/100,000	
Stewart *et al.* 1996[66]	Survey, telephone interview	General population, USA	IHS	12,000	18–65	1 year period prevalence: 8,200/100,000	1 year period prevalence: 19,000/100,000	
						Incidence per 100 000 person-years		
						Men	**Women**	**Overall**
Rozen *et al.* 1999[56]	Retrospective survey, medical record review, 1989–90	General population with medically recognised migrainous disorder, Olmsted County, Minnesota, USA	IHS		All ages	194/100,000	482/100,000	
Stang *et al.* 1992[54]	Retrospective survey, medical record review, 1979–81	General population with medically recognised migrainous disorder, Olmsted County, Minnesota, USA	IHS	6,476 records reviewed	All ages	137/100,000	294/100,000	216/100,000

In women, migraine incidence with aura peaked between ages 12 and 13 and migraine without aura between 14 and 17, giving a higher migraine incidence peaking at a lower age. The difference may be due to the different data collection methods. A recent report showed an increase in the incidence of migraine in the USA in women of reproductive age.[56]

A primary care trust of 100 000 people will have about 10 000 women and 2000 men who suffer from migraine. Only about one in five or six will seek medical care, the remainder using analgesics available off prescription, or no treatment at all.[67]

Headache

Based on five UK population-based studies in adults, the one year period prevalence of headache ranged from 70–83% in men and 78–90% in women.[68–72] These studies all used disparate, and in many cases unclear, headache definitions, and therefore do not provide reliable prevalence estimates.

When a more restricted headache definition was used, such as frequent headache as defined by IHS criteria, five population-based studies in adults from North America and Europe were found (**Table 10**). All of the studies used validated methods such as clinical examination, telephone interview or self-assessed questionnaires. In four studies, the one year prevalence of chronic tension-type headache (CTTH) was 1000 to 3000/100 000, and was reported more frequently by women than men.[58,73–75] One German study reported a lifetime prevalence of CTTH of 1% for women. There were no cases of CTTH reported by men in this study.[59]

The incidence of cluster headaches[76] was 10/100 000.

Trigeminal neuralgia

Incidence and prevalence of trigeminal neuralgia are difficult to estimate due to the lack of epidemiological studies with clear diagnostic criteria. Only two large population-based studies reported incidence rates for the UK[77] and USA,[78] respectively (**Table 11**).

From the medical records of the 70 000 residents of Carlisle between the years 1955–6 an incidence of 2.1/100 000 was derived.[77] The authors stated that the true incidence might have been higher because local ENT hospitals were not included. A retrospective review of the medical records of the 60 000 residents of Rochester county, Minnesota gave an annual incidence for the first episode of trigeminal neuralgia of 4.7 per 100 000 (95% CI 3.6 to 5.8).[78] Incidence rates increased with age, and were not significantly different between men and women. The authors also reported a crude prevalence rate by multiplying the annual incidence by the median survival time in years. They estimated that the prevalence of a current or recent attack of trigeminal neuralgia in a population aged 50–70 years would be < 1 in 250 or 400 per 100 000.

Only one direct estimate of trigeminal neuralgia prevalence was found.[79] In a survey of 1144 residents of a French village, 86% of the residents completed a neurological questionnaire, and three months later 261 were followed up with a neurological examination. One man was diagnosed with trigeminal neuralgia, diagnostic criteria not stated, to provide a prevalence estimate of 100/100 000.

Atypical facial pain

No studies providing reliable prevalence and incidence data for atypical facial pain were found.

Table 10: Headache.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Prevalence per 100,000		
						Men	Women	Overall
Franceschi *et al.* 1997[58]	Longitudinal study, clinical exam	Elderly population, random sample, Italy	IHS criteria for headache classification	n=312	65–84	1 year period prevalence CTTH: 1,200/100,000	1 year period prevalence CTTH: 4,000/100,000	1 year period prevalence CTTH: 2,600/100,000
Gobel *et al.* 1994[59]	Survey, face-to-face interview	General population, randomly selected, Germany	IHS criteria for headache classification	n=1,200, 8,4% (n=1,007) response rate	21–30	Lifetime prevalence CTTH: 0/ 100,000	Lifetime prevalence CTTH: 1,000/100,000	Lifetime prevalence CTTH: 1,000/100,000
Rasmussen 1995[73]	Survey, recruitment by telephone followed by examination and interview by a physician	General population, randomly selected residents Copenhagen county, Denmark	IHS criteria for headache classification	n=1,000 selected, 25 unattainable, 75.9% (n=790) response rate	25–64	1 year period prevalence: Tension-type headache: 63,000/100,000 ETTH: 56,000/100,000 CTTH: 2,000/100,000	1 year period prevalence: Tension-type headache: 86,000/100,000 ETTH: 71,000/100,000 CTTH: 5,000/100,000	

Table 10: Continued.

						Incidence per 100000		
						Men	**Women**	**Overall**
Scher *et al.* 1998[75] and Schwartz *et al.* 1998[74]	Survey, telephone interview	General population, randomly selected households, Baltimore County, USA	Type of headache per IHS criteria, either migraine or frequent headache Frequent headache defined as > 180 headaches/year and further subclassified: chronic tension-type headache (CTTH), frequent headache with migrainous features (FH/M) and other frequent headache (FH/O)	19,840 households selected, 6.7% could not be contacted Interview completed on 13,343 (77.4%) eligible subjects	18–65	1 year period prevalence: ETTH: 36,000/100,000 Frequent headache: 2,800/100,000 CTTH: 1,600/100,000 FH/M: 700/100,000 FH/O: 500/ 100,000	1 year period prevalence: ETTH: 42,000/100,000 Frequent headache: 5,000/100,000 CTTH: 2,600/100,000 FH/M: 1,700/100,000 FH/O: 800/100,000	1 year period prevalence: ETTH: 38,000/100,000 Frequent headache: 4,100/100,000 CTTH: 2,200/100,000 FH/M: 1,300/100,000 FH/O.: 600/100,000
Swanson *et al.* 1994[76]	Case ascertainment from population	Olmsted County, Minnesota, USA	Cluster headaches, IH definition with minor variations	6,476 respondents in migraine and headache survey	Adults	15.6/100,000 (8.9–22.3)	4.0/100,000 (0.4–7.6)	9.8/100,000 (6.0–13.6)

Abbreviations: IHS = International Headache Society; CTTH = chronic tension type headache; ETTH = Episodic tension type headache.

Table 11: Trigeminal neuralgia.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Incidence per 100 000 population				
						Overall	Men	Women	Prevalence	Natural history
Brewis *et al.* 1966[77]	Retrospective review of medical records	General population, residents of Carlisle, UK	Disease definition not given, but states that diagnosis by consultant physician was accepted, cases where diagnosis not clear further investigated, most excluded	n =70,000	0–85+	Annual age adjusted incidence 1955–61: 2/100,000				
Katusic *et al.* 1990[78]	Retrospective review of medical records 1945–84 with diagnosis confirmed by a neurologist by clinical examination	General population, all residents of Rochester County, Minnesota, USA	Diagnosis of trigeminal neuralgia per Rushton and Olafson, briefly: 1. Brief paroxysms of severe pain of trigeminal nerve 2. Unpredictable remissions and exacerbations of pain 3. No evidence of sensory or motor deficit of involved nerve 4. Occurrence of trigger zones	n=222 medical records identified with diagnosis of trigeminal neuralgia, 147 excluded from study due to not meeting diagnosis criteria, not meeting residency requirements or onset outside of study time period	24–93	Annual incidence of first episode of trigeminal neuralgia 1945–84: 4.7/100,000 (3.6–5.8)	Annual incidence of first episode of trigeminal neuralgia 1945–84: 3.4/100,000 (1.9–4.9)	Annual incidence of first episode of trigeminal neuralgia 1945–84: 5.9/100,000 (4.3–7.5)	Prevalence may be derived by multiplying the annual incidence by the median survival measured in years, providing that incidence does not change with time An estimate of the prevalence of a current or recent attack of trigeminal neuralgia in a population aged 50–70 years would be < 1:250 or 400:100,000	Median number of episodes = 3 (range 1–11), 29% had 1 episode, 19% had 2, 24% had 3, 28% had 4–11 episodes Median length of an episode was 49 days, mean 116 days (range 1–1,462 days) 65% patients were estimated to have a second episode within 5 years, 77% within 10 years Among the 53 patients with 2 or more episodes, 66% experienced a third episode within 5 years of the second episode, 79% had a third episode within 10 years The 10 year survival from onset of trigeminal neuralgia to death was 46% (n=75)

Neuropathic pain

Diabetic neuropathy

Two large population-based studies have been conducted to determine the occurrence of diabetic neuropathy (**Table 12**). The first, in the UK, involved 97 034 adult patients registered with 10 general practices covering both urban and rural areas. According to strict diagnostic criteria, the occurrence of sensory neuropathy in all diabetics was 16% (95% CI 15 to 19%). There were no significant differences between prevalence rates for type I and II diabetes, or men and women.[80] There was no specific mention of painful neuropathy. In an American survey of a random sample of 84 572 adults there were 2405 diagnosed diabetics, and 99% completed a postal self-assessed questionnaire.[81] The occurrence of at least one symptom of sensory neuropathy in all diabetics was 38%, and pain or tingling in 23%.

These findings broadly agree with those from four clinic or hospital-based studies that determined the prevalence of sensory neuropathy in diabetic subjects having treatment (**Table 12**). The occurrence of painful neuropathy was 11% in type I diabetics with strict diagnostic criteria[82] and 25% in all diabetics using a pain questionnaire.[83] Nabarro[84] found 16% painful neuropathy and O'Hare *et al.*[85] found 13%.

These studies showed that sensory neuropathy becomes more prevalent at older ages, but occurs with similar frequency in men and women. There was no significant difference between the prevalence rates for type I and type II diabetes. A primary care trust of 100 000 people will have about 2000 diabetics. About one in five will have painful neuropathy at some stage

Postherpetic neuralgia

Herpes zoster occurs in the general population at a rate of about 340/100 000 per year,[86,87] with 195 000 new cases a year. Following primary infection with the varicella zoster virus, the virus becomes dormant in dorsal root ganglia. Postherpetic neuralgia (PHN) is a common complication of herpes zoster, occurring in about 13–26% of cases, and including persistent pain after the onset of zoster. In the over-60s particularly, pain is common.

A summary of the occurrence of PHN is in **Table 13**, though Edmunds *et al.* also have a detailed review of the epidemiology.[86,87] The occurrence of painful neuropathy depended upon populations studied because of the large age-dependency. Painful neuropathy in over 40% of people aged over 50 was a common finding (**Table 13**). One incidence study[88] indicated that a primary care group of 100 000 people could expect to see 34 new cases a year.

Multiple sclerosis

Multiple sclerosis has a crude prevalence of about 100/100 000 in England and Wales, but rates about double that in Scotland.[95] A number of studies have examined the occurrence of chronic pain in patients with multiple sclerosis, and they are summarised in **Table 14**. Whatever definition of pain used, pain was common, occurring in about half of multiple sclerosis patients. A primary care trust of about 100 000 people in England or Wales could expect to have about 50 patients with multiple sclerosis and chronic pain. There would be about twice as many in Scotland.

Table 12: Chronic pain due to diabetic neuropathy.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Occurrence
Boulton *et al.* 1985[82]	Prospective study, clinical exam	IDDM subjects attending diabetic clinic, Sheffield, UK	Definition of sensory polyneuropathy by strict criteria requiring presence of symptoms and signs of nerve dysfunction in the absence of peripheral vascular disease Pain sensations for at least 1 year	387 approached, 99% (n=382) agreed to participate	16–59	Painful neuropathy in 10.7%
Chan *et al.* 1990[83]	Case-controlled survey, questionnaire	Patients attending a diabetic clinic, case-matched with non-diabetic control group (visitors of relatives in hospital), UK	Diabetes > 3 months duration. Chronic pain defined as pain present most of the time Patients used diagram to indicate site and radiation of pain, pain descriptors include aching, burning, and stabbing/ shooting Duration of pain also sought	Diabetics n=974 98% response rate (n=962)	adults – mean age all diabetics 58.1 ± 17.5	Chronic pain in 25.2% Burning and stabbing or shooting pain in 7.4%
Harris *et al.* 1993[81]	Cross-sectional survey, part of National Health Interview survey 1989, interview and questionnaire	General population, NIDDM adults identified from households, USA	Questions asked 'During the last 3 months have you experienced: 1. Numbness or loss of feeling in hands and feet 2. Painful sensation or tingling in hands and feet 3. Decreased ability to feel hot or cold in things you touch IDDM defined in paper'	84,572 surveyed 2,405 diagnosed diabetics, of these 99.3% (2,405) questioned further	± 18	In all diabetics over 3 months: numbness: 28.2% pain or tingling: 26.8% decreased sensation to hot or cold: 9.8% ± 1 of above symptoms: 37.9%. In type I diabetics over 3 months: numbness: 15.7% pain or tingling: 22.8% decreased sensation to hot or cold: 9.9% ± 1 of above symptoms: 30.2%.

