Health Information and Quality Authority

An tÚdarás Um Fhaisnéis agus Cáilíocht Sláinte

# Health Technology Assessment of Scheduled Procedures

# Release of Carpal Tunnel

**December 2013**

*Safer Better Care*

# About the Health Information and Quality Authority

The Health Information and Quality Authority (HIQA) is the independent Authority established to drive continuous improvement in Ireland's health and personal social care services, monitor the safety and quality of these services and promote person-centred care for the benefit of the public.

The Authority's mandate to date extends across the quality and safety of the public, private (within its social care function) and voluntary sectors. Reporting to the Minister for Health and the Minister for Children and Youth Affairs, the Health Information and Quality Authority has statutory responsibility for:

- **Setting Standards for Health and Social Services** – Developing person-centred standards, based on evidence and best international practice, for those health and social care services in Ireland that by law are required to be regulated by the Authority.

- **Social Services Inspectorate** – Registering and inspecting residential centres for dependent people and inspecting children detention schools, foster care services and child protection services.

- **Monitoring Healthcare Quality and Safety** – Monitoring the quality and safety of health and personal social care services and investigating as necessary serious concerns about the health and welfare of people who use these services.

- **Health Technology Assessment** – Ensuring the best outcome for people who use our health services and best use of resources by evaluating the clinical and cost effectiveness of drugs, equipment, diagnostic techniques and health promotion activities.

- **Health Information** – Advising on the efficient and secure collection and sharing of health information, evaluating information resources and publishing information about the delivery and performance of Ireland's health and social care services.

# Table of Contents

# 1 Carpal tunnel release surgery

## 1.1 Scope of HTA

This health technology assessment (HTA) evaluates the appropriateness and potential impact of introducing clinical referral or treatment thresholds for carpal tunnel syndrome surgery for adults within the publicly-funded healthcare system in Ireland. The effectiveness of this surgery may be limited unless undertaken within strict clinical criteria. This report is one of a series of HTAs of scheduled procedures. Details of the background to the request for the assessments from the Director General of the Health Service Executive (HSE), Mr Tony O'Brien, and the general methodology are included in the separate 'Background and Methods' document.[1]

The scope of this HTA is to investigate clinical referral and treatment thresholds that can be used in the assessment, referral and surgical management of adults presenting with carpal tunnel syndrome in Ireland. Inputs from an Expert Advisory Group along with a review of the clinical and cost-effectiveness literature were used to inform the criteria. Additionally, the budget impact and resource implications were assessed as appropriate.

## 1.2 Surgical indication

Carpal tunnel syndrome (CTS) is caused by compression of the median nerve running through the wrist resulting in numbness, weakness or tingling in the hand. Nerve entrapment occurs in the carpal tunnel, a narrow opening between the carpal bones and transverse carpal ligament at the base of the hand, through which the finger flexor tendons and median nerve pass. CTS occurs in people of all ages, with peak incidence occurring between the ages of 50 and 60 years.[2;3] CTS is rare in children, where it mostly occurs as a result of congenital abnormalities or trauma.[4] Women are more likely to be affected than men (incidence rates of 506 versus 140 per 100,000 person years, respectively).[3] The overall incidence rate in a general population ranges from 2.7% to 5.8%.[2;5] Risk factors for the disease include pregnancy, obesity, arthritis and trauma.[4;6] Classical clinical presentation includes paresthesia and loss of manual dexterity or thenar weakness unrelated to neck or arm pathology. Patients may report experiencing pain at night-time and a history of shaking the hand or flicking the wrist to alleviate discomfort. Diagnosis is primarily based on history and physical examination, with adjunctive tests such as diagnostic ultrasound, electromyography (EMG) and nerve conduction studies being used when there is doubt about the diagnosis. Nerve conduction studies can also be used to quantify disease severity.[6]

Many patients with CTS recover spontaneously over a six-month period. However, those who do not and are untreated can develop permanent median nerve

damage.[4] A European study on the natural course of CTS[7;8] found that younger age and a shorter duration of symptoms were associated with a better prognosis, whereas the presence of bilateral symptoms or a positive Phalen's test were associated with a poorer prognosis. Treatment is generally based on the severity of the disease as measured by the duration and severity of symptoms. Severe disease is characterised by worsening clinical symptoms of longer than one year's duration and clearly abnormal electromyography (EMG) and nerve conduction studies.[6]

## 1.3 Surgical procedure, potential complications and alternative treatments

Surgical release of the carpal tunnel can be performed under local anaesthetic using either open or endoscopic techniques. The aim of surgery is to dissect the transverse carpal ligament to relieve compression on the nerve, thereby alleviating symptoms. Open surgery involves a single longitudinal incision at the base of the palm whereas endoscopic surgery can be performed using either one or two smaller access incisions.

Success rates for surgery (as defined by overall improvement in symptoms at three months) range from 80% to 98%.[9-11] The rate of major complications (structural damage to nerves, arteries or tendons) for both surgical approaches is low (0.19% endoscopic, 0.49% open).[12] Endoscopic surgery is associated with more transient nerve problems (neurapraxia, numbness, paraesthesiae) than open surgery, which is associated with more wound problems (infection, hypertrophic scarring, scar tenderness).[9] The rate of repeat operations required does not differ significantly between the two approaches (OR 1.24, 95%CI: 0.50 to 3.07).[9]

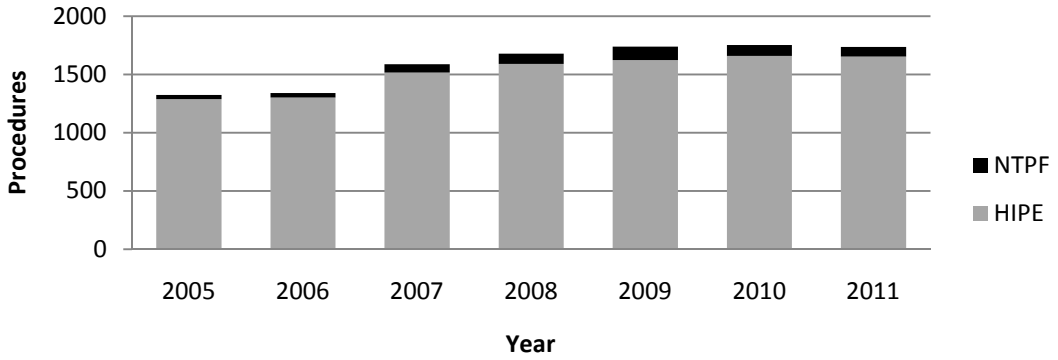
Non-surgical alternatives include corticosteroid treatment (local injection or oral), splinting, therapeutic ultrasound, yoga or carpal bone mobilisation.[13-17]

## 1.4 Current practice in Ireland

Hospital In-Patient Enquiry Scheme (HIPE) data indicate that the number of carpal tunnel release surgeries performed annually in Irish hospitals increased from approximately 1,300 in 2005 before stabilising at around 1,700 surgeries per year since 2009 (Figure 1.1).[18] In addition to activity levels in public hospitals, surgery for carpal tunnel has also been procured in private hospitals for the public healthcare system via the National Treatment Purchase Fund (NTPF). The percentage of surgeries performed endoscopically has risen from 6% to 11% between 2005 and 2011, and the percentage of surgeries performed as day cases rose from 70% to 93% over the same time period. The Elective Surgery Programme in the Health Service Executive (HSE) has a target that at least 95% of carpal tunnel release procedures (ICD [International Classification of Diseases] code: 39331-01) should be

undertaken on a day case basis.[19] The average age of CTS patients undergoing surgery is 57 years. In 2011, carpal tunnel release procedures were undertaken in 35 separate centres for which HIPE data is recorded.[18] CTS surgery may also be undertaken in the primary care setting by trained providers (GP surgeons/ community-based surgeons), however this is not currently common practice in Ireland.

