Management of Carpal Tunnel Syndrome

Technical Report

Submitted by:

American Academy of Orthopaedic Surgeons

Developed by:

American Society for Surgery of the Hand and the American Academy of Orthopaedic Surgeons

Prepared for:

Centers for Medicare & Medicaid Services (CMS)

Adopted by the American Academy of Orthopaedic Surgeons

Board of Directors

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Contents

Executive Summary

This report presents three quality measures related to diagnosis and treatment of carpal tunnel syndrome.

- Discouraging use of MRI for diagnosis of carpal tunnel syndrome
- Discouraging the use of adjunctive surgical procedures during carpal tunnel release
- Discouraging the routine use of occupational and/or physical therapy after carpal tunnel release

This report presents the measure specifications and analytic results. Included are the rationale for each measure and the specific proposed technical approach to each measure.

Burden of Disease

CTS is the most common compressive neuropathy affecting the upper extremity and is an important cause of lost workplace productivity. The prevalence of CTS is estimated to be 0.7/10,000 workers. Between

1997 and 2010 CTS was the second most common cause of days lost from the workplace. Throughout this period the median time lost per case of CTS varied between 21 and 32 days.

Etiology

CTS is caused by compression of the median nerve under the transverse carpal ligament. Although pressure on the median nerve is clearly the pathophysiologic basis for the symptoms observed clinically, the etiology of elevated pressure within the carpal canal is unknown.

Work Group Composition

Solicitation of the work group members was done through medical societies and research organizations that have a relevant interest in the selected topic, commonly treat/interact with patients who receive the procedure, or have particular expertise in measure development. This project's workgroup consisted of 15 individuals.

Roster

1. Steve McCollam, MD
   Oversight Chair

2. Robin Kamal, MD
   Chair

3. Philip Blazar, MD
   American Society for Surgery of the Hand/American Academy of Orthopaedic Surgeons

4. Mia Erickson, PT, EdD, CHT, ACT *American Society of Hand Therapists*

5. Brent Graham, MD, MSc
   American Society for Surgery of the Hand/American Academy of Orthopaedic Surgeons

6. Andy Gurman, MD
   American Society for Surgery of the Hand/American Academy of Orthopaedic Surgeons

7. Peter Jebson, MD
   American Society for Surgery of the Hand/American Academy of Orthopaedic Surgeons

8. William Jones, MD
   American Academy of Physical Medicine and Rehabilitation

9. John Kincaid, MD
   American Academy of Neurology

10. David Ring, MD, PhD
    American Association for Hand Surgery

11. John Seiler, MD
    American Society for Surgery of the Hand/American Academy of Orthopaedic Surgeons

12. Alex Sox-Harris, PhD, MS *Hand Surgery Quality Consortium*

13. John Stephenson, MD
    American Society for Surgery of the Hand/American Academy of Orthopaedic Surgeons

14. Jennifer Waljee, MD
    American Society of Plastic Surgeons

15. Daniel Wessell, MD, PhD *American College of Radiology*

16. Hayes Wilson, MD
    American Society for Surgery of the Hand/American Academy of Orthopaedic Surgeons

Methods

Evidence Base

The quality measures listed in this document are based directly on the American Academy of Orthopaedic Surgeons Management of Carpal Tunnel Syndrome Clinical Practice Guideline, published in 2016.

Prior to performing the literature search for this guideline, both patients and payors were surveyed for topics of interest related to the management of carpal tunnel syndrome. These responses helped inform the PICO development by the workgroup. All PICO questions and inclusion criteria were developed a priori. AAOS staff trained in research methodology conducted a comprehensive systematic literature review, and final recommendations were developed by a panel of experts. The workgroup that created these final recommendations is separate from the one that evaluated these quality measures. All included articles underwent study design quality appraisal, which assessed risks of bias/confounders that may skew the study's results. Only the best available evidence was considered for inclusion in recommendations.

Requirements for the strength of recommendation are listed below as Table 1.

Table 1. Strength of Recommendation Descriptions

Strength	Overall Strength of Evidence	Description of Evidence Quality	Strength Visual
Strong	Strong	Evidence from two or more "High" quality studies with consistent findings for recommending for or against the intervention.	
Moderate	Moderate	Evidence from two or more "Moderate" quality studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.	
Limited	Low Strength Evidence or Conflicting Evidence	Evidence from one or more "Low" quality studies with consistent findings **or** evidence from a single "Moderate" quality study recommending for against the intervention or diagnostic or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.	
Consensus*	No Evidence	There is no supporting evidence. In the absence of reliable evidence, the guideline work group is making a recommendation based on their clinical opinion. Consensus statements are published in a separate, complimentary document.	

Detailed methodology for guideline development can be found at: https://www.aaos.org/uploadedFiles/PreProduction/Quality/Guidelines_and_Reviews/guidelines/Guideline%20and%20Systematic%20Review%20Processes_v2.0_Final.pdf.
The published guideline contains 35 recommendations (13 Limited Evidence, 13 Moderate Evidence, and 9 Strong Evidence). As a foundation for the measures listed in this document, only moderate and strong guideline recommendations were considered.

In order to systematically narrow the scope of this project, the measure development work group evaluated the moderate and strong clinical practice guideline recommendations for feasibility as adapted quality measures. Of the initial 22 recommendations, the group narrowed the initial scope to 13 recommendations.