Table 12: Continued.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Occurrence
Nabarro 1991[84]	Prospective survey, interview and questionnaire	Type I and type II diabetic outpatients attending diabetic clinic, 1954–88, London, UK	Type I and type II diabetes as per WHO criteria Neuropathy recorded if considered to be clinically important, DNS diagnostic criteria	n=1,410 type I diabetes, n=4,962 Type II diabetes, data on all patients	DNS	In Type I: Painful neuropathy in 16.3% with neuropathy and 2.8% of all type I In type II: Painful neuropathy in 5.4% with neuropathy and 0.6% of all type II
O'Hare *et al.* 1994[85]	Prospective survey, interview and questionnaire	Type I and type II diabetics attending outpatient diabetic clinic over 1 year, UK	Type I and type II diabetes per standard criteria neuropathy criteria not defined, pain intensity not defined	n=800, type I = 336, type II = 464, data on all patients	16–84	1 year period prevalence pain/paraesthesia: All diabetics: 13.3% Type I: 12.5% Type II: 13.8%
Walters *et al.* 1992[80]	Case-controlled survey, interview and clinical exam	All diabetics registered with 10 GP practices, case-matched with non-diabetic controls, UK	Diabetes defined per WHO criteria Neuropathy defined as: 1. Presence of symptoms: numbness, burning, prickling, deep aching, tenderness or tingling present bilaterally, ± 1 year, at rest and included in the feet 2. Loss of light touch 3. Impairment of pain perception 4. Absent ankle jerks in subjects < 70 years 5. Abnormal vibration perception thresholds	n=97,034 patients registered in 10 practices n=1,150 diabetics (93.7% reviewed)	Diabetics all ages	Occurrence of neuropathy: All diabetics 16.3% (14.6–19.0) Type I diabetes 12.7% (8.0–17.6) Type II diabetes 17.2% (15.9–18.5)

Table 13: Chronic pain due to post-herpetic neuralgia (PHN).

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Occurrence
Brown 1976[89]	Retrospective review of medical records	Patients attending dermatology outpatients, 10 year period 1963–72, USA	PHN defined as pain > 6 weeks after initial eruption of herpes zoster	140, all reported	Not stated	All ages: pain occurred in 34% Less than 50 years: pain occurred in 6% More than 50 years: pain occurred in 43%
de Moragas and Kierland 1957[90]	Retrospective review of medical records	Patients diagnosed with herpes zoster or PHN 1939–45, USA	PHN not defined	916 records reviewed, all reported	Less than 20 to more than 70	Pain occurred in 49% beyond 1 month Pain lasted 1–6 months in 21% Pain lasted 6–12 months in 4% Pain lasted more than 12 months in 25%
Helgason *et al.* 2000[91]	Prospective cohort study	January 1990 to June 1999 in 100,000 general practice population in Iceland	Single investigator diagnosis and questions about pain at 1, 3, 6 and 12 months	421 patients with complete ascertainment	All ages	In under-60s, 2% had pain at 3 months In over-60s, 7% had pain at 3 months and < 3% at 12 months
Lancaster *et al.* 1995[92]	Meta-analysis of randomised trials of acute interventions to prevent long-term pain	Any randomised trial measuring pain at (at least) 1 month	Treatment of acute zoster Pain (not defined)	617 patients treated with placebo and with at least 6 months' follow-up	Adults	94/617 patients had pain at 6 months (15%)

Table 13: Continued.

Meister *et al.* 1998[93]	Prospective documentation of all cases of zoster by random selection of German physicians	Patients recruited September 1994–March 1995 486 physicians contributed patients	Pain at 4–5 weeks	2,063 patients with zoster	Less than 10 to more than 70	Pain in afflicted dermatome at 4–5 weeks in 28%
Rogers and Tindall 1971[94]	Retrospective review of medical records	Patients attending a medical centre and diagnosed with HZ or post-zoster complications, 1939–68, USA	PHN defined as pain persisting > 4 weeks after HZ infection	n=576 patients with HZ or complications n=243 age 60+ (results presented for these patients)		Pain occurred in 47% of over-60s Pain occurred in 16% of under-60s Pain lasted longer than 6 months in 58% of over-60s
						Incidence
Cockerell *et al.* 1996[88]	Prospective 1 year study, clinical exam	Patients attending two GP surgeries, UK	Neurological disease as diagnosed by clinician	n=25,000 registered with 2 GPs	DNS	34/100,000

Table 14: Chronic pain due to multiple sclerosis.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Occurrence of pain
Archibald *et al.* 1994[96]	Prospective examination of consecutively referred outpatients with MS in a clinic	Clinic patients, Nova Scotia, Canada	Clinically definite MS Pain measured in a structured interview for severity, type and duration	85 of 94 approached	19–75	Pain occurred in 53%
Brochet *et al.* 1992[97]	Prospective study, questionnaire	Multiple sclerosis patients attending outpatients, Group 1 = pain reported at least once; Group 2 = no pain, France	Pain syndromes reported: painful paraesthesias or dysaesthesias; electric shocks; lightning pain; painful leg spasms; articular and myofascial pain, also location, duration and frequency of pain	108	DNS	Pain occurred in 41%
Clifford and Trotter 1984[98]	Retrospective medical record survey	Attendees at MS clinic between 1977 and 1983, in St Louis, Missouri, USA	Pain was defined as a major complaint that lasted at least 2 weeks	317	15–70	Pain occurred in 29%
Moulin *et al.* 1988[99]	Retrospective review of medical records, PSAQ and telephone interview	MS patients who attended outpatient clinic between 1973 and 1985, Canada	MS by Rose criteria, 62% definite MS, 38% probable or possible MS Clinically significant pain defined as: 1. Paroxysmal stereotyped pain syndrome regarded as characteristic for MS 2. Chronic pain present intermittently or continuously over 1 month	167 patients approached, 159 responded	20 to over 60	Occurrence of any clinically significant pain in 55% Occurrence of chronic pain in 48%

Table 14: Continued.

Stenager *et al.* 1991[100]	Prospective survey, questionnaire and interview	Random selection of patients with MS attending neurology clinic, Denmark	Chronic pain defined as constant or intermittent pain lasting more than 1 month Acute syndromes included transient symptoms lasting < 1 month Headaches and minor pain syndromes excluded.	117, all patients interviewed	25–55 years	Occurrence of pain at any time in 65% Occurrence of pain at interview in 45%
Vermote *et al.* 1986[101]	Consecutive prospective survey of MS patients	Patients with MS attending MS clinic in Belgium	MS by Schumacher criteria Pain measured by Dutch equivalent of MPQ	83	not given	Pain occurred in 54%
Warnell 1991[102]	Prospective survey, PSAQ	MS patients attending outpatient clinic, Canada	Painful symptoms reported, including their frequency and intensity PIVAS scale	500, 73% (n=364) responders	19–74	Pain occurred in 64%

Chronic post-stroke pain

Only one prospective study of chronic post-stroke pain has been reported.[103] Two hundred and sixty seven adult patients were recruited to a Danish study after admission to hospital following an acute stroke. At six months, 78% had survived and the occurrence of chronic post-stroke pain, according to strict criteria, was 6.5% at six months and 8.4% at one year. The incidence of chronic post-stroke pain during the first year after stroke was 8%, of which 10/16 patients reported pain of moderate to severe intensity. In a retrospective survey of 400 cases of stroke in the UK, 2% were reported to have chronic post-stroke pain.[104] The median time for onset of pain was three months from stroke, and could be as long as 24 months. In a primary care trust of 100 000 people there could be as many as 10 to 50 people with chronic post-stroke pain.

Vascular pain

There is substantial information on the incidence and prevalence of cardiovascular disease due to its high mortality and morbidity. There is limited information about the incidence and prevalence of painful symptoms.

Intermittent claudication

Accurate estimates of intermittent claudication can only be obtained from population surveys, as most subjects with claudication are not referred to hospital unless symptoms are severe enough to warrant surgery. Larger studies published since 1990 are summarised in **Table 15**. Most studies are conducted in an older adult population because this is primarily a disorder of older adults. In older adults the prevalence of intermittent claudication is of the order of 1000/100 000 to 2000/100 000, according to a review.[105] When the age range involves mainly people in their seventh decade and older, higher prevalence rates are found.[106,107]

The incidence, again in older adults, is 400–1600/100 000. A typical primary care trust of 100 000 people might expect to have 400–800 people with intermittent claudication, and see 200 new cases a year.

Raynaud's phenomenon

One of the problems with prevalence estimates of Raynaud's phenomenon is that of knowing the degree of chronic pain experienced. The four population surveys identified (**Table 16**) record quite high figures for prevalence, though reducing with more exacting definitions of disorder.[112] It is likely that even the prevalence of a clear edge between pale and normal colour overstates the prevalence of painful Raynaud's.

Angina

Many UK epidemiological studies estimating prevalence of coronary heart disease are in specific occupational groups only (Whitehall and UK heart disease prevention study),[116] or use methods other than the standard Rose chest pain questionnaire and ECG to estimate prevalence rates.[117] The Speedwell and Caerphilly survey,[118] Scottish Heart Health Study,[119] Grampian survey[6] and the Maidstone and Dewsbury survey[106] provide reliable estimates of prevalence rates of angina in the UK (**Table 17**). Prevalence is age-dependent, because almost no angina occurs until the sixth decade of life. In all adults the prevalence is about 5000/100 000, but is about double this at 10 000/100 000 in over-50s. A US study suggests an incidence in adults between 30 and 74 years of about 1000/100 000.

A primary care trust with a population of 100 000 might expect to have about 4000 cases of angina, with about a third of them severe. There would be about 500 new cases a year.

Table 15: Claudication.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Prevalence per 100,000			Incidence per 100,000
						Overall	Men	Women	
Bainton *et al.* 1994[108]	Prospective, longitudinal study, part of Speedwell heart disease study, Q and clinical exam	Male patients registered with 16 GPs, Bristol, UK	Claudication defined as: 1. pain on walking in one or both calves 2. no pain on rest 3. relieved within 10 min resting 4. never disappears when walking continued 5. pain causes subject to stop or slow down	2,550 men selected, 92% attended clinic for first visit	45–59		Prevalence 1,200/100,000 at baseline rising to 2,800/100,000 after 10 years		Annual incidence of new cases 400/100,000
Bowlin *et al.* 1994[109]	Prospective study and follow-up of Israeli men	Male government employees	London School of Hygiene cardiovascular disease questionnaire	8,343 men free of coronary heart disease	40–65		baseline prevalence 2,700/100,000		Annual incidence of new cases 860/100,000
Leng *et al.* 1996[110]	Prospective, longitudinal study, SAQ and exam	Patients randomly selected from 10 GP practices, UK	Criteria for IC per Rose/WHO questionnaire, ankle brachial pressure index and reactive hyperaemia test. Grade 1 = calf pain when walking uphill or hurrying Grade 2 = pain upon walking ordinary pace on level Probable = calf pain present on exercise but not at rest	1,592 selected 65% responded	55–74	Prevalence at 5 years in those that completed WHO questionnaire: 7,100/100,000			Annual incidence 1,550/100,000

Table 15: Continued.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Prevalence per 100,000			Incidence per 100,000
						Overall	Men	Women	
Leng *et al.* 2000[106]	Prospective survey of random sample of men and women	Dewsbury and Maidstone, UK	Leg pain typical of intermittent claudication if pain on walking relieved within 10 minutes	417 of 481 men and 367 of 441 women attended for ultrasound examination	56–77		6,400/100,000 (2,100–10,700) in men without femoral plaque 17,200/100,000 (12,600 to 21,800 with femoral plaque) Plaque present in 64%	6,700/100,000 (2,500–10,900) in women without femoral plaque 5,600/100,000 (2,400 to 8,800 with femoral plaque) Plaque present in 64%	
Meijer *et al.* 1998[105]	Prospective follow-up study	Individuals aged 55 and over in Rotterdam, Holland	WHO/Rose questionnaire	10,275 invited, 7,983 responded (78%)	over 54	Prevalence 1,600/100,000	2,200/100,000	1,200/100,000	
Menotti *et al.* 2001[107]	Prospective longitudinal study of men in three European countries	Men aged 65 to 84 years in 1985 from previous longitudinal study	Rose leg pain questionnaire	2,285 men	65–84		Finland 11,000/100,000 Holland 7,600/100,000 Italy 8,400/100,000		
Smith *et al.* 1990[111]	Prospective longitudinal study of government employees	Large prospective study	Questionnaire	18,388	40–64	Probably intermittent claudication 800/100,000 Possible intermittent claudication 1,000/100,000			

Abbreviations: IC = intermittent claudication; Q = questionnaire; SAQ = self-assessed questionnaire; PSAQ = postal self-assessed questionnaire; ECG = electrocardiogram.