**Figure 1.1. Number of carpal tunnel surgical procedures provided through the publicly-funded healthcare system in Ireland, 2005-2011[18]**




*Key: HIPE – Hospital In-Patient Inquiry Scheme; NTPF – National Treatment Purchase Fund. HIPE data include all activity in publicly-funded hospitals, including procedures in patients that used private health insurance*

The breakdown of CTS procedure activity and incidence rate by proposed HSE hospital group[20] is shown in Table 1.1. Overall, there were 118 inpatient admissions in 2011, with an average length of stay of 7.2 days.

**Table 1.1. HIPE data per proposed HSE hospital group* 2011[18]**

| HSE Hospital Group | Total (%) | Rate per 10,000 | Inpatient bed days | % day case | Average age |
|---|---|---|---|---|---|
| Dublin East | 402 (24) | 4.02 | 243 | 94 | 56 |
| Dublin Midlands | 258 (16) | 3.23 | 474 | 92 | 59 |
| Dublin North East | 88 (5) | 1.10 | 8 | 94 | 58 |
| Midwest | 120 (7) | 3.00 | 12 | 93 | 56 |
| South/South West | 449 (27) | 5.28 | 68 | 92 | 55 |
| West/North West | 335 (20) | 4.79 | 49 | 92 | 58 |
| Other paediatric hospitals | <5 | N/A | <5 | N/A | N/A |
| Total (exc. paediatric) | 1652 | 3.54 | 854 | 93 | 57 |

** Data for hospitals included in the proposed HSE hospital groups.[20] Please note that this does not reflect all activity in 2011 because not all hospitals that participate in HIPE are included within these proposed hospital groups; N/A – not available; HIPE data include all activity in publicly-funded hospitals, including procedures in patients that used private health insurance*

Initial management of patients requiring treatment for CTS is generally undertaken in the primary care setting, with the possibility of subsequent onward referral for an

outpatient consultant appointment by their general practitioner (GP). Corticosteroid injection is provided by a limited number of GPs, with some onward referral to GPs with a special interest in this area[21] or to radiologists with sub-specialty training and interest in musculoskeletal radiology.[22] It is reported that it is difficult to obtain access to specialist hand therapists in the primary care setting as there are limited numbers practising in Ireland. Access is reported to be variable, with average waiting lists of six weeks reported for routine occupational therapy and physiotherapy services and longer wait times for specialist services.[21]

At the end of August 2013, it was reported that there were 374,104 patients on the NTPF Outpatient Waiting List database, 58% of whom were waiting less than six months with 78% waiting less than 12 months.[23] Within orthopaedics, it was reported that as of August 2013 there were 52,455 patients on the waiting list, 45% of whom were waiting less than six months and 67% waiting less than 12 months.[23] Of the patients who underwent surgery for CTS, approximately 70% were referred to orthopaedic surgeons, 21% to plastic surgeons and 4% to neurosurgeons.[18] Data from the NTPF[24] indicate that there were a total of 421 patients on the waiting list for carpal tunnel surgery at the end of May 2013. Half of these (218 patients) had been waiting for 0-3 months, with 3% (14 patients) waiting longer than 12 months. Delays in accessing electrodiagnostic tests have also been reported as a contributory factor in extending the period of time from initial referral to treatment.

Initiatives are underway by the HSE to standardise the management of outpatient services and to ensure that there are consistent management processes across all publicly-funded healthcare facilities that provide outpatient services. This includes the publication of a protocol[25] for the management of these services by the NTPF in January 2013 which provides the core guidance for the Outpatient Services Performance Improvement Programme. This specifies that patients should be treated based on clinical urgency, with urgent referrals seen and treated first. It is intended that the definition of clinical urgency and associated maximum wait times is to be developed at specialty or condition level and agreed by the National Clinical Programmes. For patients with CTS, initiatives are underway by the Orthopaedic and Rheumatology Clinical Programmes in the HSE to develop interface clinics and consultations between primary and secondary care services in Ireland and to implement agreed national referral guidelines for all patients with musculoskeletal disease. In January 2013, the NTPF published a national waiting list management policy[26] that outlines the standardised approach to managing scheduled care treatment for inpatient, day case and planned procedures in all publicly-funded hospitals. It outlines a consistent structured approach that must be adopted to the management of the waiting list; monitoring of the implementation of the policy will be routinely undertaken by the NTPF in the form of annual quality assurance reviews.

# 2 Clinical referral/treatment threshold

## 2.1 Review of the literature

A literature search was conducted up to May 2013. The approach and general search terms are described in the separate Background and Methods chapter accompanying this document. A summary of the results of this search is included in Table 2.1.

### Table 2.1. Included evidence sources

| Publication Type | Number | References |
|---|---|---|
| Clinical guidelines | 3 | (27-29) |
| Systematic reviews | 2 | (30;31) |
| Cost-effectiveness studies | 2 | (32;33) |

## 2.2 Clinical evidence

### Clinical guidelines

The American Academy of Orthopaedic Surgeons published clinical guidelines for CTS in 2008.[27] Recommendations contained within these guidelines that have implications for surgical thresholds include:

- A course of non-operative treatment is an option in patients diagnosed with carpal tunnel syndrome. Early surgery is an option when there is clinical evidence of median nerve denervation, or when the patient elects to proceed directly to surgical treatment (Recommendation 1).
- Another non-operative treatment or surgery is suggested when the current treatment fails to resolve the symptoms within two weeks to seven weeks (Recommendation 2).
- Local steroid injection or splinting is suggested when treating patients with carpal tunnel syndrome, before considering surgery (Recommendation 4a).

Recommended non-surgical interventions include local corticosteroid injection, oral corticosteroids, splinting and therapeutic ultrasound. Heat therapy is not recommended and guidelines note that there is insufficient evidence to recommend for or against: activity modifications, acupuncture, cognitive behavioural therapy, cold laser, diuretics, exercise, electric stimulation, fitness, graston instrument, iontophoresis, laser, stretching, massage therapy, magnet

therapy, manipulation, medications (including anticonvulsants, antidepressants and non-steroidal anti-inflammatory drugs [NSAIDs]), nutritional supplements, phonophoresis, smoking cessation, systemic steroid injection, therapeutic touch, vitamin B6 (pyridoxine), weight reduction or yoga.[27]

In the UK, the National Institute for Health and Care Excellence (NICE) has published a clinical knowledge summary[28] (last revised September 2012) for CTS which contains the following recommendations for treatment and referral:

- Treat symptoms if they are interfering with quality of life. If the symptoms are mild or moderate and are not progressing:
    - Explain that the symptoms may resolve within six months. This is most likely to occur in young people (less than 30 years of age), if the symptoms are unilateral and of short duration, and in women in whom fluid retention due to pregnancy is the precipitating factor.
    - Advise wearing a wrist splint that maintains the wrist at a neutral angle without applying direct compression. Any improvement should be apparent within 12 weeks of use.
    - Acupuncture may be effective for pain relief in the short term, although there is no therapeutic benefit.
    - Advise minimisation of activities that exacerbate symptoms. Explain to people who work with computer keyboards that there is little evidence to suggest that modifications at their work place are likely to be of any help in relieving symptoms.
    - Do not recommend the use of non-steroidal anti-inflammatory drugs or diuretic medication.
- Referral may be to a rheumatologist, orthopaedic surgeon, hand surgeon, or neurologist depending on local custom and practice, and in some areas people may be referred to a Clinical Assessment and Treatment Service.
    - Offer referral for consideration of electromyography and nerve conduction studies if the diagnosis is uncertain and also before surgery.
    - Offer referral for consideration of corticosteroid injection or for surgical treatment if:
        - the symptoms are severe or constant, or there is severe sensory disturbance and/or thenar motor weakness
        - there is progressive motor or sensory deficit
        - there is no improvement within three months with conservative treatment.