The group chair and staff members worked to initially translate these 13 recommendations directly to preliminary candidate measures. These preliminary candidate measures were written to be consistent with the evidence supporting the guideline recommendations with an awareness of the limitations of available data sources for testing and an understanding that the work group would have the latitude to revise as they see fit in order to both fit clinical practice and more effectively represent the evidence-base.

Validity

Validity testing focuses on systematic errors and bias. It involves testing agreement between the data elements obtained when implementing the measure as specified and data from another source of known accuracy. Validity of computed measure scores involves testing hypotheses of relationships between the computed measure scores as specified and other known measures of quality or conceptually related

aspects of quality. A variety of approaches can provide some evidence for validity. The specific terms and definitions used for validity may vary by discipline, including face, content, construct, criterion, concurrent, predictive, convergent, or discriminant validity.

The approach utilized in determining the validity of these measures was face validity, as determined by a multidisciplinary clinician work group. The systematic and transparent methods address the question of whether scores obtained from the measures will provide an accurate reflection of quality and can therefore be used to distinguish good and poor quality.

The workgroup evaluated the validity of the original 13 preliminary candidate measures to address their adherence to the National Quality Forum (NQF) criteria. Using a modified Delphi voting process, workgroup members rated each candidate measure on a 9-point scale on a scale ranging from 1 (definitely not valid) to 9 (definitely valid) (Figure 1) for face-validity on each of the four NQF criteria (Table 3).

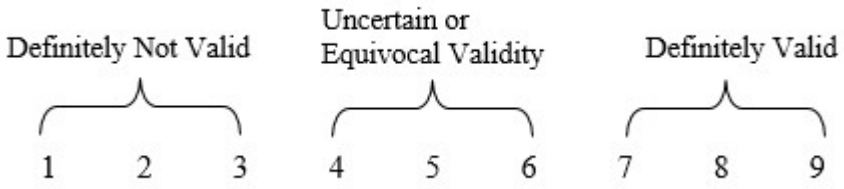

Figure 1. 9-point validity scale

Workgroup members were instructed that a candidate measure would be considered valid and be considered for gap and reliability testing only if the final median rating on all four domains was in the upper tertile for validity (median = 7-9) with agreement amongst the work group (fewer than 4 of the 15 voter ratings were outside the 3-point median range, see Table 2).

Table 2. Agreement Requirements

Panel Size	Disagreement # of ratings between 1-3 or 7-9	Agreement # of ratings outside of appropriateness rating range
8,9,10	≥ 3	≤ 2
11,12,13	≥ 4	≤ 3
14,15,16	≥ 5	≤ 4

Panels beyond these sizes require calculation of IPRAS (Interpercentile Range Adjusted for Symmetry) described in RAM.

The validity rating took place over two rounds. Before the meeting, each panelist used the aforementioned 9-point validity scale to individually rate the candidate measures based on the following criteria: 1) important to measure 2) scientifically acceptable 3) feasible and 4) useable. For the first round of voting, workgroup members were provided with the list of candidate quality measures, measure specifications, supporting literature, and definitions of each of the domains that were being used to determine validity (Table 3).

Table 3. NQF Criteria

Important to measure and report to keep our focus on priority areas, where the evidence is highest that measurement can have a positive impact on healthcare quality.
Scientifically acceptable, so that the measure when implemented will produce consistent (reliable) and credible (valid) results about the quality of care.
Feasible to collect with data that can be readily available for measurement and retrievable without undue burden.
Useable and relevant to ensure that intended users — consumers, purchasers, providers, and policy makers — can understand the results of the measure and are likely to find them useful for quality improvement and decisionmaking.

The first round votes were compiled and presented as a basis for discussion at the in-person meeting. At the in-person meeting, votes were kept anonymous, and workgroup members discussed every preliminary candidate measure at length, specifically addressing how each measure may or may not fulfill the domains "importance for clinical care" "scientific acceptability" "feasibility" and "usability". As an extension of this discussion, the workgroup was invited to revise the preliminary candidate measures as necessary to increase overall validity across the board.

After discussion and revision, workgroup members were again provided with the measure specifications, supporting literature, and evidence, and asked to vote a second time on the face validity of each revised measure. The candidate measures which received a valid rating with agreement on all four criteria were considered to have met the requirement for face validity and moved on for clinical data testing.

At the conclusion of discussion, revision, and re-voting, the workgroup members voted that a total of 6 measures were considered valid with agreement on all four domains (final results of valid measures included in Appendix A).

Reliability

Of the six measures initially deemed valid by the workgroup, only three were initially available and appropriate for testing with clinical data due to practical considerations. For this testing, claims data were evaluated through Truven Health Analytics for the years 2012-2014. The three measures deemed valid and practical for the resources available for this project were claims-based process measures and are focused on limiting overuse.

Of those measures for which reliability testing was feasible, reliability was calculated according to the methods outlined in a technical report prepared by J.L. Adams titled "The Reliability of Provider Profiling: A Tutorial" (RAND Corporation, TR-653-NCQA, 2009). In this context, reliability represents the ability of a measure to confidently distinguish the performance of one physician from another. As discussed in the report: "Conceptually, it is the ratio of signal to noise. The signal in this case is the proportion of variability in measured performance that can be explained by real differences in performance. There are 3 main drivers of reliability; sample size, differences between physicians, and measurement error." According to this approach, reliability is estimated with a beta-binomial model.

The beta-binomial model is appropriate for measuring the reliability of pass/fail measures such as those proposed. Each candidate measure's validity and reliability testing are outlined individually.