Table 16: Raynaud's phenomenon.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Prevalence per 100,000		
						Overall	Men	Women
Brand *et al.* 1997[113]	Longitudinal 16 year study, questionnaire and clinical exam	General population, 2nd generation participants in Framingham Heart study (offspring and their spouses of the original participants), USA	Evidence of Raynaud's phenomenon: 1. sensitivity to cold 2. blanching of fingers when exposed to cold, with numbness followed by cyanosis, then redness and tingling or pain.	4,182 selected DNS response rate	over 20	Prevalence: 8,800/100,000	Prevalence: 8,100/100,000	Prevalence: 9,600/100,000
Maricq *et al.* 1986[114]	Carolina Health Survey, interviewer administered questionnaire	General population, random selection residents of South Carolina, USA	Prevalence estimates given for several different criteria: 1. reported cold sensitivity of fingers or toes 2. cold sensitivity combined with blanching and/or cyanosis 3. cold sensitivity severe enough to lead to physician consultation	1,752 subjects interviewed	over 18	Lifetime prevalence: criteria 1: 10,000/100,000 criteria 2: 4,600/100,000 criteria 3: 3,000/100,000 criteria 2 + 3: 2,000/100,000		
Palmer *et al.* 2000[112]	Random sample of adults of working age	Randomly selected adult patients from 34 selected general practices across England, Wales and Scotland, plus members of armed forces	Prevalence estimates given for several different criteria: 1. Reported cold, numb and blanched fingers 2. Brought on by cold 3. Clear edge between pale and normal colour	22,194 questionnaires, 12,907 replies (58%)	16–64	Any blanching about 15,000/100,000 Cold induced blanching 12,000/100,000 Clear edge 4,800/100,000	Clear edge between 1,800/100,000 at 16–24 up to 7,200/100,000 at 55–65	Clear edge between 3,500/100,000 at 16–24 up to 5,100/100,000 at 55–65

Table 16: Continued.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Prevalence per 100,000		
						Overall	Men	Women
Silman *et al.* 1990[115]	Two questionnaire surveys: 1. SAQ clinic population 2. PSAQ	Two populations studied: 1. All new patients attending 5 GP practices 2. Random sample, patients registered with above 5 GPs, UK	Raynaud's phenomenon defined by presence of all 3 criteria: 1. Episodes of finger blanching 2. Precipitated by cold 3. Sensory sensations (pins and needles and numbness) Interview and clinical exam of the positive patients	1. n=1,119 (response rate not recorded) 2. n=600 69% (n=413) response rate	over 15	Prevalence: clinic attendees 19,000/100,000 postal sample 15,000/100,000	Lifetime prevalence: clinic attendees: 16,000/100,000 postal sample: 11,000/100,000	Lifetime prevalence: clinic attendees: 21,000/100,000 postal sample: 19,000/100,000

Abbreviations: IC = intermittent claudication; Q = questionnaire; SAQ = self-assessed questionnaire; PSAQ = postal self-assessed questionnaire; ECG = electrocardiogram.

Table 17: Angina.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Prevalence per 100,000			Incidence per 100,000
						Overall	Men	Women	
Bainton *et al.* 1988[118]	Two surveys: 1. Caerphilly and, 2. Speedwell surveys Rose chest pain questionnaire and 12 lead ECG	Both surveys general population: 1. selection middle-aged men, Caerphilly, UK 2. Selection men registered with 16 GPs, Speedwell, UK	Angina defined as: grade 1 (chest pain only on walking uphill or hurrying) grade 2 (chest pain on walking at an ordinary pace on the level)	1. n=2,818 selected 89% (n=2,512) examined 2. n=2,550 selected, 92% (n=2,348) examined	45–59		Prevalence of angina 8,200/100,000 About 30% was more severe grade 2		
Elliott *et al.* 1999[6]	Random sample of the general population	Adults aged over 25 in 29 general practices in Grampian Region, Scotland	Angina defined by patient in questionnaire, with instructions and after piloting	4,611 contacted, 3,605 responses	25 and over	Prevalence of angina 4,500/100,000, almost wholly in over-55s where prevalence was 10,100/100,000	4,900/100,000	4,100/100,000	
Leng *et al.* 2000[106]	Prospective survey of random sample of men and women	Dewsbury and Maidstone, UK	Rose chest pain questionnaire	417 of 481 men and 367 of 441 women attended for ultrasound examination	56–77	9,600/100,000 (6,100 to 13,100) without femoral plaque 15,400/100,000 (12,100–18,700 with femoral plaque) Plaque present in 64%			
McGovern *et al.* 2001[120]	Retrospective survey of hospital discharges for a population	All patients discharged from metropolitan hospitals, Twin Cities, Minnesota for 1985, 1990 and 1995	From hospital notes of signs, symptoms, medical history, enzymes, complications, therapy and ECGs	For 1995, 3,615 discharge records examined	30–74				Age-adjusted incidence of angina with or without MI in 1995 was 1,357/100,000 for men and 495/100,000 for women

Table 17: Continued.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range (years)	Prevalence per 100,000			Incidence per 100,000
						Overall	Men	Women	
Menotti *et al.* 2001[107]	Prospective longitudinal study of men in three European countries	Men aged 65 to 84 years in 1985 from previous longitudinal study	Rose chest pain questionnaire	2,285 men	65–84		Finland 19,700/100,000 Holland 10,300/100,000 Italy 9,500/ 100,000		
Shaper *et al.* 1984[117]	British Regional Heart Study, administered questionnaire, 3 lead ECG	General population, random selection middle aged men, UK	Angina defined as chest pain or discomfort with exertion plus: 1. Area of pain confirmed on diagram 2. Pain causes subject to slow down or stop 3. Pain goes away if stops exertion 4. Takes < 10 minutes for pain to go away	n=7,735 selected, 78% (n=6,033) response rate	40–59		Prevalence: 8,000/100,000		
Smith *et al.* 1990[119]	Scottish Heart Health study, prospective survey, SAQ and physical examination with 12 lead ECG	General population, random selection from 22 GP districts, UK	Angina defined as: grade 1 (less severe) grade 2 (more severe) criteria as per Rose chest pain questionnaire	74% response rate, n=10,359 analysed	40–59		Prevalence angina 6,300/ 100,000 (3,900 to 14,800) About 30% more severe grade 2	Prevalence angina: 8,500/ 100,000 (4,300 to 17,600) About 30% more severe grade 2	

Chronic postoperative pain

The contribution of surgery to the prevalence of chronic pain has been systematically studied among outpatients attending specialist pain clinics[121] and studies have been published investigating chronic pain after particular operations.[122] In the systematic review of published studies reporting the prevalence of chronic postoperative pain after a range of common surgical operations,[122] the methodological quality of the majority of studies was poor.

In a large survey of 10 pain clinics in the UK, information was collected about 5130 adult patients by a questionnaire filled out by the physician.[121] Chronic pain due to surgery was reported by 23% of patients. The pain had lasted longer than 24 months in 59% of these, was of moderate to severe intensity in 76%, and significantly disabling in 44%. The sites of pain most frequently reported were: abdominal (47%), anal, perineal and genital (38%) and lower limb (35%). These estimates may be higher than expected for the general population as this survey represents a selective group of patients, but it does indicate that chronic postoperative pain can be a significant part of the work of pain clinics.

In another systematic review[123] which included studies with information about pain 12 weeks or longer after surgery, and excluded studies smaller than 50–100 patients (apart from amputation studies with 25 patients), chronic pain after surgery was common. Many studies had information to one year or longer, and many compared different surgical approaches, or anaesthesia. Phantom limb pain was common (up to 80%), but high rates of chronic pain were reported for all surgery. Even with hernia repair, which had the lowest incidence, rates varied from 0% to 29%. Predictive factors included pre-operative pain, repeat surgery, a surgical approach with risk of nerve damage, acute and severe postoperative pain, radiation, chemotherapy and a variety of psychological and depressive symptoms.

The focus here is on the best studied areas, of phantom limb and stump pain after amputation,[124,125] of chronic postoperative pain, and breast surgery[126,127] and thoracotomy.[128,129] Detailed information on pain after hernia repair can be found in Bay-Nielsen *et al.*[130] They surveyed all repairs in Denmark over two months in 1998; 29% reported having pain in the area of the hernia within the past month, and 11% reported that the pain impaired work or leisure activities. Only 4.5% (1 in 6) had sought medical advice or received treatment for the pain.

Pain after amputation

To determine the occurrence of phantom limb pain accurately, studies must differentiate between phantom limb sensation, phantom limb pain and stump pain. This section considers the studies where phantom limb pain was described distinctly (**Table 18**). Phantom limb pain occurred in half to three quarters of amputees, persisting at seven years post-amputation.

Pain characteristics were reported in most of the studies. In the 53% of amputees reporting phantom limb pain one year following amputation, pain intensity was rated as of mild or moderate intensity by all.[131] In three other studies, mean pain intensity ranged from 5.3 to 6.9 out of a maximum of 10.[124,125,132] Five years after limb amputation, pain was reported by 73%, in 65% pain was experienced frequently to occasionally, and 7.5% experienced constant pain in the phantom limb.[133] Most prevalence estimates are potentially biased because of small sample sizes and low response rates.

High rates of stump pain were reported in prospective surveys of military veterans, with at least half of amputees having stump pain. Rates were 49%,[134] 57%[125] and 62%[124] respectively.

There are perhaps 17–20 amputees per 100 000 population in Holland,[135,136] and 28/100 000 in Finland.[137] In a typical primary care trust, about 25/100 000 may be expected, most of whom will have chronic pain problems, either phantom limb pain, or stump pain, or both.

Table 18: Phantom limb pain.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Occurrence of pain
Buchanan and Mandel 1986[138]	Retrospective review of medical records and interview by a technician	Amputees attending prosthetic clinic 1979–80, Canada	Presence of pain asked and recorded yes/no	716 respondents, in 93 (13%) of these some data missing but not specified	< 19 to 60+	Phantom limb pain in 63%
Houghton *et al.* 1994[139]	Retrospective survey, SAQ	Amputees at single centre	Pain intensity 0–10 scale	212 selected, 176 responded	Adults	Phantom limb pain in 78%
Kooijman *et al.* 2000[134]	Prospective survey with questionnaire	Amputees at a single orthopaedic centre	Not clearly stated	127 subjects of whom 99 filled in a questionnaire; 27 had congenital problems, so data on 72 with acquired defects	Adults	Phantom limb pain in 51% Stump pain in 49% Phantom sensations in 76%
Jensen *et al.* 1984[140]	Prospective hospital-based study April 1980 to March 1982 Interview, standard questionnaire and examination 8 days, 6 months and 2 years after limb amputation	Patients undergoing limb amputation, Denmark	Phantom pain defined as painful sensations referred to the lost body part, except stump pain	All 58 patients agreed to participate, 24 (42%) died	24–91	Patients with painful phantom limb: 8 days after amputation: 72%; 6 months: 65%; 2 years: 59%
Krebs *et al.* 1985[141]	Retrospective survey, interview	Patients with limb amputation 1970–77, random selection in 1983	Not stated	Of 624 amputees, 86 of 95 alive in 1983	Adults	Phantom limb pain in 52%
Pohjolainen *et al.* 1991[131]	Retrospective survey, clinical exam and interview	Amputees attending prosthetic factory	Pain intensity cat scale (mild, moderate, severe)	155 selected, 124 assessed 1 year later	Adults	1 year after amputation phantom limb pain in 53%; mostly mild or moderate intensity

Table 18: Continued.

Sherman *et al.* 1983[132]	Retrospective survey, PSAQ	Military veteran amputees, randomly selected, USA	Pain intensity 0–100 scale	764 of 1,321 members		Phantom limb pain in 85%
Sherman *et al.* 1984[124]	Retrospective survey, PSAQ	Military veteran amputees, randomly selected, USA	Stump pain and phantom pain both reported PI on 0–10 scale 0 = no pain, 10 = unbearable pain	55% responded 2,694/ 5,000		Phantom limb pain in 78% average PI = 5.3 ± 4.9 Stump pain in 62%
Steinbach *et al.* 1982[133]	Retrospective survey, interview	War veterans, traumatic amputees	Frequency of phantom limb pain assessed	75 survivors, 43 assessed	Adults	5 years after amputation phantom limb pain in 73% Pain frequency: constant 7.5% occasional 45% frequent 20%
Wartan *et al.* 1997[125]	Retrospective survey, PSAQ	Military veteran male amputees, randomly selected, UK	Pain intensity using 10 point cat scale (0 = no pain, 10 = unbearable pain) Phantom pain and stump pain evaluated Frequency, site and type of pain reported	526/590 (89%) response rate	median age 73	Phantom limb pain in 55%; Stump pain in 57% mean PI 5.6 16% complained of daily pain 16% pain always present

Chronic postoperative breast pain

Eight studies reported the occurrence of chronic post-mastectomy pain (**Table 19**). Different categories of pain were reported, including phantom breast, scar pain and pain in the ipsilateral arm. Time after operation was important, as there was a trend for some reduction in occurrence after two years or longer.[142] While most operations were partial or total mastectomy for cancer, pain occurred after augmentation and reduction operations, and after mastectomy with reconstruction.[143]

There was some variation because of time after surgery, but typically 25 to 35% of the patients reported pain more than a year after operation, and about half at one year.