The British Society for Surgery of the Hand has also produced recommendations[29] for tertiary referral of CTS patients. According to these guidelines, surgery is indicated for failed conservative treatment and for severe symptoms at presentation.

The report also notes that various disease states may alter the natural history of CTS, so surgery could be considered earlier for people with diabetes, rheumatoid arthritis, older people and those who have both CTS and cervical spondylosis, as these may exacerbate one another.

## Literature reviews comparing surgical and non-surgical treatment for Carpal Tunnel Syndrome

A Cochrane review[30] conducted in 2008 comparing surgical to non-surgical interventions for carpal tunnel treatment found that surgery was more effective than splinting at three, six and 12 months in terms of clinical improvement of symptoms such as pain, paresthesia or improvement of hypoaesthesia or muscle weakness (Appendix 1). This review also found that a substantial proportion of people (44% across two studies) treated medically will later require surgery while the need for repeat surgery is low (1% in one included study). However, the review found there was a lack of evidence in relation to the difference between surgical and non-surgical treatment for people with mild symptoms and whether surgical treatment is better than corticosteroid injection. Complications associated with CTS surgery include: painful or hypertrophic scars; wound haematoma and infection; stiffness, swelling or discomfort of the wrist; and reflex sympathetic dystrophy. Two studies reported complication rates for both the surgical and non-surgical groups. However, one of these included surgical complications in people in the splinting group who subsequently underwent surgery during follow up. In this study, a high level of complications was observed in both groups (57% in the group allocated to surgery, 52% in the non-surgical group). Overall pooled results indicate that non-surgical treatment for CTS is associated with fewer complications than surgery. The authors concluded that 'although the better results in the surgical group are statistically significant, the lower limit of the confidence interval is close to the non-significant threshold. The high incidence of adverse events indicates the need to identify subgroups of participants who would be most likely to benefit from surgery'.

A systematic review[31] published in 2011 concluded that surgical treatment was superior to non-surgical treatment at six and 12 months in terms of symptom improvement and physical function (Appendix 1). This review included seven studies comparing both splinting and corticosteroid injection to surgery. Five out of the seven studies excluded patients with more severe disease, as indicated by thenar muscle atrophy. Complication rates were reported in six of the seven included studies, but the authors noted large variation as some studies reported all complications while others only reported clinically important adverse events. Overall pooled results indicated that non-surgical treatment for CTS was associated with fewer complications than surgery. The most common complications in the surgery group were skin irritation and haematoma; in the splinting group it was swelling of the

wrist, hand and finger. In their discussion of the results, the authors concluded that 'given the treatment differential and potential for adverse effects and that conservative interventions benefitted a substantial proportion of patients, current practice of a trial of conservative management with surgical release for severe or persistent symptoms is supported by evidence'.

## International referral and treatment thresholds

A detailed pathway[34] for CTS patients published in 2002 describes referral criteria developed in UK primary care. It includes similar criteria to the aforementioned policy documents and also highlights a number of key points in relation to the management of CTS in primary care, including:

- CTS is often a progressive condition; however, many patients have a satisfactory response to work modification or conservative management.
- If CTS does not respond to conservative management within six months, it is unlikely to respond at all.
- Steroid injection provides effective temporary relief, but symptoms are likely to return within a few months. For this reason, it is only recommended for pregnant patients, because CTS is likely to resolve after pregnancy.
- Patients who are unlikely to respond to conservative management include those who have constant symptoms for more than six months at presentation and those who have already failed to respond to a trial of conservative management. These patients should be referred in order to be considered for surgery.
- If a patient is being referred for surgery, they should be aware of the general character of the procedure and be agreeable to having surgery if it is deemed necessary.

Thresholds for the referral and surgical treatment of people with CTS have been in place in a number of primary care trusts (PCTs) in the UK for some time. As part of the changes to the National Health Service (NHS) brought about by the Health and Social Care Act 2012, PCTs and Strategic Health Authorities (SHAs) ceased to exist on 31 March 2013. Their responsibilities were taken over by Clinical Commissioning Groups and the NHS Trust Development Authority. However the thresholds that were previously developed by these trusts are likely to represent ongoing practice at a local level while new commissioning guides are being established. A summary of specific thresholds from a sample of 10 NHS PCT areas is provided in Appendix 1. While there is a degree of variation, these thresholds generally distinguish between three subgroups of CTS patients who should be referred for treatment: the first group includes patients with chronic mild to moderate symptoms who have failed to respond to conservative treatment (nocturnal neutral splinting and/or local

corticosteroid injection) for approximately three months (range two to six months); the second are those with acute severe symptoms that are uncontrolled by conservative treatment; and the third are those presenting with neurological deficits such as sensory blunting or weakness of thenar abduction. Most thresholds make no mention of the need for nerve conduction studies. However, in those that do, some variation is apparent, with at least one threshold requiring the diagnosis to be supported by nerve conduction studies, while others note that such tests are not routinely necessary.

National and local primary care referral guidelines in use in New Zealand[35] also recommend that conservative treatment, including splinting, should be used for people with minor symptoms, with corticosteroid injection by a suitably qualified professional recommended for moderate symptoms. Onward referral is recommended for people with severe symptoms or neurological signs who have failed conservative management and have a positive Phalen's test and manual carpal compression test.

In 2012, the French National Authority for Health (HAS) published a report[36] aimed at identifying situations in which surgical treatment for CTS is definitely indicated, definitely not indicated, or optional. It concluded that:

> 'Surgery is necessary in severe forms of carpal tunnel syndrome (CTS), with a positive clinical diagnosis and documented by an electromyogram. Surgery is also appropriate for non-severe forms of CTS resistant to other medical interventions (corticosteroid injection and/or splinting) performed correctly. In general, surgery should be reserved as a second-line treatment for cases of failed non-surgical treatments (injection and/or splinting) in non-severe forms of CTS. The opinion of a well informed patient should also be taken into account when making treatment decisions, especially when they involve surgical procedures.'

United States (US) and Canadian referral and treatment criteria have been developed by a number of different organisations, many of which focus on the issue of CTS in the context of occupational medicine. These are generally consistent with referral and treatment criteria in place elsewhere (see Appendix 2).

## Cost-effectiveness evidence

Two studies comparing the cost-effectiveness of non-surgical to surgical treatment for CTS were identified.