Measure #1: Discouraging use of MRI for Diagnosis of Carpal Tunnel Syndrome

2017 Options for Individual Measures:
Claims Only

Measure Type:
Process

Description:
Percentage of patients who are suspected of CTS and should not have received an MRI in the 90 days leading up to the diagnosis or 90 days after the diagnosis to limit overuse

Instructions:
This measure is to be reported at **each denominator eligible visit** occurring during the reporting period for patients with a diagnosis of carpal tunnel syndrome are seen during the reporting period. This measure may be reported by eligible clinicians who perform the quality actions described in the measure based on the services provided and the measure-specific denominator coding.

Measure Reporting:
The listed denominator criteria is used to identify the intended patient population. The numerator quality data codes included in this specification are used to submit the quality actions allowed by the measure. All measure-specific coding should be reported on the claim(s) representing the eligible encounter.

Denominator:
Number of patients with a diagnosis of carpal tunnel syndrome

> **Denominator Criteria (Eligible Cases):**
> Diagnosis for carpal tunnel syndrome (ICD-10-CM): G56.00, G56.01, G56.02
> OR
> Diagnosis for carpal tunnel syndrome (ICD-9-CM): 354.0

Numerator:
Number of patients with a diagnosis of carpal tunnel syndrome, who did not receive an upper extremity MRI to evaluate for carpal tunnel syndrome within 90 days before the diagnosis or 90 days after the diagnosis

> **Numerator Criteria (Eligible Cases):**
> (Diagnosis for carpal tunnel syndrome (ICD-10-CM): G56.00, G56.01, G56.02
> OR
> Diagnosis for carpal tunnel syndrome (ICD-9-CM): 354.0)
> AND
> No patient encounter for Upper extremity joint w/ and w/o contrast & Upper extremity w/ and w/o contrast MRI within 90 days before or after diagnosis (CPT): 73218, 73219, 73220, 73221, 73222, 73223

Evidence-Based Recommendation:
Moderate evidence supports not routinely using MRI for the diagnosis of carpal tunnel syndrome.

Rationale

There was one high quality study (Jarvik, 2002) evaluating MRI for the diagnosis of CTS. Findings on MRI had a weak or poor association as a rule out test for CTS as compared to a classic or probable hand pain diagram and nerve conduction study. Only severe fascicular swelling, severe flexor tenosynovitis, or severe increased muscle signal had a strong association with CTS, suggesting that MRI would be insensitive in identifying the diagnosis of CTS in the majority of patients in whom these findings would be unlikely to be present.

Validity

The validity of this measure comes from a combination of a strong basis in literature, by way of a systematic literature review conducted for a clinical practice guideline, and the face validity vote of our panel of experts. All candidate measures which were tested with clinical data received a "valid" score with agreement from the workgroup. See the explanation of our Delphi face-validity voting process and see appendix A for individual face validity scores.

Clinical Data

The Measure was specified to include all patients who are suspected of CTS should not have received an MRI in the 90 days leading up to the diagnosis or 90 days after the diagnosis to limit overuse. With such an inclusive study population the 3 most recent years of the Truven Claims files were selected. The data represented as many known Metro-Statistical Areas of the of the United States population for each year (Table 1.).

Table 1. Description of Truven Data Files

Year	Data Source	Size
2012	Truven Claim Files	N= 262,190
2013	Truven Claim Files	N= 179,990
2014	Truven Claim Files	N= 201,177
Overall	Truven Claim Files	N= 643,357

When the inclusion criteria are applied to the 2012-2014 datasets the numbers of the diagnosed population can be found in Table 2.

Table 2. Descriptions of Included populations

Year	Patient Sample Diagnosed	Patient Sample Assessed	# Metro-Statistical Areas
2012	262190	430	390
2013	179990	291	391
2014	201177	315	406

Reliability

Physician specific reliability is around .99 for each year, which is considered reliable. Reliability scores vary from 0.0 to 1.0, with a score of zero indicating that all variation is attributable to measurement error (noise, or variation across patients within providers) whereas a reliability of 1.0 implies that all variation is caused by real difference in performance across accountable entities. There is not a clear cut-off for minimum reliability level. Values of 0.7 and above, however, are considered sufficient to see differences between some physicians and the mean (see RAND tutorial, 2009). The Results of the Signal to Noise analysis can be found in Table 3.

Table 3. Reliability statistics from the Signal to Noise Analysis

Year	# of Metro-Statistical Areas	Reliability Statistic from signalto-noise analysis (95% Cl)
2012	390	.9984 (.9982,.9985)
2013	391	.9984 (.9982,.9986)
2014	406	.9984 (.9982,.9986)

Variability in Care

Overall, this candidate measure shows a very high adherence rate (99%), with a very small overall number using MRI to diagnose carpal tunnel syndrome (Table 4.1). However, this is a measure for which it is difficult to justify any variation. As part of our in-depth analysis, we removed the metropolitan statistical areas (MSA) for which there was complete adherence and evaluated only those in which there was variation. When evaluating only the MSAs that showed a willingness to utilize MRI as a diagnostic modality, the performance is less consistent. The median ranges varied from year to year, and ranged from as low as .88% in 2014 quartile and as high 100% through all 3 years (Table 4.2).

Although there are high overall rates of adherence by MSA for this measure, in examining the total available population, consistently over 30% of all observed MSAs for the observed years were not adhering to this candidate measure 100% of the time (Table 4.3). There is not consistent adherence within MSAs all the time, which means there is regional variability in care in regards to region's full adherence.