Chronic postoperative thoracotomy pain

Surgical aspects of post-thoracotomy pain have been reviewed, together with reports on its occurrence.[149] **Table 20** gives results from six studies in the last ten years, all of which showed that chronic pain after thoracotomy was common, and that severe pain requiring treatment is also common, occurring in 15%–25% of patients undergoing thoracotomy. Results from surveys are supported by results from randomised trials; half of the patients reported long-term pain at one and half years.[150] The precise relationship between pain before, during, and after surgery, and the development of chronic pain, remains contentious.

Chronic postoperative cholecystectomy pain

Two prospective studies reported the occurrence of chronic scar pain following open cholecystectomy. At 12 months occurrence of chronic pain at the incision site was 27%,[155] and at 24 months 21%.[156] Two studies have attempted to compare the occurrence of chronic pain after open with the incidence after laparoscopic cholecystectomy. Stiff *et al.* reported a occurrence of 3.4% after laparoscopic compared with 9.7% after open procedure.[157] Wilson and Macintyre found a similar occurrence of 7% in both groups.[158]

Conclusion: prevalence and burden

Health care needs for chronic pain obviously extend from community through to hospital care. Patients with some chronic pain conditions, migraine for instance, may manage with over the counter medications, others will require prescription medication and some will need other interventions. **Figure 2** summarises prevalence data for some of the conditions mentioned above.

The prevalence data contains some surprises, and shows how biased a hospital view can be, omitting as it does those conditions which trouble patients but which they manage themselves (e.g. migraine), and those conditions which are managed largely in the community (e.g. polymyalgia rheumatica). A second facet of the prevalence data is that it does not capture, and indeed it cannot capture, the burden of the pain, nor the burden of the disability which goes with the pain in many of these conditions. Much of the 'repeat business' in secondary care pain management is for conditions for which there is no certain remedy. Health care needs therefore not only have to have to consider prevalence, but also the burden of the pain (and disability), and the 'treatability' of the pain.

The disease impact of some of the conditions mentioned above, compared with other conditions, was studied in about 15 000 Dutch patients. All research groups known to examine chronic diseases in the Netherlands were contacted to see what datasets were available.[159] Studies had to use a standardised quality of life instrument, have full coverage of quality of life domains, include a range of chronic diseases, be big (at least 200 patients), have medically confirmed diagnoses, be obtained since 1992 and be geographically broad. Eight datasets broadly fulfilling these categories were obtained, with information on about 15 000

Table 19: Mastectomy.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Occurrence
Ivens *et al.* 1992[142]	Survey	Outpatient attending breast clinic	Not stated	126	28–80	Pain at 1 year 45 %, 1–2 years 37%, 2–4 years 28 %, > 4 years 20% Mostly mild, less than 20% of patients with at least moderate pain
Kroner *et al.* 1992[144]	Prospective 6 year survey	Patients attending oncology and radiotherapy department	Standard questionnaire	120, 110 at 1 year, 69 at 6 years	less than 69	Phantom breast pain at 1 year = 13 % Scar pain at 1 year = 23% Phantom breast pain at 6 year = 17% Scar pain at 6 year = 31%
Polinsky 1994[145]	Survey	Patients attending support group, post-mastectomy 16 months to 32 years	Pain intensity, categorical scale	314, 251 responded, 223 analysed	31–76	Pain 22–32 %
Smith *et al.* 1999[146]	Retrospective consecutive cohort	All surviving women having mastectomy from 1990 to 1995 in Aberdeen, Scotland	Character, location and timing of pain	511 questionnaires sent, 457 returned and 408 fully completed	32–93	Post-mastectomy pain in 43%, and 40% had pain related to operation site Highest rate in younger women
Stevens *et al.* 1995[147]	Survey	Oncology outpatients	Cancer pain questionnaire and McGill questionnaire	95	over 18	Post-mastectomy pain in 20%
Tasmuth *et al.* 1995[126]	Retrospective study, PSAQ	Patients with breast cancer treated by surgery between 1988–91 Types of surgery: modified radical mastectomy with axillary evacuation (MRM) or breast resection with axillary evacuation (BCT), Finland	PI VAS 10-cm scale, Finnish McGill pain questionnaire, Effect of chronic pain on daily lives 5 point cat scale (none, slight, mod., considerable, great), analgesic consumption	569, response rate 92%, 467 included in analysis	29–92	49% reported pain and about a quarter reported moderate or severe pain

Table 19: Continued.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Occurrence
Tasmuth *et al.* 1996[127]	Prospective, 1 year study 1993–4 Patients assessed pre-op, 1 month, 6 months and 1 year after surgery Patients assessed by a researcher by examination and questions	Patients with non-metastasised breast cancer Types of surgery: modified radical mastectomy with axillary evacuation (MRM) or breast resection with axillary evacuation (BCT), Finland	PI VAS 10-cm scale: Activities of daily living that increase pain assessed Pain in breast region or ipsilateral arm assessed	105 patients recruited, all agreed to participate, 93 (89%) included in final analysis 12 excluded due to disease complications	29 years	Chronic pain 1 year post-op in breast in 24% and in ipsilateral arm in 17%
Tasmuth *et al.* 1999[148]	Prospective survey in an oncology department	Consecutive women from January to June 1996, Helsinki, Finland	VAS and McGill questionnaire Pain, chronic, and with at least a considerable effect on daily life	265 questionnaires sent, 221 responded (83%)	less than 70	Chronic pain in 56% in women operated on in high volume units, compared with 43% in those from low volume units.
Wallace *et al.* 1996[143]	Retrospective survey	Breast cancer patients attending medical centre	Pain intensity VAS, McGill pain questionnaire	n=429 recruited, 282 responded		Pain at 1 year follow-up: post-mastectomy = 31% mastectomy/reconstruction = 49% breast augmentation = 38% breast reduction = 22%

Table 20: Post-thoracotomy pain.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Occurrence
Dajczman *et al.* 1991[151]	Retrospective cohort study of patients who had undergone thoracic surgery between 1982–87 by one particular surgeon were reviewed, then interviewed and questionnaire completed	Post-thoracotomy patients, disease-free without metastases and at least 2 months post-op, Quebec, Canada	PIVAS 10 cm scale, shoulder pain and aggravating factors assessed	206 patients identified, 59 interview and questionnaire, 56 analysed	35–79	54% had pain at thoracotomy site, moderate or severe in about half, between 5 months and 5 years after operation
Kalso *et al.* 1992[128]	Retrospective review of medical records, pain questionnaire sent to surviving patients	Patients who underwent a thoracotomy during 1986–88, Finland	Patients asked to describe pain as ache, burning, or tenderness and numbness, and state the duration and if analgesic required Patients asked to state if pain is associated with thoracotomy site	214 medical records reviewed, 150 surviving patients questioned further with pain questionnaire, 89% response rate	less than 70	44% persistent thoracotomy pain lasting longer than 6 months. 66% received treatment for pain.
Landreneau *et al.* 1994[152]	Postal questionnaire of an identified patient population	Post-thoracotomy patients > 3 months post-operation Patients had either pulmonary resection by lateral thoracotomy or video-assisted thoracic surgery (VATS) Divided into cohorts on basis of operation < 1 year or more than a year from this questionnaire contact None of patients had local recurrence of malignancy, USA	Post-thoracotomy pain defined as persistent pain along the thoracotomy scar and/or its intercostal dermatomal distribution lasting more than 2 months after operation	391, 343 (88%) responded, 165 thoracotomy, 178 VATS	mean age 59	Postoperative pain 3 months to 1 year after surgery in 44% with thoracotomy (18% treated), and 30% with VATS (11% treated) Postoperative pain more than 1 year after surgery in 29% with thoracotomy (16% treated), and 22% with VATS (6% treated)

Table 20: Continued.

Reference	Type of study	Sample source	Disease definition	Sample size	Age range	Occurrence
Matsunaga *et al.* 1990[153]	Retrospective survey, surgical records	Patients of one surgeon		n=90 contacted, 77 responded		Pain in 67% 6 to 18 months post-thoracotomy, 20% required analgesics
Perttunen *et al.* 1999[154]	Prospective cohort	Patients undergoing thoracotomy in Helsinki, Finland	Patients interviewed with standard letter at 3, 6 and 12 months	110 patients entered, with information on 62 at 1 year	19–77	Moderate or severe pain in 16% and mild pain in 45% at 1 year
Richardson *et al.* 1994[129]	Retrospective analysis of medical records of patients between January 1980 and December 1991 at a general hospital	Patients had undergone a thoracotomy, UK	Post-thoracotomy neuralgia defined as chest wall pain unrelated to recurrent or persistent tumour or infection at least 2 months post-operation Unilateral chest wall pain on the side of the thoracotomy 2 months after operation taken as positive presence of neuralgia.	n=1,000 patient records reviewed, n=883 records evaluated	range 1–84 years, mean 55 years	Post-thoracotomy neuralgia in 14% at 12 months; 15% had pain sufficient for clinic referral in first year

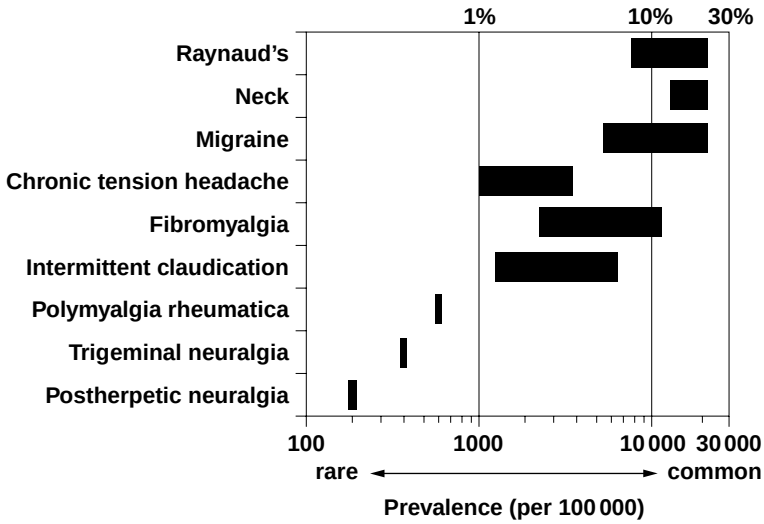

Figure 2: Prevalence of some chronic pain conditions.

people. They all used SF-36 or SF-24. These were analysed by quality of life dimension (physical functioning, physical role functioning, bodily pain, general health, vitality, social functioning and mental health) according to disease clusters (e.g. musculoskeletal conditions of osteoarthritis, joint complaints, rheumatoid arthritis and back impairments), disease categories (ranking the individual diseases within the cluster) and patient characteristics (sociodemographic variables, like age, gender, education).

The method used was the ranking of mean scores. Thus if three diseases scored (say) 5, 10 and 15 (with 5 the 'best' score), then they would be ranked 1, 2 and 3. This was done for all quality of life domains, and the ranks for individual domains added together. This summed rank produces low scores for the diseases or disease clusters causing the least distress, and high scores for those causing the most problems. The summed rank scores for chronic disease clusters are shown in **Figure 3**.

Musculoskeletal conditions, renal disease, cerebrovascular/neurological conditions and gastrointestinal conditions had the most severe impact on quality of life. In musculoskeletal conditions, osteoarthritis had more adverse impact than back impairments, which scored higher (worse) than rheumatoid arthritis. The method used for measuring quality of life, in this case SF-36, may not be perfect, but this analysis is thought-provoking for any consideration of health care needs in chronic pain, and highlights a research agenda.

The impact of the increasing age of the population, the higher prevalence of arthritis in older people and the 'worst' disease burden of musculoskeletal problems is a likely escalation of demand for pain management of arthritic problems. Co-morbidity, and treatment for that co-morbidity, can make pain management tricky in this patient group.

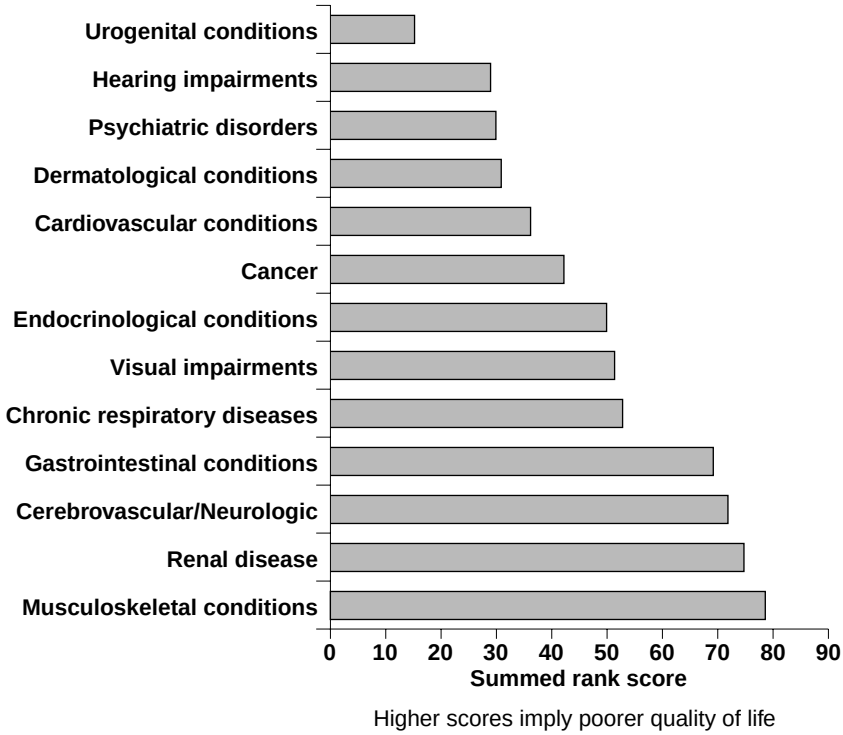

Figure 3: Summed rank scores for disease clusters.[159]

5 Services available and their costs

This section outlines current interventions available to treat pain, how these interventions are provided and used (the service as a whole) and the costs of providing a chronic pain service

Interventions

There are many interventions, pharmacological, non-pharmacological, invasive and non-invasive, from which to choose to treat chronic pain. These are outlined in **Figure 4**.