An economic analysis[32] carried out as part of a multi-centre randomised controlled trial (RCT) in the Netherlands in 2006 comparing splinting to open surgery found that surgery was more cost-effective. This study included patients if they had clinical and electrophysiologically confirmed CTS, were 18 years of age or older, and were able to complete written questionnaires. Patients were excluded from the trial if they were previously treated with splinting or surgery, had a history of wrist trauma or surgery, had a history suggesting underlying causes of CTS (e.g. diabetes mellitus, pregnancy), had clinical signs or symptoms or electrophysiological findings suggesting conditions that could mimic CTS or interfere with its validation (e.g. cervical radiculopathy, polyneuropathy), or had severe thenar muscle atrophy. Patients were randomly allocated to either surgery (n=87) or splinting (n=89). Overall costs per patient were similar (€2,126 for surgery, €2,111 for splinting; all costs from 1998-2000), but the success rate in the surgical group was better than in the splinting group (92% versus 72%, respectively). At a ceiling ratio of €2,500 per patient there was a 90% probability that surgery was cost-effective in the Netherlands. This analysis was conducted from a societal perspective, so it included direct health (e.g. surgery, splints) and non-health costs (e.g. over-the-counter medication, time required to attend appointments) as well as indirect costs (e.g. loss of productivity in paid and unpaid labour due to treatment). The study found that patients with splints visited medical specialists more often than surgical patients, primarily because a number of patients underwent surgery after their initial treatment with a wrist splint. In the surgery group, 73 of the 87 patients underwent surgery, while 14 patients refused to undergo the operation. All patients in the splint group received a splint at the beginning of the trial. After one year, 33 patients (39%) in the splint group had also undergone surgery. Absenteeism from work in the surgical groups was higher than in the splinting group (39% of surgery patients, mean 12.1 days; and 23% of splinting patients, mean 11.8 days), though the difference in length of absence was not statistically signicant.

A retrospective cost-effectiveness analysis[33] carried out in the US in 2009 compared the direct costs of managing two groups of 60 patients matched for disease severity and age, who received either surgical or non-surgical treatment. Only employed patients who had electrodiagnostically proven idiopathic CTS and no prior surgery were considered for the study and the control group was matched on age, gender, severity of nerve conduction abnormalities, body mass index, smoking history, job category, and insurance coverage. The non-surgical group (n=60) received nocturnal splinting and nerve and tendon gliding exercise, with the addition of corticosteroid

injection for those whose pain was not relieved by splinting alone. The surgical group (n=60) underwent open carpal tunnel release without any non-surgical care. There was no statistically significant difference in the average cost per patient treated ($3,335 non-surgery, $3,068 surgery). Over half of the non-surgical group (n=32) opted for surgery during the 12-month follow-up period. The incremental cost-effectiveness ratio was -$64/Quality Adjusted Life Year (QALY), indicating that on average there was a slight cost saving per QALY gained using surgical treatment compared to non-surgical treatment in the US. When patients with mild nerve conduction study abnormality results were analysed separately the average cost per patient was similar to the overall results ($3,325 non-surgery, $3,079 surgery).

## 2.3 Budget impact and resource implications

In Ireland, the most recent Casemix[37] data indicate that the cost of an inpatient carpal tunnel release is €3,443 compared to €1,063 for a day case procedure (Table 2.2). As noted in section 1.4, 18% of procedures were undertaken as inpatient cases in 2011.

**Table 2.2. HSE inpatient and day case acute hospital activity and costs summarised by diagnosis-related group (based on 2011 costs and activity)[37]**

| Diagnosis-related group (DRG) code | Description | No. of procedures | Cost/case (€) |
|---|---|---|---|
| **B05** | Day case carpal tunnel release | 1,527 | 1,063 |
| **B05Z** | Inpatient carpal tunnel release | 72 | 3,443 |

*Data summary from HSE National Casemix Programme Ready Reckoner, 2013 based on the 2011 inpatient and day case activity and costs reported by 38 hospitals participating in the programme that year.*

No comparable estimates of the cost of conservative treatment are available. Costs for conservative treatment may include therapy fees, off-the-shelf (estimated cost €7 to €15 each) or custom-made splints (estimated cost €20 each) and corticosteroid injection. In addition to this, the overall cost of conservative treatment will include the cost of subsequent surgery for patients who fail to respond.

# 3 Advice on clinical referral/treatment threshold

There is general agreement across the clinical guidelines and systematic reviews of the evidence that conservative approaches should be used in the initial treatment of carpal tunnel syndrome. It is estimated that between 33%[38] and 49%[7] of cases will resolve or significantly improve without treatment at all. However, for those not responding to treatment or who experience severe symptoms that significantly impact quality of life or functional ability, surgery is indicated to restore function, alleviate symptoms and prevent permanent neurological damage. The following criteria are advised for referral for surgical treatment of CTS in the Irish healthcare system:

Surgery for carpal tunnel release should be considered for the following patients:

- those with severe symptoms indicative of neurological deficits including constant paresthesia, numbness or pain, muscle atrophy, weakness in thenar abduction or proven EMG changes.
- those with acute severe symptoms that significantly interfere with daily work, education, care or self-care activities.
- those with chronic mild or moderate symptoms (including paresthesia, pain or numbness) who have not responded to three months of conservative treatment that included nocturnal splinting and local corticosteroid injection, as appropriate.

Patients who do not meet these criteria should remain under the care of their primary care practitioner who will manage conservative treatment of the patient. This may include the need for patients to be referred to another suitably qualified health professional for local corticosteroid injection.

# 4 Discussion

Both surgical and non-surgical treatment approaches are beneficial for patients with CTS. In head-to-head trials, surgery is superior, but associated with a greater risk of complications. Since it is estimated that symptoms will improve significantly or resolve in 34% to 49% of patients, current clinical guidelines recommend that conservative treatment should be trialled initially, unless a patient presents with signs of serious neurological deficits or symptoms that significantly impact on quality of life or functional ability. Surgery is indicated for those who do not respond to conservative treatment after a reasonable trial period to relieve symptoms and prevent permanent neurological damage.

One caveat to the effective implementation of referral thresholds in Ireland is the limited access to conservative treatment in the primary care setting. It is reported that there is extremely limited access to specialised hand therapists. Currently the Irish Association of Hand Therapists has five registered certified hand therapists (four occupational therapists, one physiotherapist) and two accredited hand therapists through the British Association of Hand Therapists.[21] There are also a number of occupational therapists and physiotherapists working in regional hospitals with experience in treating hand conditions.[21] Waiting lists for general occupational and physiotherapy services may exceed six weeks. Corticosteroid injection treatment is only provided by a limited number of GPs who have specialist training. Therefore patients may continue to be referred to hospital-based specialists to provide conservative treatment in the absence of community-based services. As noted in section 1.4, initiatives are underway by the Orthopaedic and Rheumatology Clinical Programmes in the HSE to develop interface clinics and consultations between primary and secondary care services in Ireland and to implement agreed national referral guidelines for all patients with musculoskeletal disease.

Although beyond the specific remit of this assessment, feedback was provided around anomalies in the service location in which certain treatments are provided. While it was noted that injection corticosteroid therapy for carpal tunnel syndrome may be safely provided in the outpatient setting by trained providers, current reimbursement policies and high outpatient clinic numbers influence local practice, so that in some hospitals patients must be rebooked as day cases following outpatient surgical review. This necessitates a repeat hospital visit with associated costs and delays for patient and provider. Initiatives described in the Department of Health's 'Money follows the patient policy paper on hospital financing'[39] where funding will be based on the episode of care and not by reference to the care setting may reduce inefficiencies due to funding anomalies.

The crossover rate from conservative treatment to surgery has been estimated to be between 40% and 50% of patients receiving splinting or local corticosteroid injection. Patients who end up receiving both interventions consume more resources than those who go straight to surgery, whereas those who do respond to conservative treatment consume fewer. Taking this into account, economic analyses from the US and the Netherlands comparing the two approaches have found that the overall cost-effectiveness of both treatment options is similar, although differences in service costs may mean that these studies may not be directly relevant to the Irish healthcare system.