Table 4.1 Minimum to Maximum Ranges of Adherence scores for All Physicians

Year	Mean	SD	Max	99%	95%	90%	75%Q3	50% Median	25% Q1	10%	5%	1%	Min
2012	0.999	0.0033	1	1	1	1	1	1	1	1	0.99	0.99	0.965
2013	0.999	0.0058	1	1	1	1	1	1	0.998	0.99	0.994	0.984	0.9
2014	0.998	0.0063	1	1	1	1	1	1	0.998	0.996	0.993	0.987	0.8889

Table 4.2 Minimum to Maximum Ranges of Adherence scores for Participating Physicians

Year	Mean	SD	Max	99%	95%	90%	75%Q3	50% Median	25% Q1	10%	5%	1%	Min
2012	0.996	0.0043	0.9997	0.9997	0.9994	0.9992	0.9986	0.9975	0.9952	0.9912	0.9885	0.9778	0.965
2013	0.995	0.0097	0.9996	0.9996	0.9994	0.9991	0.998	0.9958	0.995	0.99	0.9886	0.968	0.9

2014	0.995	0.01	0.9995	0.9994	0.9992	0.999	0.9984	0.9974	0.9951	0.9901	0.9881	0.9655	0.8889

Table 4.3 Number of MSA's which did not meet 100% adherence of this candidate measure

Year	Number of MSA's Overall	Number of MSA's Not at 100%	Percent of MSA's not at 100%
2012	390	150	38.46%
2013	**391**	**120**	**30.69%**
2014	**406**	**128**	**31.52%**

Measure #2: Discouraging the use of Adjunctive Surgical Procedures during carpal tunnel release

2017 Options for Individual Measures:
Claims Only

Measure Type:
Process

Description:
Percentage of patients who are diagnosed with carpal tunnel syndrome, receive carpal tunnel release and should not receive the following procedures at the same time: Internal neurolysis, using operating microscope (64727), Radical nine-tendon flexor synovectomy (25115), Tenolysis, flexor or extensor tendon, forearm and/or wrist; each tendon (25295).

Instructions:
This measure is to be reported at each denominator eligible visit occurring during the reporting period for patients who underwent carpal tunnel release during the reporting period. This measure may be reported by eligible clinicians who perform the quality actions described in the measure based on the services provided and the measure-specific denominator coding.

Measure Reporting:
The listed denominator criteria is used to identify the intended patient population. The numerator quality data codes included in this specification are used to submit the quality actions allowed by the measure. All measure-specific coding should be reported on the claim(s) representing the eligible encounter.

Denominator:
Number of patients who underwent carpal tunnel release

> **Denominator Criteria (Eligible Cases):**
> Patient encounter (CPT): 64721 or 29848

Numerator:
Number of patients who underwent carpal tunnel release (64721 or 29848) and did not have any one of the following procedures completed at the same time: Internal neurolysis, using operating microscope (64727), Radical nine-tendon flexor synovectomy (25115), Tenolysis, flexor or extensor tendon, forearm and/or wrist; each tendon (25295).

> **Numerator Criteria (Eligible Cases):** Patient encounter (CPT): 64721 or 29848
> **AND**
> No simultaneous patient encounter for internal neurolysis, using operating microscope, radical nine-tendon flexor synovectomy, or tenolysis, flexor or extensor tendon, forearm and/or wrist; each tendon (CPT): 64727 OR 25115 OR 25295

Evidence-Based Recommendation:

Moderate evidence supports that there is no benefit to routine inclusion of the following adjunctive techniques: epineurotomy, neurolysis, flexor tenosynovectomy, and lengthening/reconstruction of the flexor retinaculum (transverse carpal ligament).

Rationale

Epineurotomy: There are two high quality studies (Leinberry 1997and Crnkovic 2012) and one moderate quality study (Blair 1996) that evaluated carpal tunnel release alone versus the addition of epineurotomy of the median nerve. The Leinberry (1997) evaluated patients at 11.8 months after surgery. There was no significant difference found in clinical evaluation (Boston Questionnaire, APB strength, Phalen's, Tinel's, or two-point discrimination) or in symptom recurrence. Crnkovic (2012) studied nerve volume measured by MRI as an index of nerve recovery. Patients were evaluated at 3 and 6 months after surgery and no significant differences was noted at either time point. There were also no differences found for the symptoms of pain between the groups. Blair (1996) found no differences in post-operative two-point discrimination, pain, or ability to complete activities of daily living at a minimum of two years following surgery. There were also no differences electrodiagnostic parameters.

Neurolysis: There was one high quality study (Mackinnon 1991) and one moderate quality study (Lowry 1988) which evaluated the addition of neurolysis of the median nerve to a standard carpal tunnel release. The Mackinnon study focused on internal neurolysis and found no differences in thenar atrophy, muscle strength, pressure threshold, vibration threshold and static two-point discrimination at 12 months after surgery. No difference was noted in pinch or grip strength. The Lowry study evaluated the NCS findings at 3 months after surgery and did not find a difference in nerve conduction velocity or distal motor and sensory latency. Neither study found a difference in symptom relief or recurrence.

Flexor Tenosynovectomy: There was one high quality study (Shum 2002) evaluating flexor tenosynovectomy as an adjunct to carpal tunnel release. There was no difference in surgical site infection, scar sensitivity, wrist motion, finger motion, or Boston Carpal Tunnel Questionnaire at 12 months following surgery.