Analgesics

By far the majority of acute pain is managed with analgesics alone. Most chronic pain is also managed initially with analgesics, but in contrast with acute pain, more commonly involves nerve transmission block and alternative methods. **Figure 1** (the pain treatment ladder) showed a simple plan. As acute pain wanes, weaker analgesics are used. If chronic pain increases, stronger ones are used. The same analgesics,

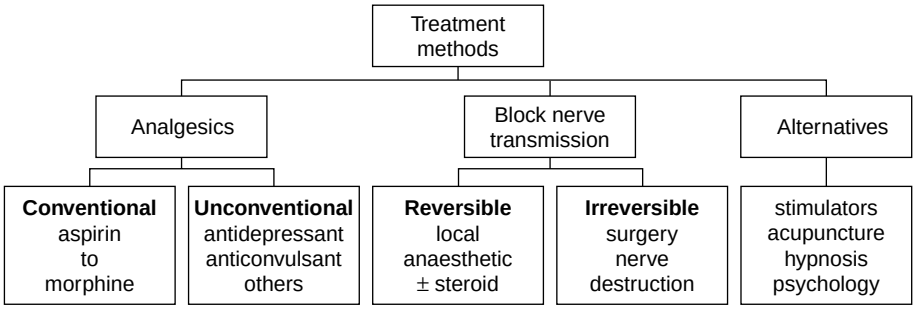

Figure 4: Treatment methods for chronic pain.

from paracetamol to NSAIDs through to opioids, are used in chronic as in acute pain. If analgesics relieve the pain to an adequate extent, and with tolerable or controllable adverse effects, then there is little reason to use other interventions. If analgesics are ineffective, other methods have to be considered. If analgesics are effective but cause intolerable or uncontrollable adverse effects then again other methods should be considered. The effectiveness and the adverse effects of the analgesics are critical.

It is known from work with cancer pain that using analgesics according to the WHO pain ladder (**Figure 1**) can relieve pain for 80% of patients. For most of the 80% the relief will be good, for a minority it will only be moderate. This presumes that the pain is managed optimally, but it is known from audit that this is often not the case. Optimal management requires that the correct drugs are available, and that they are given in the correct dose by the correct route and at the correct time. This needs staff who are well versed in the problems, and who are available to care for the patient. The second problem is the 20% of patients whose pain is not well managed by intelligent use of analgesic guidelines. The other treatment methods outlined in **Figure 4** are necessary to manage those for whom analgesics fail.

Non-opioid analgesics

Oral simple analgesics, combinations and NSAIDs

There is an old adage that if patients can swallow it is best to take drugs by mouth. Effective relief of nociceptive pain (as opposed to nerve damage pain) can be achieved with oral paracetamol, paracetamol/opioid combinations and oral NSAIDs. Paracetamol at doses of 4 gm or less per day is the safest analgesic, contrasting with NSAIDs which carry a small but finite chance of gastric bleed within the therapeutic dose range,[160] and risks of renal and cardiac problems.[161,162]

Topical NSAIDs

Many doctors are sceptical about the efficacy of topical NSAIDs. This may not be correct, however, with topical NSAIDs, like paracetamol, having a first-line role.

Opioids

In chronic pain there are two particular problems with opioids. The first is that adequate doses are often not available or are not given, primarily because of fears of addiction.[163] The second is that some (rarer) chronic pain states, particularly when the nervous system is damaged, may not respond fully to opioids.

Opioids used for people who are not in pain can induce physical and psychological dependence. This does not happen to patients who receive them for pain relief, for instance after an operation or for severe pain from osteoporotic vertebral collapse. Some governments restrict medical availability on the grounds that if the drugs are available medically this will worsen the street addiction problem. There is no evidence for this. The casualties are patients who are deprived of adequate pain relief.

In chronic pain opioids are usually given by mouth. The dose is worked out by titration over a period of days, and then the drug is given regularly, not waiting for the pain to come back. Initial problems with nausea or dizziness commonly settle. If constipation is likely, laxatives are given.

Patients who cannot swallow can try sublingual, transdermal or suppository dosing. Subcutaneous infusion, usually from a small (external) pump, is used for terminal patients who cannot manage these other routes. Rarely the epidural route is used for combination infusion of opioid and local anaesthetic.

If patients' pain starts to increase the dose is increased. If sensible dose increases do not produce pain relief, or if increasing the opioid dose provokes intolerable or unmanageable adverse effects, then other methods have to be considered, either as well as the opioid or instead of it. A working rule is that if the pain is in a numb area, which is a marker for a damaged nervous system, you should be less confident that opioids would necessarily produce pain relief,[164] and the threshold for using other strategies would be lower.

Unconventional analgesics

Unconventional analgesics[165] are drugs which have other indications in other medical settings, and are not normally thought of as analgesics. Treating chronic pain in a tertiary hospital setting these drugs are used for about one third of patients. The hall-mark is pain in a numb area, neuropathic pain.

When the patient has symptoms and signs of nervous system damage in the area of their pain it is expected that the response to conventional analgesics will be reduced. Conventional analgesics have often failed already, which is why the patient has been referred. If not, they should be tried, before empirical testing is embarked upon, to see if any of the unconventional analgesics can provide relief.

Antidepressants

Antidepressants work on the nervous system to relieve depression. They are used in much lower dosage (about half) to relieve pain.[166] Classically they were used to relieve pain that was burning rather than shooting in character, and anticonvulsants were used for shooting pains. Now antidepressants are used as first line for both types of pain, because greater success has been achieved and because it is believed that antidepressants cause fewer adverse effects.

Lower doses (median 75 mg amitriptyline nocte, maximum 150 mg) are used compared with those used to control depression. The pain-relieving effect happens, if it is going to happen, well within a week, whereas 10 days is the minimum often quoted for an antidepressant effect. The older (tricyclic) antidepressants seem to be better than the selective serotonin reuptake inhibitors as analgesics. The simplest analogy is that these older drugs are like shotguns, acting on multiple transmitter pathways, whereas the newer ones are more like rifles, designed as they are to be more selective and affect only one pathway.

Anticonvulsants

Anticonvulsants have been used for many years to treat the shooting pains of trigeminal neuralgia, painful diabetic neuropathy and postherpetic neuralgia. The catch-all explanation was that they stabilised nerve membranes, preventing them carrying spurious messages. Precisely how these channel blocking drugs work as analgesics in neuropathic pain remains unclear.

In the UK antidepressants are first choice drug therapy in neuropathic pain, supplemented or replaced by anticonvulsants if antidepressants alone provide inadequate analgesia or intolerable or unmanageable adverse effects.

Others

Clonidine and other alpha-2 adrenergic agonists have analgesic effects, both in conventional pain and in neuropathic pain. They extend the duration of local anaesthetic effect and have a synergistic effect with opioids. Their clinical utility is limited by the adverse effects of sedation and hypotension. Epidural clonidine is used in neuropathic cancer pain. Baclofen is used by intrathecal pump to treat the painful spasms of cerebral palsy. Ketamine and dextromethorphan, both drugs with NMDA antagonist action, are being used in severe neuropathic pain.

Block nerve transmission

Reversible

Local anaesthetics

Local anaesthetics block nerve conduction reversibly. When the local anaesthetic wears off the pain returns. That is the pharmacologically correct statement, but another old saying, that a series of local anaesthetic blocks can be used to 'break the cycle' of pain and effect a cure, now has some empirical support,[167] even if the mechanism is not understood. Arner and colleagues showed that the duration of pain relief could far outlast the duration of local anaesthetic action, and that prolonged relief could result from a series of blocks.[167] Local anaesthetic blocks can thus be diagnostic and therapeutic. Diagnosis of pain for instance from a 'trapped' lateral cutaneous nerve of thigh can be confirmed by local anaesthetic block, and a series of blocks may prevent pain recurring.

Pain clinics use such blocks commonly, for shoulder pain (suprascapular nerve block[168,169]), for intercostal neuralgia, for rectus sheath nerve entrapment, postoperative scar pains and other peripheral neuralgias (**Table 21**). What is not clear is the extent to which adding steroid to the local anaesthetic makes a difference, either prolonging the duration of effect of a particular procedure or increasing the chance of success of a series of blocks.

Fibromyalgia

Similar injections are done for the trigger points of fibromyalgia, but there do not appear to be any controlled comparisons of injections with other treatments. Antidepressants remain one of the few remedies of proven benefit.

Intravenous regional sympathectomy

Intravenous regional sympathetic blocks (IRSBs) are used in patients with reflex sympathetic dystrophy (complex regional pain syndrome). The blocks are useful if they facilitate mobility.

Table 21: Common nerve blocks.

Nerve block	Common indications
Trigger point	focal pain (e.g. in muscle)
Peripheral: intercostal sacral nerves rectus sheath	pain in dermatomal distribution
Extradural (midline perineal pain)	Uni or bilateral pain (lumbosacral, cervical, thoracic etc.)
Intrathecal (midline perineal pain)	Unilateral pain (neurolytic injection for pain due to malignancy, limbs, chest etc.)
Autonomic	
Intravenous regional sympathectomy	reflex sympathetic dystrophy
Stellate ganglion	reflex sympathetic dystrophy arm pain brachial plexus nerve compression
Lumbar sympathetic	reflex sympathetic dystrophy lumbosacral plexus nerve compression vascular insufficiency lower limb perineal pain
Coeliac plexus	abdominal pain

Epidural steroids and facet joint blocks

Two other common pain clinic procedures particularly for back pain are epidural steroid injection and facet nerve blocks. However, there is considerable current controversy about the potential for epidural steroid to produce long-term neurological sequelae. Intrathecal injection of steroid can produce neurological sequelae. It is therefore important that intrathecal injection is avoided.

Classically facet joint injection with local anaesthetic and steroid is indicated when pain is worse when sitting, and pain is provoked by lateral rotation and spine extension. Recent studies suggest that whether or not the injection is actually in the facet joint makes little difference,[170] and indeed cast some doubt on long-term utility.[171] Short-lived success (less than six weeks) with local anaesthetic and steroid is said to be improved by use of cryoanalgesia or radiofrequency blocks to the nerves to the joints.

Irreversible

The destructive procedures are aimed at cutting, burning or damaging (**Table 21**) the nerve fibres carrying the pain signals. The flaw in the logic is that the nervous system can all too often rewire, finding a way around the lesion. If that happens, and the pain returns, then it may be even more difficult to manage – severe neuropathic pain can result. In general neurolytic blocks in non-malignant pain are not recommended, because they do not last forever, and recurrent pain may be more difficult to manage, and because of the morbidity. In cancer pain these neurolytic block procedures do have a place, when there is a short (less than three month) prognosis, or where alternatives such as meticulous drug control or long-term epidural infusion are not possible. Similar distinction between cancer and non-cancer pain holds for coeliac plexus block in pancreatic pain.

The limitation is the potential for motor and sphincter damage. This risk is higher with bilateral and repeat procedures, and higher the lower the cord level of the block. Extradural neurolytics have limited efficacy. While claims have been made that the paravertebral approach is preferable, patchy results may be attributed to unpredictable injectate spread. Results of spinal infusion of a combination of local anaesthetic and opioid are superior to neurolytic blocks, providing good analgesia with minimal irreversible morbidity.

Surgery

The relevant neurosurgical interventions for orthopaedic pain include dorsal column stimulation, rhizotomy, cordotomy and dorsal root entry zone (DREZ) lesions. The indications are usually non-malignant neuropathic pain which has failed to respond to pharmacological measures.

Alternatives

TENS and acupuncture

The rationale for transcutaneous nerve stimulation (TENS) is the gate theory.[172] If the spinal cord is bombarded with impulses from the TENS machine then it is distracted from transmitting the pathological pain signal. Acupuncture is another alternative method used to address chronic pain.

Physiotherapy and variants

Pain clinics keep a very open mind about other interventions such as physiotherapy. If patients benefit from alternatives they are encouraged to continue with these methods.