Approximately 1,700 carpal tunnel release operations are performed annually in Ireland. Given the uncertainty in relation to the proportion of these who would be candidates for conservative treatment it is difficult to estimate what impact, if any, the introduction of formal thresholds would have on outpatient referrals and surgical activity for carpal tunnel syndrome in Ireland. The fact that the recommended threshold is consistent with well established clinical guidelines and the findings of literature reviews means it is unlikely to represent a major change from current practice, but rather a standardisation of referral and treatment criteria across all areas of the publicly-funded healthcare system. However, as outlined in the ethical analysis report,[(40)] if clinical referral or treatment thresholds are implemented, it is imperative that there are opportunities for appeal mechanisms to ensure good governance. Implementation of thresholds also depends on timely access to the full range of conservative treatment options at the primary care level. Without this, it is likely that CTS patients will continue to be referred to specialist services before all recommended conservative measures have been exhausted. Continued trends towards performing these procedures as day cases or within a minor procedure setting will reduce the resources needed to provide this service further. While beyond the scope of this review, the development of stated criteria in relation to the role of imaging and nerve conduction studies in the diagnosis of CTS could potentially reduce any unnecessary resource consumption in this area.

# 5 References

(1) Health Information and Quality Authority. *A series of health technology assessments (HTAs) of clinical referral or treatment thresholds for scheduled procedures. Background chapter.* Dublin: Health Information and Quality Authority; 2013.

(2) Atroshi I. Prevalence of carpal tunnel syndrome in a general population. *JAMA.* 1999; 282(2) pp.153-8.

(3) Mondelli M, Giannini F, Giacchi M. Carpal tunnel syndrome incidence in a general population. *Neurology.* 2002; 58(2) pp.289-94.

(4) Seffinger MA, Hruby RJ. CHAPTER 10 - Carpal Tunnel Syndrome. Michael AS, DO, FAAFP, Raymond JH, (Eds) In: *Evidence-Based Manual Medicine.* Philadelphia. W.B. Saunders; 2007. pp.273-90.

(5) Ferry S, Pritchard T, Keenan J, Croft P, Silman AJ. Estimating the prevalence of delayed median nerve conduction in the general population. *Br J Rheumatol.* 1998; 37(6) pp.630-5.

(6) LeBlanc KE, Cestia W. Carpal tunnel syndrome. *Am Fam Physician.* 2011; 83(8) pp.952-8.

(7) Padua L, Padua R, Aprile I, Pasqualetti P, Tonali P. Multiperspective follow-up of untreated carpal tunnel syndrome: a multicenter study. *Neurology.* 2001; 56(11) pp.1459-66.

(8) Padua L, Mondelli M. Evolution of hand dysfunction and symptoms in untreated carpal tunnel syndrome. *Muscle Nerve.* 2005; 32(4) pp.545-7.

(9) Scholten-Rob JPM, Mink-van-der-Molen A, Uitdehaag-Bernard MJ, Bouter LM, de-Vet-Henrica CW. Surgical treatment options for carpal tunnel syndrome. *Cochrane Database of Systematic Reviews.* 2007;

(10) Gerritsen AA, de Vet HC, Scholten RJ, Bertelsmann FW, de Krom MC, Bouter LM. Splinting vs surgery in the treatment of carpal tunnel syndrome: a randomized controlled trial. *JAMA.* 2002; 288(10) pp.1245-51.

(11) Brown RA, Gelberman RH, Seiler JG, III, Abrahamsson SO, Weiland AJ, Urbaniak JR, et al. Carpal tunnel release. A prospective, randomized assessment of open and endoscopic methods. *J Bone Joint Surg Am.* 1993; 75(9) pp.1265-75.

(12) Benson LS, Bare AA, Nagle DJ, Harder VS, Williams CS, Visotsky JL. Complications of endoscopic and open carpal tunnel release. *Arthroscopy.* 2006; 22(9) pp.919-24, 924.

(13) Marshall SC, Tardif G, Ashworth NL. Local corticosteroid injection for carpal tunnel syndrome. *Cochrane Database of Systematic Reviews.* 2007;

(14) Page MJ, Massy WN, O'Connor D, Pitt V. Splinting for carpal tunnel syndrome. *Cochrane Database of Systematic Reviews.* 2012;

(15) Page MJ, O'Connor D, Pitt V, Massy WN. Therapeutic ultrasound for carpal tunnel syndrome. *Cochrane Database of Systematic Reviews.* 2013;

(16) Page MJ, O'Connor D, Pitt V, Massy WN. Exercise and mobilisation interventions for carpal tunnel syndrome. *Cochrane Database of Systematic Reviews.* 2012;

(17) O'Connor D, Marshall SC, Massy WN, Pitt V. Non-surgical treatment (other than steroid injection) for carpal tunnel syndrome. *Cochrane Database of Systematic Reviews.* 2003;

(18) Hospital In-Patient Enquiry. *Hospital In-Patient Enquiry (HIPE) Portal data*. Ireland: ESRI; 2013.

(19) Health Service Executive, Royal College of Surgeons in Ireland, Irish College of Anaesthetists. *Elective Surgery Programme Implementation Support Guide*. Dublin, Ireland: 2011.

(20) Department of Health. *The Establishment of Hospital Groups as a transition to Independent Hospital Trusts*. Dublin, Ireland: DoH; 2013.

(21) Expert Advisory Group for the HIQA HTA on Scheduled Surgical Procedures. Personal communication. 24 January 2013.

(22) HIQA. *Public Consultation on Phase 2 of the HTA on Scheduled Surgical Procedures*. 2013.

(23) National Treatment Purchase Fund (NTPF). *NTPF Out Patient Waiting List - 30/08/2013.* 2013, [Online]. Available from: http://www.ntpf.ie/home/nwld_outp.htm. Accessed on: 22 October 2013.

(24) National Treatment Purchase Fund (NTPF). *Hospital elective surgery waiting list data (May 2013).* Ireland: NTPF; 2013.

(25) National Treatment Purchase Fund. *Protocol for the management of outpatient services*. Ireland: NTPF; 2013.

(26) National Treatment Purchase Fund. *National waiting list management policy*. Ireland: NTPF; 2013.

(27) Keith MW, Masear V, Chung KC, Amadio PC, Andary M, Barth RW, et al. American Academy of Orthopaedic Surgeons clinical practice guideline on the treatment of carpal tunnel syndrome. *J Bone Joint Surg Am.* 2010; 92(1) pp.218-9.

(28) National Institute for Health and Care Excellence. *Carpal Tunnel Syndrome.* 2012, [Online]. Available from: http://cks.nice.org.uk/carpal-tunnel-syndrome#!scenariorecommendation:2. Accessed on: 22 July 2013.

(29) The British Society for Surgery of the Hand. *BSSH Evidence for Surgical Treatment (BEST) - Carpal Tunnel Syndrome.* 2013, [Online]. Available from: http://www.bssh.ac.uk/education/guidelines/carpal_tunnel_syndrome.pdf. Accessed on: 22 July 2013.

(30) Verdugo RJ, Salinas RA, Castillo JL, Cea JG. Surgical versus non-surgical treatment for carpal tunnel syndrome. *Cochrane Database of Systematic Reviews.* 2008; 4

(31) Shi Q, MacDermid JC. Is surgical intervention more effective than non-surgical treatment for carpal tunnel syndrome? A systematic review. *J Orthop Surg Res.* 2011; 6 p.17.