Flexor Retinaculum Reconstruction/Lengthening: There was one high quality study (Dias 2004) that evaluated flexor retinaculum lengthening/reconstruction. Six months following surgery there were no differences in grip strength, Jebsen Taylor score, Phalen test, pinch strength, Boston Carpal Tunnel Questionnaire score or symptom recurrence.

Validity

The validity of this measure comes from a combination of a strong basis in literature by way of a systematic literature review conducted for a clinical practice guideline, and the face validity vote of our panel of experts. All candidate measures which were tested with clinical data received a "valid" score with agreement from the workgroup. See the explanation of our Delphi face-validity voting process and see appendix A for individual face validity scores.

Clinical Data

The Measure was specified to include all Patients who are diagnosed with carpal tunnel syndrome and receive carpal tunnel release and should not receive the following procedures at the same time: Internal neurolysis, using operating microscope, Radical nine-tendon flexor synovectomy Tenolysis, flexor or extensor tendon, forearm and/or wrist; each tendon. The 3 most recent years of the Truven Claims files were selected. The data represented as many known Metro-Statistical Areas of the of the United States population for each year (Table 5.).

Table 5. Description of Truven Data Files

Year	Data Source	Size
2012	Truven Claim Files	N= 31,920
2013	Truven Claim Files	N= 22912
2014	Truven Claim Files	N= 28,273
Overall	Truven Claim Files	N= 83,050

When the inclusion criteria are applied to the 2012-2014 datasets the numbers of the diagnosed population can be found in Table 6.

Table 6. Descriptions of Included populations

Year	Patient Sample Diagnosed (Denominator)	Patient Sample Assessed (Numerator)	# Metro-Statistical Areas
2012	31920	31416	385
2013	22912	22469	385
2014	28327	27882	401

Reliability

MSA specific reliability is around .98 or .99 for each year, and thus can be considered to be good. Reliability scores vary from 0.0 to 1.0, with a score of zero indicating that all variation is attributable to measurement error (noise, or variation across patients within providers) whereas a reliability of 1.0 implies that all variation is caused by real difference in performance across accountable entities. There is not a clear cut-off for minimum reliability level. Values of 0.7 or higher, however, are considered sufficient to see differences between some physicians and the mean (see RAND tutorial, 2009). The Results of the Signal to Noise analysis can be found in Table7.

Table 7. Reliability statistics from the Signal to Noise Analysis

Year	# of Metro-Statistical Areas	Reliability Statistic from signalto-noise analysis (95% Cl)
2012	385	.9843 (.9813,.9874)
2013	385	.9943 (.9813,.9874)
2014	401	.9943 (.9928,.9957)

Variability in Care

Overall, this candidate measure shows a very high adherence rate (98%), with a very small overall number performing the specified adjunctive techniques with carpal tunnel release (Table 8.1). With a high adherence rate across regions, this measure does not show a normal distribution. However, this is a measure for which it is difficult to justify any variation as it addresses unnecessary adjunctive surgical techniques. As part of our in-depth analysis, we removed the metropolitan statistical areas (MSA) for which there was complete adherence and evaluated only those in which there was variation. When evaluating only the MSAs that showed a willingness to perform one or more of these adjunctive

procedures, the performance is less consistent, and we end up with a more normal distribution. The median ranges varied from year to year, and ranged from as low as .67% in 2014 and as high 100% through all 3 years (Table 8.2).

Although there are high overall rates of adherence by MSA for this measure, in examining the total available population, consistently over 25% of all observed MSAs for the observed years were not adhering to this candidate measure 100% of the time (Table 8.3). There is not consistent adherence within MSAs all the time, which means there is regional variability in care in regards to region's full adherence.

Table 8.1 Minimum to Maximum Ranges of Performances scores for All MSA's

Year	Mean	SD	Max	99%	95%	90%	75%Q3	50% Median	25% Q1	10%	5%	1%	Min
2012	0.987	0.031	1	1	1	1	1	1	0.989899	0.960854	0.928144	0.861423	0.714286
2013	0.988	0.02921	1	1	1	1	1	1	0.990868	0.962963	0.942308	0.842105	0.75
2014	0.989	0.03	1	1	1	1	1	1	0.992537	0.972727	0.947368	0.854685	0.666667

Table 8.2 Minimum to Maximum Ranges of Performances scores for Participating MSA's

Year	Mean	SD	Max	99%	95%	90%	75%Q3	50% Median	25% Q1	10%	5%	1%	Min
2012	0.962	0.044	0.9997	0.9996	0.995	0.993	0.988	0.979	0.953	0.904	0.875	0..767	0.714
2013	0.96	0.042	0.997	0.996	0.994	0.9931	0.998	0.9729	0.95	0.911	0.875	0.769	0.75

2014	0.96	0.048	0.997	0.996	0.9992	0.992	0.989	0.98	0.957	0.916	0.866	0.75	0.6667

Table 8.3 Number of MSA's which did not meet 100% adherence of this candidate measure

Year	Number of MSA's Overall	Number of MSA's Not at 100%	Percent of MSA's not at 100%
2012	**385**	**126**	**32.73%**
2013	**385**	**116**	**30.13%**
2014	**401**	**114**	**28.43%**

Measure #3: Discouraging the routine use of occupational and/or physical therapy after carpal tunnel release

2017 Options for Individual Measures:
Claims Only

Measure Type:
Process

Description:
Percentage of adult patients aged 18+, with carpal tunnel syndrome, who received surgical carpal tunnel release and who were inappropriately routinely prescribed postoperative hand, physical, or occupational therapy within 6 weeks after release.