Behavioural management

Back schools through to behavioural management programmes offer a range of help for patients to cope with their (usually back) pain problems. Making decisions about the benefits of psychologically-based treatments of medical problems is not easy, and especially difficult to compare with other treatments and to measure relative benefit and cost. Patients whose pain has proved intractable to all reasonable medical and other interventions are chronic consumers of health care – GP or hospital clinic time, analgesic and psychotropic drugs, repeated admissions and sometimes surgery. If rehabilitation treatment enables these patients to carry on more satisfying lives with minimum medical help, how can it be most effectively and economically offered?

Chronic pain service provision and use

Clinical Standards Advisory Group Report

A report from the Clinical Standards Advisory Group (CSAG) on services for patients with pain analysed data collected in 1997 from a national survey (238 NHS Trusts) and 12 sample sites.[173] Of the 250 Trusts surveyed 215 (85%) provided a chronic pain service.

Activity data from the sample sites showed that only a minority (5 or 6 of 12) had activity data, and that there was wide variation in the activity levels for inpatient cases (6.4 to 35 inpatient cases annually per 100 000), day cases (72 to 155), new outpatients (67 to 158) and repeat outpatients (301 to 531).

Consultant weekly sessions per 100 000 population served varied nationally from 0 to 2.9, considerably below the recommended provision of 10 sessions per 100 000 population.[174]

The national survey showed wide variation in the level of service offered (defined as particular treatments offered), and this was reflected in the data from the 12 sample sites. Only one of the sample sites offered all the 15 treatments,* but the majority did offer injection treatments, transcutaneous nerve stimulation (TENS), single shot epidurals, and supervised opioid therapy for non-cancer pain. The reasons that all sites did not offer all 15 treatments may include the fact that it was a pretty eclectic list, including interventions such as acupuncture and hypnotherapy, which clinics might not offer because of lack of efficacy evidence. For some smaller clinics single-handed consultants might not have the skill mix to offer all the treatments.

Oxford Study

The use of chronic non-malignant pain services was estimated for the Oxford Region for the Summer of 1982.[175] The population served, 2.3 million, had a Regional Pain Relief Unit with 1115 'actively maintained records' of patients with non-malignant pain, records which had not been archived, excluding those who had died or not returned to the unit for 18 months. This gives an overall prevalence of 485 patients per million population. However, the Unit treated patients from outside the region, and adjusting for that the prevalence would be lower, at 325 patients per million.

Referrals in 1982

Referral patterns for 1982 are shown in the **Table 22**.

Changes since 1982

No documented evidence of change exists. Present patterns of referral and perceived changes include both patient-related and service-related factors. The patient-related factors include changes in the types of patient referred. More treatment now occurs in primary care,[176] particularly in Oxfordshire. For example, antidepressants for postherpetic neuralgia will often now be initiated by GPs. More difficult patients are being referred, and in greater numbers. The service factors are that overall workloads have increased since 1982. Medical staffing has increased from one consultant and senior registrar to two consultants and a 0.5 FTE honorary consultant running what is essentially a consultant-only service, with two psychology sessions per week. Joint clinics are run with psychiatry, neurology, neurosurgery and oral surgery. There are more specialist pain centres in the UK, and in the former Oxford Region there are consultants (especially anaesthetists) specialising in pain relief.

Chronic pain services – costs

Clinical Standards Advisory Group Report

Half of the 12 sample site Health Authorities in the CSAG report provided data on tariffs charged. For first outpatient consultation these varied from £54 to £171, for repeat outpatient from £54 to £134, for elective inpatient from £553 to £1471, and for day care from £75 to £384. The more than threefold variation shows that accurate costs are not available.

* Nerve blockade, TENS, X-ray assisted treatment, one-shot epidural, acupuncture, physiotherapy, supervised opioid therapy for non-cancer pain, continuous epidural, drug delivery systems: subcutaneous, psychology, drug delivery systems: intravenous, radiofrequency lesions, pain management programme, spinal cord stimulation, hypnotherapy.

Table 22: Prevalence, treatability and burden of chronic pain syndromes.

Condition	Percent	per 100,000		Treatability	Burden
Low back pain	6	6,000		variable	low to high
Ankylosing spondylitis	1.5	1,500		fair	low to high
Neck pain	15	15,000		fair	low to high
Whiplash	0.028	28		variable	low to high
Polymyalgia rheumatica	0.627	627		good	low to medium
Fibromyalgia	2	2,000		fair	low to medium
Migraine	15	15,000		good	low to medium
Headache (CTTH)	1	1,000		poor	low to medium
Trigeminal neuralgia	0.4	400		fair	low to high
Diabetic neuropathy	0.4	400		fair	low to high
Postherpetic neuralgia	0.03	34 (incidence)		fair	low to high
Multiple sclerosis	0.05	50	50% pain prev – how many MS?	variable	low to high
Central post stroke pain	0.01–0.05	10–50	8% of strokes	poor	high
Phantom limb pain	0.025	25	75% of amputees	poor	low to high
Stump pain	0.025	25		poor	low to high
Claudication	1	1,000		variable	low to high
Raynaud's	2–19			variable	low to medium
Angina	4	4,000		variable	low to high
Postop			say 10% of all?	variable	low to medium
post-mastectomy pain				variable	low to medium
thoracotomy				variable	low to medium
cholecystectomy				variable	low to medium

Treatability; poor, fair or good. Variable if variable.
Burden; low, medium or high.

Using the professional recommendation of 10 sessions per 100 000 population the requirements will be a consultant's salary, secretarial support, sessional nursing, psychology and physiotherapy, bed costs for inpatients and procedure costs for treatments. Using the CSAG activity data and tariffs yields annual costs per 100 000 population of £29 000 (lowest activity, lowest tariffs) and £210 000 (highest activity, highest tariffs). Thus a primary care trust covering 100 000 patients should be budgeting between £100 000 and £200 000 per year for chronic pain services.

As previously referred to in the section on prevalence and incidence, the burden of chronic pain seen at pain clinics has increased substantially in the last decade. Patients are usually in the sixth and seventh decade of life, so demographic imperatives will increase prevalence still further until at least about 2020. Some foresee increasing problems in recruiting and retaining staff to work in chronic pain, and this may make adequate provision more difficult.[177]

Canadian study on costs

A detailed Canadian study of the costs incurred by users of speciality pain clinic services[178] showed that users of the services incur less direct health care expenditure than non-users with similar conditions. This conclusion is important and in an ideal world this study would be repeated in the UK to show the financial benefit of the service.

Of 626 patients referred to the chronic pain clinic in Hamilton, Ontario, between January 1986 and April 1988, 210 did not attend the clinic (non-attender), 180 had a consultation appointment only (consultation only), 98 had an incomplete treatment programme (incomplete treatment) and 83 had a complete treatment programme. A sample of 222 of 626 patients was used to compute the use of different types of health services and other costs. This was done by asking patients about their use of five categories of direct health services – primary care, emergency room and specialists, hospital episodes and days, and the use of seven types of other health professionals. Other direct and indirect costs for the patient and associated with their use of health care were also estimated. Money values in the paper are given in 1991 dollars, but whether these are Canadian or US dollars is not stated.

There was no demographic or condition diagnosed difference between the four groups. The results showed that the direct health care costs were lower for users of chronic pain services than for non-users. Broken down by type of cost for one year these are shown in **Table 23**.

Table 23: Annual per patient direct health care costs for patients referred to a chronic pain unit using different levels of service (1991 dollars).

Service used	Non-attender	Consult only	Incomplete treatment	Complete treatment
Number surveyed	57	80	44	41
Primary care visits	477	422	412	462
Specialists	548	642	862	817
Emergency room	206	439	266	191
Hospital stay	3,116	2,017	462	1,290
Health professional	833	396	226	237
Total	5,181	3,917	2,229	2,996

The total annual direct health costs were much lower for users of chronic pain services (even if it was only a consultation), and the savings were clearly derived mostly from reduced costs of days spent in hospital. This is shown graphically in **Figure 5**.

The 74% of the chronic pain referrals who actually used some chronic pain services had only 64% of the total costs for the referred patients. The 'saving' that came from using chronic pain services derived mainly from the intensive users of the service who had treatments, rather than those who had only a consultation.

The average direct health care cost of a patient using chronic pain services, even if that was a single consultation, was $2947. Referred patients who did not use the service cost more, an average of $5181. The difference between these averages was $2234.

Using the most conservative estimate – that is, no cost inflation since 1991 and assuming that the currency was Canadian dollars with an exchange rate of about $2/£ – the average difference amounts to a saving in direct health care costs of about £1117 per patient. Using this figure with the 1982 figure of 1115 patients with non-malignant pain on the Oxford Pain Relief Unit books translates to health care savings of £1 250 000.

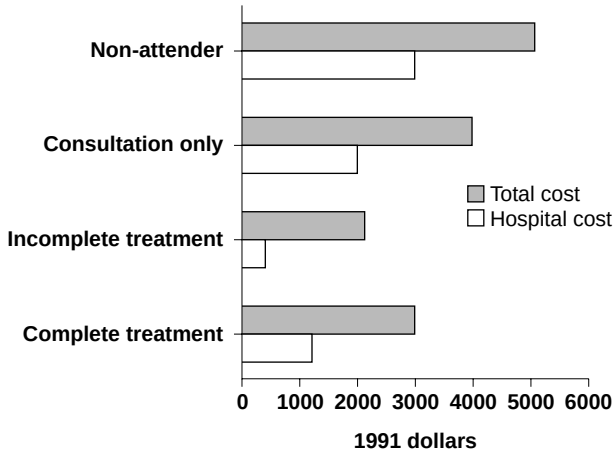

Figure 5: Total per patient direct health care costs and cost of hospital stay for patients referred to a chronic pain unit using different levels of service (1991 dollars).

This compares with the running costs (labour, consumables, estates, overheads) of the Pain Relief Unit in Oxford (with a larger workload) of £500 000 (see **Figure 6**).

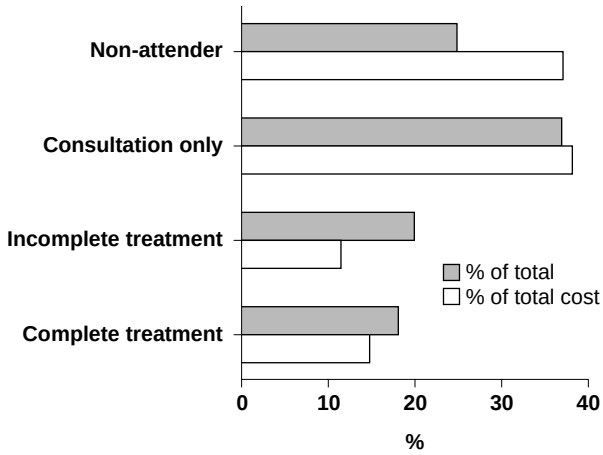

Figure 6: Percentage of total number and total direct health care costs for patients referred to a chronic pain unit using different levels of service.

6 Effectiveness of services and interventions

As mentioned previously there are many interventions, pharmacological, non-pharmacological, invasive and non-invasive, from which to choose. Whether we are making decisions for our own patients or for our service or for national or international guidelines, the same principles should apply. The relative efficacy and safety of the possible interventions, and then the cost, have to be the key determinants. This section uses systematic reviews when possible to provide the best available evidence for the various interventions, with the number-needed-to-treat (NNT) as the measure of clinical significance from quantitative systematic reviews. The arguments about best choice treatment are covered in greater detail in a Health Technology Assessment report[179] and in book form.[180]

Analgesics

Figure 7 shows a league table for relative analgesic efficacy for single dose use and **Table 24** shows the NNT for some analgesic interventions. Paracetamol 1 g will produce at least 50% relief of pain for one out of four patients, ibuprofen 400 mg (and other NSAIDs analysed) for one out of two patients. The efficacy evidence thus leads to the advice to start with paracetamol, and move to combination and then to NSAID if greater efficacy is needed. This is inherently a safer strategy than leaping in with the greater efficacy NSAID, because it carries greater risk than paracetamol. (A I-1)

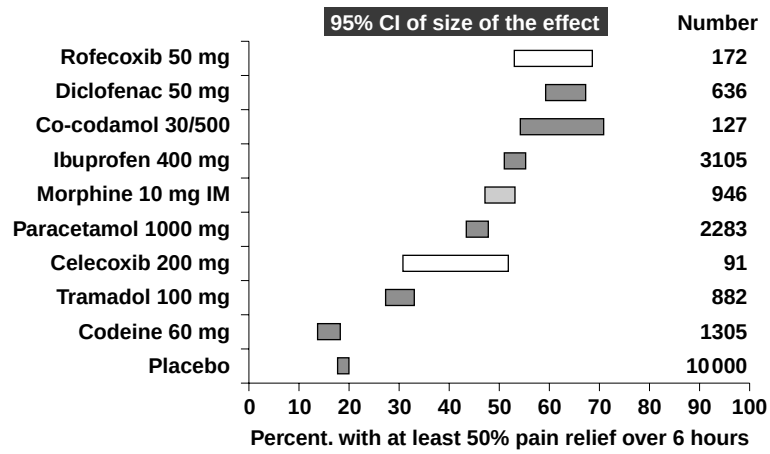

Figure 7: League table of relative efficacy for single dose analgesic use.