(32) Korthals-de B, I, Gerritsen AA, van Tulder MW, Rutten-van Molken MP, Ader HJ, de Vet HC, et al. Surgery is more cost-effective than splinting for carpal tunnel syndrome in the Netherlands: results of an economic evaluation alongside a randomized controlled trial. *BMC Musculoskelet Disord.* 2006; 7 p.86.

(33) Pomerance J, Zurakowski D, Fine I. The cost-effectiveness of nonsurgical versus surgical treatment for carpal tunnel syndrome. *J Hand Surg Am.* 2009; 34(7) pp.1193-200.

(34) Hayward AC, Bradley MJ, Burke FD. Primary care referral protocol for carpal tunnel syndrome. *Postgrad Med J.* 2002; 78(917) pp.149-52.

(35) Hawkes Bay District Health Board. *Referral Guidelines for Elective Services*. New Zealand: National and Local Primary Care Management Guidelines; 2004.

(36) HAS. *Surgical treatment for Carpal Tunnel Syndrome: a multidimensional approach in reaching a relevant decision*. Paris: Haute Autorité de Santé; 2012.

(37) National Casemix Programme. *Ready Reckoner of Acute Hospital inpatient and daycase activity and costs (summarised by DRG) relating to 2011 costs and activity*. Ireland: Health Service Executive; 2013.

(38) Futami T, Kobayashi A, Ukita T, Endoh T, Fujita T. Carpal Tunnel Syndrome; Its Natural History. *Hand Surg.* 1997; 02(02) pp.129-30.

(39) Department of Health. *Money Follows the Patient Policy Paper on Hospital Financing. Draft for Consultation*. Dublin: Department of Health; 2013.

(40) Health Information and Quality Authority. *Health Technology Assessment of Scheduled Procedures: Ethical Analysis 1198.* 2013, [Online]. Available from: http://www.hiqa.ie/healthcare/health-technology-assessment/assessments/scheduled-procedures.

(41) Practice parameter for carpal tunnel syndrome (summary statement). Report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology.* 1993; 43(11) pp.2406-9.

# Appendix 1 – Clinical Guidelines, systematic reviews and cost-effectiveness studies

| Reference | Scope | Clinical Guidelines | Evidence* |
|---|---|---|---|
| AAOS (2010) US[27] | **Indications:** Carpal tunnel syndrome **Population:** Adults | **Recommendation 1** A course of non-operative treatment is an option in patients diagnosed with carpal tunnel syndrome. Early surgery is an option when there is clinical evidence of median nerve denervation or the patient elects to proceed directly to surgical treatment. | (Grade C, Level V) |
| | | **Recommendation 2** We suggest another non-operative treatment or surgery when the current treatment fails to resolve the symptoms within two weeks to seven weeks. | (Grade B, Level I and II) |
| | | **Recommendation 3** We do not have sufficient evidence to provide specific treatment recommendations for carpal tunnel syndrome when found in association with the following conditions: diabetes mellitus, coexistent cervical radiculopathy, hypothyroidism, polyneuropathy, pregnancy, rheumatoid arthritis, and carpal tunnel syndrome in the workplace. | (Inconclusive, No evidence found) |
| | | **Recommendation 4a** Local steroid injection or splinting is suggested when treating patients with carpal tunnel syndrome, before considering surgery. | (Grade B, Level I and II) |
| | | **Recommendation 4b** Oral steroids or ultrasound are options when treating patients with carpal tunnel syndrome. | (Grade C, Level II) |
| | | **Recommendation 4c** We recommend carpal tunnel release as treatment for carpal tunnel syndrome. | (Grade A, Level I) |
| | | **Recommendation 4d** Heat therapy is not among the options that should be used to treat patients with carpal tunnel syndrome. | (Grade C, Level II) |
| | | **Recommendation 4e** The following treatments carry no recommendation for or against their use: activity modifications, acupuncture, cognitive behavioral therapy, cold laser, diuretics, exercise, electric stimulation, fitness, graston instrument, iontophoresis, laser, stretching, massage therapy, magnet therapy, manipulation, medications (including anticonvulsants, antidepressants and NSAIDs), nutritional supplements, phonophoresis, smoking cessation, systemic steroid injection, therapeutic touch, vitamin B6 (pyridoxine), weight reduction, yoga. | (Inconclusive, Level II and V) |

| | | | |
|---|---|---|---|
| | | **Recommendation 5**<br>We recommend surgical treatment of carpal tunnel syndrome by complete division of the flexor retinaculum regardless of the specific surgical technique.<br><br>**Recommendation 6**<br>We suggest that surgeons do not routinely use the following procedures when performing carpal tunnel release:<br>- skin nerve preservation<br>- epineurotomy.<br>The following procedures carry no recommendation for or against use: flexor retinaculum lengthening, internal neurolysis, tenosynovectomy, ulnar bursa preservation.<br><br>**Recommendation 7**<br>The physician has the option of prescribing pre-operative antibiotics for carpal tunnel surgery.<br><br>**Recommendation 8**<br>We suggest that the wrist not be immobilized postoperatively after routine carpal tunnel surgery.<br>We make no recommendation for or against the use of postoperative rehabilitation.<br><br>**Recommendation 9**<br>We suggest physicians use one or more of the following instruments when assessing patients' responses to CTS treatment for research:<br>■ Boston Carpal Tunnel Questionnaire (disease-specific)<br>■ DASH – Disabilities of the arm, shoulder, and hand (region-specific; upper limb)<br>■ MHQ – Michigan Hand Outcomes Questionnaire (region-specific; hand/wrist)<br>■ PEM (region-specific; hand)<br>■ SF-12 or SF-36 Short Form Health Survey (generic; physical health component<br>■ for global health impact) | (Grade A, Level I and II)<br><br>(Grade B, Level I)<br>(Grade C, Level II)<br><br>(Inconclusive, Level II and V)<br><br>(Grade C, Level III)<br><br>(Grade B, Level II)<br><br>(Inconclusive, Level II)<br><br>(Grade B, Level I, II, and III) |

* Evidence graded as follows: A: Good evidence (Level I Studies with consistent findings) for or against recommending intervention. B: Fair evidence (Level II or III Studies with consistent findings) for or against recommending intervention. C: Poor quality evidence (Level IV or V) for or against recommending intervention. I: There is insufficient or conflicting evidence not allowing a recommendation for or against intervention.