Instructions:
This measure is to be reported at **each denominator eligible visit** occurring during the reporting period for patients who received surgical carpal tunnel release during the reporting period. This measure may be reported by eligible clinicians who perform the quality actions described in the measure based on the services provided and the measure-specific denominator coding.

Measure Reporting:
The listed denominator criteria are used to identify the intended patient population. The numerator quality data codes included in this specification are used to submit the quality actions allowed by the measure. All measure-specific coding should be reported on the claim(s) representing the eligible encounter. **This measure is an inverse measure – lower scores indicate higher quality.**

Denominator:
Number of adult patients aged 18+, with a diagnosis of carpal tunnel syndrome, who underwent carpal tunnel release.

Denominator Criteria (Eligible Cases):
Carpal Tunnel Syndrome Diagnosis ICD-10-CM Codes: G56.0, G56.00, G56.01, G56.02, G56.03.
Patient encounter CPT Codes: 64721 or 29848.

Numerator:
Number of patients who underwent carpal tunnel release and did not receive postoperative hand, physical therapy (low, moderate, or high complexity) or occupational therapy (low, moderate, or high complexity) within 6 weeks (42 days) of carpal tunnel release

Numerator Criteria (Eligible Cases):
Denominator patients
AND
Patient encounter for postoperative hand, physical therapy (low, moderate, or high complexity) within 6 weeks (42 days) of carpal tunnel release (CPT): 97161, 97162, 97163.
AND
Patient encounter for postoperative hand occupational therapy (low, moderate, or high complexity) within 6 weeks (42 days) of carpal tunnel release (CPT): 97165, 97166, 97167.

Note: Code change implemented 2015, for data prior to 2015 CPT codes for 97161, 97162, 97163 is equivalent to 97001 (PT) and codes 97165, 97166, 97167 is equivalent to 97003 (OT).

Evidence-Based Recommendation:

Moderate evidence supports no additional benefit to routine supervised therapy over home programs in the immediate postoperative period. No evidence meeting the inclusion criteria was found comparing the potential benefit of exercise versus no exercise after surgery.

Rationale

Routine post-operative therapy after carpal tunnel release was examined in 6 high quality studies. From these, two studies (Hochberg 2001 and Jerosch-Herold 2012) addressed interventions not relevant to current core practices of postoperative rehabilitation. The remaining four studies (Alves 2011, Fagan 2004, Pomerance 2007, and Provinciali 2000) addressed the need for supervised therapy in addition to a home program in the early postoperative period, the early use of laser, or the role of sensory reeducation in the later stages of recovery.

One high quality study (Alves 2011) evaluated the use of laser administered to the carpal tunnel in 10 daily consecutive sessions at a 3J dosage and found no difference in pain/symptom reoccurrence in comparison to placebo.

Two moderate quality studies (Pomerance 2007 and Provinciali 2000) compared in-clinic or therapist supervised exercise programs in addition to a home program to a home program alone. The studies were somewhat limited by an incomplete description of who delivered home programs, exercise/education content and dosage, and treatment progression. Pomerance (2007) compared a two week program directed by a therapist combined with a home program alone and found no additional benefit in terms of grip or pinch strength in comparison to the home program alone. Provinciali (2000) compared one hour sessions over 10 consecutive days of in-clinic physiotherapy comprising a multimodal program with a home program that was progressed in terms of strength/endurance. No benefit was found in outcome when measured by a CTS-specific patient reported instrument.

Validity

The validity of this measure comes from a combination of a strong basis in literature by way of a systematic literature review conducted for a clinical practice guideline, and the face validity vote of our panel of experts. All candidate measures which were tested with clinical data received a “valid” score with agreement from the workgroup. See the explanation of our Delphi face-validity voting process and see appendix A for individual face validity scores.

We also assessed the empirical predictive validity of the measure score. We sought to test the hypothesis that being a numerator patient significantly contributes to post-procedural costs, adjusting for age. We ran a multivariate regression model with the dependent variable being cost, and the independent variable being a dichotomous numerator variable (yes/no). The variable we controlled for was age, which can be viewed as a health risk proxy. The standard regression assumptions were tested, including nonlinearity, error term independence, autocorrelation, non-normality of error terms, heteroskedasticity, and collinearity. As cost data is often skewed and may contain outliers, we found the most appropriate regression function to use was the SAS PROC ROBUSTREG, which specifically underweights outlying values, and deals with potential violations to regression assumptions.

The cost variable we used was a derivative of CMS' key cost field "**Claim Payment Amount**". After removing duplicate claims, we summed the **Claim Payment Amount** variable for each patient. This "**Post-Procedural 2017 Total Claim Payment Amount**" included the cost of the carpal tunnel syndrome release procedure, as well as any outpatient costs accrued in the post-procedural 42-day window, included but not limited to: physical therapy, occupational therapy, laboratory claims, office visits, and other related or unrelated procedures.