This philosophy is used in the American College of Rheumatologists Guidelines for arthritic pain. Two early studies suggested that there is little advantage in osteoarthritis of either NSAIDs over paracetamol[189] or weak opioids in combination with paracetamol over paracetamol alone,[190] but recent trials do show the expected superiority of NSAID over paracetamol.

No single-dose trial has shown any efficacy advantage of one NSAID over another.[191] This does not fit well with patients' reports on multiple dosing of increased efficacy from NSAIDs with greater anti-inflammatory action. The efficacy dose-response curve for NSAIDs is flat compared with the dose-response for adverse effects such as gastrointestinal symptoms, dizziness and drowsiness.[192] Increasing the dose to improve analgesia is therefore more likely to increase adverse effects than to improve analgesia.

Table 24: Number-needed-to-treat (NNT) for some analgesic interventions.

Condition	Intervention	Outcome	NNT	Reference
Postoperative pain	(good) ibuprofen 400 mg	> 50% pain relief	2	Moore, McQuay *et al.* 1996[181]
	paracetamol 1 g	> 50% pain relief	4	Moore, McQuay *et al.* 1996[181]
	(poor) codeine 60 mg oral	> 50% pain relief	> 10	Moore and McQuay 1997[182]
Back pain	epidural steroid	> 75% relief at 60 days	> 6	Watts and Silagy 1995, McQuay and Moore 1996[183,184]
Acute sprains etc.	topical NSAID (good)	> 50% pain relief	2+	Moore, Tramèr *et al.* 1998[185]
Trigeminal neuralgia	anticonvulsants	> 50% pain relief	2.5	McQuay, Carroll *et al.*[186]
Diabetic neuropathy	anticonvulsants	> 50% pain relief	2.5	McQuay, Carroll *et al.*[186]
	topical capsaicin	> 50% pain relief	4.2	Zhang and Li 1994[187]
Neuropathic pain	antidepressants	> 50% pain relief	2.5	McQuay, Tramer *et al.* 1996[188]

NSAIDs alone produced as good analgesia as single or multiple doses of weak opioids alone or in combination with non-opioid analgesics.[192] Adverse effect incidence and patient dropout rates were the same for multiple doses of NSAIDs or weak opioids in combination with non-opioid analgesics.[192]

In contrast to efficacy, where we see little difference between NSAIDs, the risk of NSAID-induced gastric bleeding is lowest with ibuprofen, and increases with increasing age.[193] Prophylactic misoprostol should be considered for preventing NSAID-associated gastrointestinal complications when age is greater than 75 years, cardiovascular disease, history of peptic ulcer or of gastrointestinal bleeding (NNTs to prevent one serious GI complication in one year 105, 58, 11 and 7 respectively).[194,195] The alternative to COX1 NSAID used with gastric protection is the COX2 specific inhibitors (COXIBs), which show similar efficacy to their forebears but with decreased risk of peptic ulceration or bleeding,[196] which has economic consequences.[197] Cardiac risk with NSAIDs does not appear to be improved by COXIBs.

Topical NSAIDs

Published RCTs on chronic pain conditions (mainly knee osteoarthritis) studied over 800 subjects treated with topical NSAIDs and 322 subjects who received placebo. The analgesic response for combined placebo treatment was 30%, and for combined topical non-steroidal anti-inflammatory preparations it was 63%. For analgesic effects the odds ratio was 3.6 (2.6–4.8) and the number-needed-to-treat was 3.2 (2.6–4.1).[185] (A I-1)

Opioids

There is little strong evidence to support the intrathecal pump administration of opioid in preference to the oral route.[198] (C I-1)

1 **Antidepressant drugs:** Antidepressants can provide good relief in neuropathic pain (NNT of 2–3, **Table 24**).[188] For fibromyalgia as in more classic neuropathic pain, antidepressants are one of the few remedies of proven benefit.[45] (A I-1)
2 **Anticonvulsant drugs:** Anticonvulsants can provide good relief in neuropathic pain (NNT of 2–3, **Table 24**).[186] Doses required for analgesic effect are close to the anticonvulsant dosing range, and carry an adverse effect burden. This systematic review suggests that there is little difference in the number of adverse effects seen with antidepressant and anticonvulsant used in neuropathic pain, but that may conceal a difference in severity (which was not reported). (A I-1)

3 **Others – Alpha-2 adrenergic agonists and NMDA antagonists:** Epidural clonidine is effective in neuropathic cancer pain[199](A I-2). Ketamine is used in severe neuropathic pain, with scientific rationale but little strong evidence yet of good benefit.[200] (C I-1)

4 **Reversible block nerve transmission:**
Epidural injections for back pain and sciatica: Epidural steroids in back pain have been studied in two systematic reviews.[183,201] Overall the combined data showed statistically significant (odds ratios) improvement for both short-term (1–60 days) and long-term (12 weeks up to one year). The clinical significance is that the NNT for short-term (1–60 days) greater than 75% pain relief from the ten trials with short-term outcomes combined, was just under 6, with 95% confidence intervals from 4 to 12.[184] This means that for 6 patients treated with epidural steroid, one will obtain more than 75% pain relief short-term. (A I-1)

The NNT for long-term (12 weeks up to one year) improvement from the five trials combined, was about 11, with 95% confidence intervals from 6 to 90. This means that for 11 patients treated with epidural steroid, one will obtain more pain relief over this longer-term period. There is still the interesting question of whether local anaesthetic alone could achieve these results (breaking the cycle), or whether the steroid is an essential component. (A I-1)
Intravenous regional sympathetic blockade: A systematic review of seven RCTs of IRSBs found that none of the four guanethidine trials showed significant analgesic effect. Two reports, one using ketanserin and one bretylium, with 17 patients in total, showed some advantage of IRSBs over control.[202] Adding guanethidine in IRSBs does not appear to be more effective than local anaesthetic alone. (D I-1)

5 **Irreversible block nerve transmission:** Pain associated with pancreatic cancer responds well to coeliac plexus block,[203] and it may also help those with abdominal or perineal pain from tumour in the pelvis. In chronic pancreatitis results are much less convincing. (A I-1)

6 **Surgery:** The difficulties of trials of uncommon surgical procedures are well known. These procedures are usually documented by glowing case series. Longer-term outcomes may not be so good.[204] (D II-2)

7 **TENS:** A systematic review shows that TENS has limited efficacy in chronic pain.[205] (D I-1)

8 **Acupuncture:** Several systematic reviews discuss acupuncture in chronic non-malignant pain.[206–9] These show limited effect on pain outcomes. Any effect on well-being is often short-lived (three days), and is therefore expensive in time. It is difficult to know what is the real place of acupuncture, like other complementary interventions, because of the lack of trials comparing complementary with mainstream procedures.[210] (D I-1)

9 **Physiotherapy:** The evidence from back pain, however, suggests that on rigorous outcome measures physiotherapy and other forms of manipulation have but limited success. Such analyses often did not include any measure of quality of life. If they make the patient feel better and they are cheap then it is a decision for the third party payer whether or not these physiotherapy manoeuvres should be offered. A number of systematic reviews are published on this subject.[211–19] (D I-1)

10 **Behavioural management:** Randomised comparison of the St Thomas' four-week inpatient treatment with eight-week half-day outpatient treatment, with fitness training, planned increases in activity, activity scheduling, drug reduction, relaxation and cognitive therapy as the pain management methods taught by the same staff team,[220] showed that for every three patients treated as inpatients rather than outpatients, one patient fewer was taking analgesic or psychotropic drugs. For every four patients treated as inpatients rather than outpatients, one patient fewer sought additional medical advice in the year after treatment. For every five patients treated as inpatients rather than outpatients, one patient more had a ten-minute walking distance improved by more than 50%. For every six patients treated as inpatients rather than outpatients, one patient fewer was depressed.[221] A number of systematic reviews exist in this area[222–9] (and see McQuay *et al.*[179] for evidence of efficacy of psychological interventions). (B I-1)

Effective service provision

Once the effectiveness of an intervention is known the next step must be to check whether the interventions used in pain clinics reflect these known levels of efficacy. **Table 25** shows the attempt the Audit Commission made to make a matrix of treatment efficacy, determine the percentage of clinics in their sample which offer particular treatments, and to put the percentage offering a particular treatment on the matrix.[230] The CSAG report on pain focused more on provision and process, but has interesting data on variation in provision of services (discussed above).[173]

Table 25: Chronic pain treatments classified by evidence of effectiveness and risk of side-effects, degree of invasiveness and cost of the procedure.[230]

Clinical risk and/ or cost:*	Effective**		Evidence of effectiveness			
			Thought to be effective, but with little formal evidence***		Ineffective****	
Low	Some minor oral analgesics (e.g. ibuprofen, paracetamol)		TENS provided for use at home	90%	Some minor oral analgesics (e.g. codeine alone)	
	Topical NSAIDs in rheumatological conditions (e.g. single arthritic joint pain)	90%	Relaxation therapy			
	Topical capsaicin in diabetic neuropathy, psoriasis	95%				
Medium	Antidepressant drugs (for e.g. neuropathic pain, post-herpetic neuralgia, diabetic neuropathy)	95%	Outpatient TENS courses	60%	Injection of corticosteroids in or around shoulder joints for shoulder pain	89%
	Anticonvulsant drugs (for e.g. trigeminal neuralgia)	100%	Outpatient psychological intervention programmes	70%		
	Systematic local anaesthetic drugs for nerve injury pain	60%	Acupuncture courses by nurse or therapist	50%		
			Manipulation for back pain	50%		
			Epidural given once, but abandoned if ineffective			
			Long-term, low-rate opioids			
			Surgical intervention for back pain when surgery has not yet been tried (e.g. laminectomy for sciatica with positive neurological signs and MRI)			
			Orthopaedic corsets, neck collars used for long periods			
			Sclerosis injection for low back pain	21%		

Table 25: Continued.

Clinical risk and/or cost:*	Effective**		Evidence of effectiveness			
			Thought to be effective, but with little formal evidence***		Ineffective****	
High	Epidural for back pain and sciatica (effects for first 60 days)		Acupuncture courses provided by doctors (higher salary costs)	65%	Epidural for back pain and sciatica (effects beyond 3 months)	
	Inpatient psychological intervention programmes	25%	Trigeminal neuralgia treatments using specialised/expensive equipment (e.g. radio frequency block kit)	30%	IRSB guanethidine	90%
			Lignocaine infusion as inpatient	45%		
			Epidural left in-situ for several weeks as inpatient	84%		
			Long-term, high doses of a cocktail of opioids and other drugs			
			Repeated back pain surgery			
			Cordotomy	11%		
			Spinal cord implanted stimulators	25%		
			Destructive nerve burning, freezing, phenol injections	95%		

* Clinical risks could include side-effects, the degree of invasiveness of the procedure, and whether the effects on the body are reversible. Treatments have been placed into a category according to the professional judgement of consulted practitioners.
** Treatments proved to be effective are those with a sufficient number of randomised controlled trials available to calculate a statistic called the 'number needed to treat' (NNT), and, in this context, which have values of NNT between 2 and 4.
*** Many treatments have not been subjected to enough randomised controlled trials to make a statistical judgement about their effectiveness.
**** Treatments shown to be without effect in this context are those with NNTs greater than 4.
% = percentage of 20 Trusts providing each treatment is listed where known; some treatments may be provided via referral to another clinic.
Source: Audit Commission; evidence of effectiveness is drawn from previous chapters; relative risk/cost from discussion with practitioners

While all of us may disagree with the particular judgements made about efficacy and safety in **Table 25**, the approach is the same approach we all use (covertly) in our professional life. What might be perceived as threatening clinical freedom, in that those paying for health care might choose to pay only for treatments in the upper left sections of **Table 25**, is in reality a matter of judging relative efficacy, safety and cost.

Primary care prescribing

Another approach is to use the national prescribing data to see to what extent the prescribing of oral analgesics in primary care matches the efficacy league table for oral analgesics.[180] Using the Government Statistical Service Prescription cost analysis for England 2001,[231] which provides data on the number of prescriptions for particular categories of drug (**Table 26**), we then produced a simple scattergram of the number of prescriptions for the different drugs against the NNT for single dose analgesia[180](**Figure 8**).

Table 26: UK oral analgesic prescribing and efficacy.

Analgesic studied	NNT	Prescriptions (thousands)
Codeine	17.7	1,324
Dihydrocodeine	9.7	2,460
Tramadol	4.7	1,815
Paracetamol	4.6	7,814
Dextropropoxyphene HCl 65 mg/paracetamol 650 mg	4.4	8,775
Ibuprofen	2.7	5,300
Diclofenac	2.3	7,040
Co-codamol 30 mg codeine/500 mg paracetamol	1.9	3,938

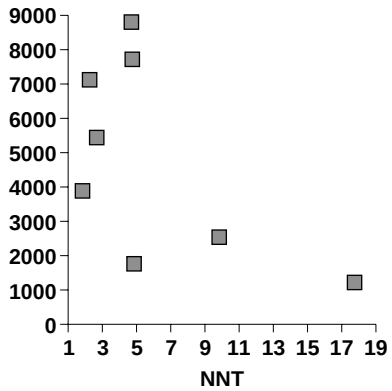

Figure 8: UK oral analgesic prescribing and efficacy (2001).