| | | | |
|---|---|---|---|
| NICE 2012 UK[28] | **Indications:** Carpal tunnel syndrome **Population:** Adults | Referral may be to a rheumatologist, orthopaedic surgeon, hand surgeon, or neurologist depending on local custom and practice, and in some areas people may be referred to a clinical assessment and treatment service.<br><br>Offer referral for consideration of electromyography and nerve conduction studies if the diagnosis is uncertain and also before surgery.<br><br>Offer referral for consideration of corticosteroid injection or for surgical treatment if:<br><br>▪ The symptoms are severe or constant, or there is severe sensory disturbance and/or thenar motor weakness.<br>▪ There is progressive motor or sensory deficit.<br>▪ There is no improvement within three months with conservative treatment. | Key references: Quality Standards Subcommittee of the American Academy of Neurology[41] |
| BSSH Clincial Guidelines, 2013, UK[29] | **Indications:** Carpal tunnel syndrome **Population:** Adults | Carpal Tunnel Release (CTR) is thus indicated for:<br><br>▪ failed conservative treatment<br>▪ severe symptoms at presentation<br><br>Various "disease" states may alter the natural history of CTS and CTR should be considered differently, perhaps earlier:<br>▪ diabetes,<br>▪ rheumatoid arthritis,<br>▪ older people<br>▪ CTS and cervical spondylosis often occur together and may exacerbate one another: 'double crush' | Guidelines developed by experts (BSSH) including evidence synthesis by expert review, no further details |

| Reference | Literature Review | | | | | Evidence |
|---|---|---|---|---|---|---|
| **Verdugo 2008**[30] | **Outcome or subgroup title** | **No. of studies** | **No. of participants** | **Statistical method** | **Effect size** | Cochrane Review |
| | Improvement in clinical symptoms at three months. | 3 | 295 | Risk Ratio (M-H, Fixed, 95% CI) | 1.23 [1.04, 1.46] (favouring surgery) | |
| | Improvement in clinical symptoms at six months. | 2 | 245 | Risk Ratio (M-H, Fixed, 95% CI) | 1.19 [1.02, 1.39] (favouring surgery) | |
| | Clinical improvement at one year of follow up. | 2 | 198 | Risk Ratio (M-H, Fixed, 95% CI) | 1.27 [1.05, 1.53] (favouring surgery) | |
| | Clinical improvement without including its relevance. | 1 | 50 | Risk Ratio (M-H, Fixed, 95% CI) | 0.71 [0.43, 1.15] (not significant) | |
| | Need for surgery or secondary surgery during follow-up. | 2 | 198 | Risk Ratio (M-H, Fixed, 95% CI) | 0.04 [0.01, 0.17] (favouring surgery) | |
| | Clinical improvement at less than three months. | 1 | 176 | Risk Ratio (M-H, Fixed, 95% CI) | 0.64 [0.41, 0.98] (favouring conservative tx) | |
| | Complications of surgery and medical treatment. | 2 | 226 | Risk Ratio (M-H, Fixed, 95% CI) | 1.38 [1.08, 1.76] (favouring conservative tx) | |
| | Improvement in neurophysiological parameters. | 1 | 50 | Risk Ratio (M-H, Fixed, 95% CI) | 1.44 [1.05, 1.97] (favouring surgery) | |

| Reference | Literature Review | | | | | Evidence |
|---|---|---|---|---|---|---|
| **Shi 2011**[31] | **Outcome or subgroup title** | **No. of studies** | **No. of participants** | **Statistical method** | **Effect size** | Systematic review |
| | Patient reported functional outcome at six months. | 4 | 416 | WMD (fixed) 95%CI | -0.35 [-0.47, -0.22] (favouring surgery) | |
| | Patient self-reported symptom improvement at six months. | 4 | 416 | WMD (fixed) 95%CI | -0.43 [-0.57, -0.29] (favouring surgery) | |
| | Patient self-reported functional improvement at three months. | 3 | 300 | WMD (random) 95%CI | 0.03 [-0.30, 0.37] (not significant) | |
| | Patient self-reported symptom improvement at three months. | 3 | 300 | WMD (random) 95%CI | -0.08 [-0.46, 0.30] (not significant) | |
| | Patient reported functional improvement at 12 months. | 2 | 293 | WMD (random) 95%CI | -0.35 [-0.55, -0.15] (favouring surgery) | |
| | Patient self reported symptom improvement at 12 months. | 2 | 292 | WMD (fixed) 95%CI | -0.37 [-0.56, -0.19] (favouring surgery) | |
| | Improvement in distal motor latency at six months | 2 | 226 | WMD (fixed) 95%CI | 0.50 [0.16, 0.85] (favouring surgery) | |
| | Number of normal nerve studies after intervention. | 3 | 184 | OR (fixed) 95%CI | 2.30 [1.20, 4.40] (favouring surgery) | |
| | Complications and side effects. | 6 | 599 | OR (fixed) 95%CI | 2.03 [1.28, 3.22] (favours conservative tx) | |

<table>
<tr><th>Reference</th><th>Literature Review</th><th>Evidence</th></tr>
<tr><td>Pomerance 2009[33]</td><td>Cost-effectivness analysis of surgical versus non-surgical treatment of carpal tunnel syndrome. Costs in each group, including those in the non-surgical group that crossed over to surgery later are shown below.
<table>
<tr><td></td><td colspan="4">Costs ($)</td></tr>
<tr><td>Expenses</td><td>Non-surgical Group (n=60)</td><td>Surgical Group (n=60)</td><td>Non-surgical Group – Continue splinting (n=28)</td><td>Non-surgical Group – crossover to surgery (n=32)</td></tr>
<tr><td>Doctor’s office</td><td>15,839</td><td>11,221</td><td>7,642</td><td>8,197</td></tr>
<tr><td>Anaesthesia</td><td>4,037</td><td>8,733</td><td>0</td><td>4,037</td></tr>
<tr><td>Therapist fees</td><td>80,853</td><td>3,236</td><td>36,674</td><td>44,179</td></tr>
<tr><td>EMG/NCS/lab</td><td>37,295</td><td>39,651</td><td>17,404</td><td>19,891</td></tr>
<tr><td>Surgery</td><td>23,002</td><td>52,808</td><td>0</td><td>23,002</td></tr>
<tr><td>Surgical facility</td><td>30,055</td><td>68,808</td><td>0</td><td>30,055</td></tr>
<tr><td>Splinting</td><td>6,539</td><td>0</td><td>3,291</td><td>3,248</td></tr>
<tr><td>Steroid injection</td><td>2,457</td><td>0</td><td>0</td><td>2,457</td></tr>
<tr><td>Total costs</td><td>200,077</td><td>184,093</td><td>65,011</td><td>135,066</td></tr>
<tr><td>Average per-patient cost</td><td>3,335</td><td>3,068</td><td>2,322</td><td>4,221</td></tr>
</table></td><td>US cost-effectiveness analysis – All expenses are presented in U.S. dollars. Doctor’s office, total paid fees to physician for office visits; therapist, total fees paid to therapist; EMG/NCS/lab – fees paid for diagnostic studies, including nerve conduction studies (NCS); surgery, total fees paid for surgery and 90 days of postoperative care; surgical facility, fees paid to surgical facility, including supplies used; splinting, total cost of splints; steroid injection, total cost of steroid injections, including doctor’s fees and materials. Final incremental cost effectiveness ratio (ICER) -$64.03 / QALY</td></tr>
<tr><td>Korthals-de Bos 2006[32]</td><td>Cost-effectiveness analysis of surgical versus non-surgical treatment of carpal tunnel syndrome, carried out alongside a randomised control trial. Mean costs in each group and differences in mean costs between the treatment groups (95% confidence interval obtained by bias corrected and accelerated bootstrapping).
<table>
<tr><td></td><td colspan="3">Costs (€)</td></tr>
<tr><td>Cost Groups</td><td>Surgery (n=79)</td><td>Splint (n=88)</td><td>Difference **</td></tr>
<tr><td>Direct health care costs</td><td>216 (161)</td><td>273 (163)</td><td>-57 (-103;-10)</td></tr>
<tr><td>Direct non-health care costs</td><td>366 (1,213)</td><td>412 (1,124)</td><td>-46 (-379;325)</td></tr>
<tr><td>Total direct costs</td><td>582 (1,256)</td><td>684 (1,198)</td><td>-103 (-472;316)</td></tr>
<tr><td>Indirect costs</td><td>1,544 (3,508)</td><td>1,427 (4,514)</td><td>118 (-1,034;1,448)</td></tr>
<tr><td>Total costs</td><td>2,126 (4,618)</td><td>2,111 (5,568)</td><td>15 (-1,458;1,913)</td></tr>
</table></td><td>CEA study run alongside an RCT</td></tr>
</table>