Parameter Estimates							
Parameter	**DF**	**Estimate**	**Standard Error**	**95% Confidence Limits**		**Chi-Square**	**Pr > ChiSq**
Intercept	1	3952.133	247.8365	3466.382	4437.884	254.29	<.0001
num	1	713.8262	182.1349	356.8484	1070.804	15.36	<.0001
AGE	1	-13.5015	3.4791	-20.3204	-6.6825	15.06	0.0001
Scale	1	2077.153					

As we can see above, numerator patients – those CTS patients who inappropriately received physical or occupational therapy, had an 'additional added cost' of $713.82 beyond the average non-numerator base cost of $3,952.13. Further, the non-adjusted outpatient PT/OT cost was calculated at $533.06, so those in the numerator may have accrued healthcare costs greater than that of the PT/OT cost. Both the numerator and age variables were significant at the 0.0001 level.

Numerator patients who received physical or occupational therapy, had a claim payment amount in the post-procedural window period of 42-days (or 6 weeks) that was $713.82 greater than the average non-numerator base cost of $3,952.13, adjusting for age, and these results were significant. Furthermore, the unadjusted mean cost for post-procedural PT/OT was $533.06. This result can be interpreted as: ***Numerator patients, on average, had a post-procedural total claim payment amount that was approximately $180 greater than the unadjusted average cost of the PT/OT service provided***. Although more research in this area may be needed, we are confident that this measure will identify numerator cases who are inappropriately receiving PT/OT (as outcomes are not improved with PT/OT after CTS-R) and are thus accruing unneeded healthcare costs.

Reliability

MSA specific reliability is around .85 for each year, and thus can be considered to be good. Reliability scores vary from 0.0 to 1.0, with a score of zero indicating that all variation is attributable to measurement error (noise, or variation across patients within providers) whereas a reliability of 1.0 implies that all variation is caused by real difference in performance across accountable entities. There is not a clear cutoff for minimum reliability level. Values of 0.7 and above, however, are considered sufficient to see differences between some physicians and the mean (see RAND tutorial, 2009). The Results of the Signal to Noise analysis can be found in Table 11. We also assessed signal to noise reliability with 2017 LDS CMS Claims Data, and derived a result of 0.99, indicating very good reliability, but due to low sample size, we supplemented this reliability with empirical predictive validity (discussed above).

Table 11. Reliability statistics from the Signal to Noise Analysis

Year	# of Metro-Statistical Areas	Reliability Statistic from signalto-noise analysis (95% Cl)
2012	387	.8585 (.8488,.8683)
2013	387	.8605 (.8507,.8704)

2014	402	.8553 (.8749,.8749)

Clinical Data

The Measure was specified to include all Patients who are diagnosed with carpal tunnel syndrome and receive surgical carpal tunnel release should not routinely be prescribed postoperative hand, physical, or occupational therapy within 6 weeks after release. The data represented as many known Metro-Statistical Areas of the of the United States population for each year (Table 9).

Table 9. Description of Truven Data Files

Year	Data Source	Size
2012	Truven Claim Files	N= 51,814
2013	Truven Claim Files	N= 30,075
2014	Truven Claim Files	N= 27,275
Overall	Truven Claim Files	N= 109,164

Patient/MSA Samples:

When the inclusion criteria are applied to the 2012-2014 datasets the numbers of the diagnosed population can be found in Table 10.

Table 10. Descriptions of Included populations

Year	Patient Sample Diagnosed (Denominator)	Patient Sample Assessed (Numerator)	# Metro-Statistical Areas
2012	51,814	8358	387
2013	30,075	4677	387
2014	27,275	4002	402

Variability in Care

Although there is fair to high adherence across metropolitan statistical areas for this measure, both the mean, standard deviation, and range across all three years examined showed a consistent variability or gap in care (Table 12.1). The median ranges varied from year to year, and ranged from as low as .0% in some MSAs in 2012 and 2013 and as high 100% through all 3 years.

In examining which MSAs were 100% compliant with this candidate measure, it is observed that in the 3 observed years, the highest rate of adherence by MSA was 20.15%. That is, only 20.15% of observed MSAs were completely compliant with this candidate measure for the year. There is clear regional variability in regards to full adherence.

Year	Number of MSA's Overall	Number of MSA's Not at 100%	Percent of MSA's not at 100%
2012	387	355	91.73%
2013	387	332	85.79%

2014	402	321	79.85%

Table 12.1 Minimum to Maximum Ranges of Performances scores for All MSA's for years 2012-2014

Year	Mean	SD	Max	99%	95%	90%	75%Q3	50% Median	25% Q1	10%	5%	1%	Min
2012	0.862	0.111	1	1	1	0.9781	0.938	0.878	0.8152	0.732	0.655	0.5	0
2013	0.864	0.1131	1	1	1	1	0.9411	0.882	0.808	0.72	0.6667	0.5	0
2014	0.876	0.10982	1	1	1	1	0.957	0.894	0.821	0.736	0.6667	0.5454	0.41667

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Appendix A. Final Validity Workgroup Ratings

Discouraging use of MRI for diagnosis of carpal tunnel syndrome	**Voter #1**	**Voter #2**	**Voter #3**	**Voter #4**	**Voter #5**	**Voter #6**	**Voter #7**	**Voter #8**	**Voter #9**	**Voter #10**	**Voter #11**	**Voter #12**	**Voter #13**	**Voter #14**	**Voter #15**	**Range**	**Median**	**Agreement Rating**
Importance for clinical care	9	9	7	8	9	7	9	7	9	7	9	8	8	7	9	Valid	8	Agreement
Scientific Acceptability	9	9	7	8	8	7	9	7	9	7	7	8	8	7	9	Valid	8	Agreement
Feasibility	7	9	7	8	1	6	9	7	9	8	7	9	6	7	9	Valid	7	Agreement
Usability	7	9	7	8	5	7	9	7	9	8	4	9	8	7	9	Valid	8	Agreement