The graph shows that prescribing in primary care does a good job – there are more prescriptions for the more effective drugs. Prescribing advice will be a factor, as will cost, but most analgesics are cheap, so that efficacy should be the primary determinant. Given that there are differences between the single-dose efficacy of the different analgesics, safety issues now need to be brought into focus. A problem here is that while there may be differences in minor adverse effect incidence on single dosing, with opioids alone or in combination being the worst offenders, the real safety issues are about what happens with multiple or chronic dosing. For somebody with arthritic pain which requires months or years of analgesic use, which is the best choice, paracetamol or NSAID? At recommended doses paracetamol has minimal safety problems. Using data from four randomised trials, taking NSAIDs for more than two months carries a risk of bleeding or perforating gastroduodenal ulcer of 1 in 228 (150–479), RR 2.8 (1.2–6.2), absolute risk

0.69%.[160] We estimate that there is a 1 in 8.3 (12%) risk that these patients with bleed or perforation will die. Using a control event (death) rate of 0.0002% with this experimental death rate of 0.69%/8.3 = 0.083%, we calculate[160] that the average number-needed-to-kill (NNK) for a patient receiving chronic oral NSAIDs for at least two months is 1/(0.083%–0.002%) = 1/0.081% = 1235. This shows the complexity of what appears at first glance to be a simple choice between NSAID and paracetamol.

Cost-effectiveness

There is little information about the costs and benefits of chronic pain services, and what little there is barely constitutes evidence. Two possible approaches were looked at. Costs may be determined by contrasting, for instance, two or more different types of treatment for a condition and working out the costs and benefits for each. This method was precluded by lack of sufficient evidence, for instance the fact that we have no real evidence that TENS works in chronic pain. Evidence of effectiveness must come first. Rational assessment of cost–benefit needs evidence of effectiveness. Irrational assessment might just compare the cost of one ineffective therapy with another.

Another way to cost the service is to use an approach in which the disease burden is examined, changes are estimated, and judgement is made as to whether pain clinics add to costs or reduce them. Here at least there is some evidence, but not very much, and not very recent.

Do chronic pain clinics reduce other NHS expenditure? A case study

From the Canadian study described in the previous section, it can be argued that attendance at a chronic pain clinic could reduce expenditure elsewhere in the NHS, so that the cost of the clinics would more than be covered by savings. To test this idea, the Audit Commission asked a pain clinic to carry out a small study.[230] A randomly-selected group of 21 patients who first attended the clinic in October 1996 were asked to take part in a telephone interview. Some of the answers were verified from clinical case notes, but mostly the results relied on the patients' memories. The interviewer (an experienced research nurse) asked the patients about their consultation and treatment histories for the six months before attending the pain clinic, and for the six months since first attending, using a structured questionnaire.

The results (**Table 27**) suggest that there may be English truth in the Canadian study, but to be sure one would need a larger sample of patients, at many more clinics, extending the period before and after the clinics, and preferably tracing patients' records rather than relying on self-report. The implication is that close liaison between the different NHS specialities could reduce excessive referral/treatment and provide a better service for patients.

These data suggest that chronic pain services not only benefit patients, but are also an efficient way of dealing with chronic pain in the community.

Table 27: Do chronic pain clinics reduce other NHS expenditure? A case study.[230]

Average number per patient		**In the six months**		
		Before attending the pain clinic	**After attending the pain clinic**	**Change + = increase – = reduction**
Outpatient attendances:	NHS pain clinic	0.05	1.6	+97%*
	Other NHS medical specialities**	2.8	0.9	–222%*
	Total	2.8	2.5	–13%
	NHS treatments (e.g. TENS, physio, surgery)	1.0	0.9	–17%
	Days in hospital	0.2	0.5	+50%
	A/E attendances	0.1	0.05	–100%
	Different types of drug for pain	2	2.2	11%
	Visits to the GP about pain	5.0	3.0	–64%*
	Home visits by GP	0.1	0.1	–
	Other NHS home visits	0	0	–
	Private treatments	0.4	0.2	–125%*
	% of patients	**Before**	**After**	
Attending outpatient clinics	NHS pain clinic	5%	100%	
	Other NHS medical specialities**	81%	38%	
	Either	86%	100%	
Having NHS treatment	Relatively high cost treatments (e.g. surgery)	10%	5%	
	Medium cost (e.g. physio, nerve block)	62%	43%	
	Low cost (e.g. X-ray)	24%	38%	
	Any treatment	67%	62%	
Hospital inpatient		5%	10%	
Attending A/E		5%	5%	
Taking drugs for pain:	Opiates	14%	16%	
	Antidepressants, tranquillisers, etc.	24%	47%	
	NSAIDs	48%	63%	
	Minor analgesics	71%	74%	
	Any type of drug	90%	90%	
Visiting the GP about pain:	For repeat prescriptions	67%	52%	
	For consultant/advice about pain	62%	24%	
	Any reason to do with pain	86%	71%	
	Having a home visit by GP	5%	5%	
	Other NHS home visits	0	0	
Having private treatment		33%	19%	

* Significant change (paired sample t-test, 1-tailed, 5% level).
** Other NHS specialities include orthopaedics, neurology, vascular surgery, gynaecology, urology, rehabilitation medicine, nephrology.

7 Models of care and recommendations

The provision of chronic pain services clearly should not be taken in isolation, and **Figure 9** shows a simple view of some major service relationships. Many treatments, drug or procedures, are common to the different service providers; the additional expertise found in the pain service is the ability to do particular invasive procedures. The ideal promoted widely in the developed world is chronic pain services which are multidisciplinary. The medical components of such multidisciplinary services are the rehabilitation, neurology, orthopaedic and psychiatric services shown in **Figure 9**, together with clinical psychology, physiotherapy and pharmacy inputs as integral to the chronic pain service.

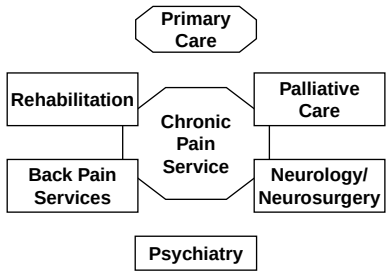

Figure 9: Chronic pain: service relationships.

The historic pattern in the UK has been a District General Hospital (DGH) service with a more comprehensive service regionally, often in the University Hospital. The size of the DGH service varies widely, and none of those sampled by CSAG came near to the 10 consultant sessions per 100 000 population recommended by the Pain Society.[174] There are two clear advantages to local service provision: the geographical proximity for the patient and the ability to interact easily with primary care and the other local specialities. The regional service would then provide the other speciality input or interventions not available at the DGH. The disadvantage of a small DGH service is the burden on a single-handed consultant, and lack of critical mass. It is hard to be precise about the minimum size of an effective service, but there would be few single-handed consultants if the 10 consultant sessions per 100 000 population recommendation were to be followed. Examples of a speciality intervention not usually available at a DGH would include a pain management programme.

The second level of decision in the model of care is determining which interventions a service should provide. We need to know whether the various components of the service (interventions) are effective, how much they cost, and examine whether their delivery is efficient. There are also the difficult issues of how treatable the pain syndrome is, and how big the burden is for the patient. As discussed above, in general the efficacy evidence for drug treatments (and pain management programmes) is as strong as the evidence for injection procedures is weak, but this weakness is sometimes a lack of evidence rather than evidence of lack of efficacy.

The evidence presented in the effectiveness section enables us to determine which effective treatments should be used and which ineffective interventions should be avoided:

Effective interventions

- Minor analgesics
- Combinations of different analgesics
- Anticonvulsant drugs

- Antidepressant drugs
- Systemic local anaesthetic-type drugs for nerve damage pain
- Topical NSAIDs in rheumatological conditions
- Topical capsaicin in diabetic neuropathy
- Epidural injections for back pain and sciatica.

Interventions where evidence is lacking

- Transcutaneous electrical nerve stimulation in chronic pain
- Relaxation
- Spinal cord stimulator.

Ineffective interventions

- Intravenous regional sympathetic blockade
- Injections of corticosteroids in or around shoulder joints for shoulder pain.

One clear recommendation is that if paracetamol is sufficient to control the pain then the choice should be paracetamol, because of its good long-term safety at recommended doses. Taking NSAIDs for more than two months carries a risk of bleed or perforation, and in turn a risk of death. Long-term harm has important financial implications. For example, the cost of NSAID gastrointestinal adverse effects, combining hospital admission and the cost of co-prescribing gastro-protective agents, was estimated as costing the NHS a conservative £250 million in 1997/8.[197] And NSAID-related gastrointestinal adverse effects account for about one-third of the long-term harm. With congestive heart failure and renal failure, NSAID prescribing can result in 50 hospital admissions each year for a primary care trust of 100 000 people.[232]

Difficult commissioning decisions will emerge on a case-by-case basis, with desperate patients seeking novel treatments. Different but also difficult is the complementary and alternative medicine lobby. Acupuncture, for instance, appeared on the CSAG checklist of interventions in chronic pain. There is no credible evidence of analgesic efficacy of acupuncture in chronic pain, but acupuncture, in common with other complementary and alternative interventions, may make patients feel better even if it does not alter the pain. One way to deal with these conundrums is to fund the unproven treatments only in the context of a randomised trial.

The fact that 85% of Trusts surveyed had a chronic pain clinic is evidence that there is a perceived need for the service. There is little evidence as to what constitutes the optimal form of the service, and very little evidence on resource use and benefit gained. The current satellite and hub model of DGH and regional centre works to an extent, but there has been a dearth of organisational research into service provision.

It is foolish to be didactic about service arrangements in this area, because there is overlap between the different services which make up the provision for chronic disease and pain. A strong rehabilitation service in a district, for example, might mean that other services could be less strong. What is clear is the need, and the ageing population means that this will become more and more apparent. The pain clinic should offer a mix of drug treatment, injection treatment, devices and psychological input, and the availability of this skill mix is the important principle rather than under which service banner it appears.

One pain consultant per 100 000 of the population seems a sensible estimate for available pain expertise. Precisely how this fits into the other service provision will vary. The current hub and spoke arrangements for chronic pain may be optimal for some regions. The need for good liaison with other specialities favours decentralised rather than centralised arrangements.

8 Information and research requirements

Information requirements

In order to organise the treatment of chronic pain better, we recommend the following information is gathered, organised and made available:

- A single electronic source of high quality evidence on the *diagnosis* of various pain conditions for use in primary care.
- A single electronic source of high quality evidence on the *treatment* of various pain conditions for use in primary care. This will involve predominantly systematic reviews of randomised trials, but will also summarise where evidence does not exist (like TENS in chronic pain) and especially where treatments are known not to be effective (acupuncture).
- A single electronic source of high quality evidence about the management of chronic pain in primary and secondary care.
- Regular training courses plus distance learning to encourage lifetime learning for developing professional pain specialists in primary care.
- Referral protocols.

Research requirements

The evidence base in pain relief is one of the best in medicine. Most of the interventions commonly used in chronic pain treatment can be shown to be very effective. Some have been shown not to be effective, and their use is less common than it was. While these findings buttress much of current practice in chronic pain treatment, a common theme is that we still need to know more. In particular, information on which to base economic analysis is missing. Such information as is available indicates that pain clinics result in direct health care savings of over £1000 per patient per year, and that total savings may be twice the cost of the chronic pain service. Knowing that major demographic changes will affect the NHS over the next several decades, and that ageing populations will demand more chronic (and cancer) pain therapy, providing more information on economic as well as humanitarian benefits will be important.

Appendix 1: Methods

Studies reporting prevalence or incidence of chronic pain were sought systematically. Chronic pain is usually as defined by authors, though a minimum requirement was duration of three months or more. Several different search strategies were used to identify reports from MEDLINE (1966 to July 2001), EMBASE (1980 to January 2001), PubMed (July 2001) and the Oxford Pain Relief Database (1950 to 1994),[233] and our own extensive literature collection in pain topics. Reference lists of retrieved reports were searched for additional studies. Abstracts and narrative review articles were not considered.

Inclusion criteria

Studies were included when they were full journal publications, studying adult community or clinic-based populations in Europe or North America, used clear and established diagnostic criteria for disease/pain conditions of interest, presented prevalence and/or incidence data for the disease/pain condition of interest and reported survey/study response rates.

Exclusion criteria

Studies were excluded if they were of occupational-based populations, used invalid or unclear diagnostic criteria, had a low response rate (below 60%) without an analysis of non-responders, or with an analysis which produced a biased result.

Data extraction

From each eligible report we extracted study design, sample source, disease/pain definition, sample size and response rate, age range, incidence and/or prevalence data. Gender and age specific rates were extracted if given, together with information on pain severity and disability.

Incidence was converted to annual incidence per 100 000 population with 95% confidence intervals (CI) where possible. Prevalence was converted to prevalence per 100 000 population with 95% CI where possible. Where pain within a condition was examined, we report the prevalence *within* the condition as occurrence, and then use prevalence information for the condition to calculate the prevalence of the *painful* condition.

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