# Appendix 2 – International Examples of Thresholds for Carpal Tunnel Surgery

## England

| Primary Care Trusts | Threshold |
|---|---|
| **Bath and North East Somerset** | Symptoms for at least three months with conservative management with local corticosteroid injection and/or nocturnal splinting; or neurological deficit: or significant function impairment (unable to carry out responsibilities). |
| **Bedfordshire and Hertfordshire** | Surgical treatment will normally only be funded if the patient has:<br>1. Mild or moderate symptoms:<br>▪ intermittent paraesthesia<br>▪ constant paraesthesia<br>▪ significant interference with activities of daily living such as work/ self care/ care duties<br>▪ reversible numbness and/or pain which have not responded to four months of conservative management (steroid injection and splints).<br>2. Severe symptoms:<br>▪ constant numbness or pain<br>▪ wasting of the thumb muscles<br>▪ weakness of the thumb muscles.<br>It should be noted that nerve conduction studies are routinely unnecessary. |
| **Black Country Cluster** | Unless one or more of the minimum criteria are met, surgical treatment will not normally be funded:<br>Acute severe symptoms uncontrolled by conservative treatment<br>OR<br>Chronic mild to moderate symptoms that have not responded to four months of conservative management (Injection and splints)<br>OR<br>Neurological deficit i.e. sensory blunting or weakness<br>AND<br>Supported by Nerve conduction studies |
| **Bournemouth and Poole and Dorset** | Requests for treatment will be considered when:<br>▪ acute, severe symptoms persist after conservative therapy with either local corticosteroid injection and/or nocturnal splinting<br>OR<br>▪ mild to moderate symptoms persist for at least four months after conservative therapy with either local corticosteroid injection (if appropriate) and/or nocturnal splinting (used for at least eight weeks)<br>OR<br>▪ there is neurological deficit e.g. sensory blunting, muscle wasting or weakness of thenar abduction, or proven EMG changes<br>OR<br>▪ severe symptoms significantly interfere with daily activities. |

| Primary Care Trusts | Threshold |
|---|---|
| | |
| **Cambridgeshire** | The PCT will fund carpal tunnel surgery in patients diagnosed with carpal tunnel syndrome according to the following criteria:<br>▪ severe neurological symptoms at presentation<br>OR<br>▪ the patient has moderate symptoms and has not responded to a minimum of three months of conservative management, including a compliant trial of nocturnal neutral wrist splints. |
| **Coventry and Warwickshire** | *Severe (Tertiary treatment)*<br>Indication:<br>▪ failed non-operative treatment (unchanged or increasing severity of symptoms > 3 months)<br>▪ severe signs/ symptoms, elderly, diabetics<br>▪ open / endoscopic carpal tunnel release. |
| **Durham and Darlington** | Policy: carpal tunnel surgery will be funded if the following criteria are met:<br>▪ symptoms persist or recur after conservative therapy with either local corticosteroid injections and/or nocturnal splinting<br>OR<br>▪ there is neurological deficit, for example sensory blunting, thenar muscle wasting or motor weakness<br>OR<br>▪ there are severe symptoms that significantly interfere with daily activities. |
| **Kent and Midway** | The PCTs will only fund this intervention if:<br>▪ acute, severe symptoms persist after conservative therapy with either local corticosteroid injection and/or nocturnal splinting<br>OR<br>▪ mild to moderate symptoms persist for at least four months after conservative therapy with either local corticosteroid injection (if appropriate) and/or nocturnal splinting (used for at least eight weeks)<br>OR<br>▪ there is neurological deficit e.g. sensory blunting, muscle wasting or weakness of thenar abduction<br>OR<br>▪ severe symptoms significantly interfere with daily activities<br>- constant pins and needles<br>- numbness<br>- muscle wasting<br>- prominent pain<br>AND<br>▪ where symptoms are significantly affecting activities of daily living.<br>For moderate symptoms referral for surgery will only be considered in exceptional circumstances and after at least three months of conservative treatment has been tried and failed. |

| Primary Care Trusts | Threshold |
|---|---|
| **Herefordshire** | Policy statement: unless one or more of the following criteria are met surgical treatment will not normally be funded:<br>■ acute severe symptoms uncontrolled by conservative treatment<br>OR<br>■ chronic mild to moderate symptoms that have not responded to four months of conservative management (injection and splints)<br>OR<br>■ neurological deficit, i.e. sensory blunting or weakness. |
| **South Essex** | The PCT will fund carpal tunnel surgery where:<br>■ symptoms persist after conservative therapy with either local corticosteroid injections and/or nocturnal splinting<br>OR<br>■ there is neurological deficit, for example sensory blunting, muscle wasting or weakness or thenar abduction<br>OR<br>■ severe symptoms significantly interfering with daily activities. |

## Other jurisdictions

| Source | Referral criteria |
|---|---|
| **Maine Workers' Compensation Board (US)** | If the worker is not improving and/or has a documented, well defined clinical and electro-physiological carpal tunnel syndrome, the attending physician should refer the worker for surgical consideration.<br><br>Surgical intervention should be considered only if the worker has a positive history and physical exam and abnormal nerve conduction studies and failure of conservative management. |
| **Tripler Army Medical Center (US)** | For cubital tunnel syndrome refer to occupational therapy (OT) for night elbow splints.<br>If the patient exhibits no relief of pain, sensory changes, decreases in AROM or strength to the upper extremity within 3-4 weeks, refer to OT for evaluation and treatment.<br><br>Chronic CTS or cubital tunnel syndrome with symptoms >6 months can be referred to OT for evaluation and treatment.<br><br>If the patient has completed a full course of treatment through OT and referred back to primary care with no improvement, referral to orthopaedic surgery is indicated.<br><br>Orthopaedic Hand Clinic referral is indicated if a sensory (two point discrimination >5mm) or motor deficit is demonstrated in patients with CTS. |
| **Workers Compensation Board, Alberta (Canada)** | The consensus of medical opinion is that, in the majority of cases, a course of appropriate conservative management of CTS should be attempted before advising surgery, except in cases with:<br><br>- Obvious thenar wasting<br><br>- Severe sensory disturbance<br><br>- History of acute or traumatic onset.<br><br>Under these circumstances, expedited medical and surgical assessment is required in the initial treatment phase due to the risk of progressive and permanent neurological damage. Treatment of coexisting medical conditions that may cause or contribute to |

| Source | Referral criteria |
|---|---|
| | CTS should be attempted and may be effective. |
| **State of Oregon Workers' Compensation Division (US)** | If the worker is not improving or has a documented, well defined clinical and electrophysiological CTS, the attending physician should refer the worker for surgical consideration.<br><br>Surgical intervention should be considered only if the worker has a positive history and physical exam and abnormal nerve conduction studies and failure of conservative management. |

**Published by the Health Information and Quality Authority.**

**For further information please contact:**

**Health Information and Quality Authority**
**Dublin Regional Office**
**George's Court**
**George's Lane**
**Smithfield**
**Dublin 7**

**Phone: +353 (0) 1 814 7400**
**URL: www.hiqa.ie**