Discouraging the use of Adjunctive Surgical Procedures during carpal tunnel release	**Voter #1**	**Voter #2**	**Voter #3**	**Voter #4**	**Voter #5**	**Voter #6**	**Voter #7**	**Voter #8**	**Voter #9**	**Voter #10**	**Voter #11**	**Voter #12**	**Voter #13**	**Voter #14**	**Voter #15**	**Range**	**Median**	**Agreement Rating**
Importance for clinical care	9	9	7	8	9	8	9	8	9	8	8	9	8	8	9	Valid	8	Agreement
Scientific Acceptability	9	9	7	8	9	8	9	8	9	8	8	9	8	7	9	Valid	8	Agreement
Feasibility	9	9	7	8	9	8	9	8	9	8	8	9	8	8	9	Valid	8	Agreement
Usability	9	9	7	8	9	9	9	8	9	8	8	9	8	8	9	Valid	9	Agreement

Discouraging the routine use of occupational and/or physical therapy after carpal tunnel release	**Voter #1**	**Voter #2**	**Voter #3**	**Voter #4**	**Voter #5**	**Voter #6**	**Voter #7**	**Voter #8**	**Voter #9**	**Voter #10**	**Voter #11**	**Voter #12**	**Voter #13**	**Voter #14**	**Voter #15**	**Range**	**Median**	**Agreement Rating**
Importance for clinical care	9	9	7	8	7	7	9	8	9	7	9	8	8	7	9	Valid	8	Agreement
Scientific Acceptability	9	9	7	8	9	8	9	8	9	8	9	8	7	7	8	Valid	8	Agreement
Feasibility	9	9	7	8	9	8	9	8	9	8	9	8	7	8	9	Valid	8	Agreement
Usability	9	9	7	8	9	8	9	8	9	9	9	8	7	8	8	Valid	8	Agreement

Appendix B. Disclosures

Stephen M McCollam, MD, Oversight Chair:
AAOS: Board or committee member ($0) Performance Measures Committee;
American Society for Surgery of the Hand: Board or committee member; Board or committee member; Governmant Affairs Committee; Journal of Hand Surgery - American: Editorial or governing board; ASSH Hand editor; Submitted on: 09/19/2016

Robin Neil Kamal, MD, Chair: (This individual reported nothing to disclose); Submitted on: 09/19/2016

Philip E Blazar, MD: Techniques in Hand and Upper Extremity: Editorial or governing board; Submitted on: 11/12/2016

Mia Erickson, PT: Academy for Hand and Upper Extremity Physical Therapy of the American Physical Therapy Association: Board or committee member, Vice-President; SLACK Incorporated: Publishing royalties, financial or material support, I have published 2 textbooks on physical therapy documentation for SLACK inc. and I am a consultant for a book series for the physical therapist assistant; Submitted on: 11/03/2016

Brent Graham, MD: Journal of Hand Surgery - American: Publishing royalties, financial or material support, Editor-in-Chief; Journal of Hand Surgery - American: Editorial or governing board, Editor-inChief; Submitted on: 11/10/2016

Andrew Gurman, MD: American Medical Association: Board or committee member, President, member of board of trustees; JAMA and JAMA Surgery: Editorial or governing board ($0) I am president of the American Medical Association which is the publisher of JAMA and the JAMA network; Submitted on: 10/30/2016

Alex HS Harris, PhD, MS: (This individual reported nothing to disclose); Submitted on: 11/03/2016

Peter JL Jebson, MD: American Society for Surgery of the Hand: Board or committee member; Axogen: Stock or stock Options; Clinical Orthopaedics and Related Research: Editorial or governing board; Elsevier - book royalties: Publishing royalties, financial or material support; Hand: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; Journal of Hand Surgery - American: Editorial or governing board; Journal of the American Academy of

Orthopaedic Surgeons: Editorial or governing board; Orthopaedic Knowledge Online Journal: Editorial or governing board; Synthes AO/ASIF: Paid presenter or speaker; Wolters Kluwer Health - Lippincott Williams & Wilkins: Editorial or governing board; Submitted on: 10/14/2016

William M Jones, MD: (This individual reported nothing to disclose); Submitted on: 11/20/2016

John C Kincaid, MD: American Association of Neuromuscular & Electrodiagnositic Medicine: Board or committee member; Ionis pharmaceuticals Carlsbad CA: Research support; Submitted on: 10/19/2016

David C Ring, MD: AAOS: Board or committee member, Chair, Patient Safety Committee; Clinical Orthopaedics and Related Research: Editorial or governing board; Journal of Orthopaedic Trauma: Editorial or governing board; Orthopaedic Trauma Association: Board or committee member

($0) Research Committee; Skeletal Dynamics: IP royalties; Royalties for Elbow Device; Wright Medical Technology, Inc.: IP royalties; Royalties for Elbow Plates; Submitted on: 11/01/2016

John G Seiler, III MD: American Board of Orthopaedic Surgery, Inc.: Board or committee member; Submitted on: 11/14/2016

John Michael Stephenson, MD: American Society for Surgery of the Hand: Board or committee member; Board or committee member; Board or committee member; Board or committee; Young Members Steering Committee; Journal of Hand Surgery - American: Editorial or governing board, Associate Editor; Submitted on: 11/14/2016

Jennifer Waljee, MD: (This individual reported nothing to disclose); Submitted on: 11/11/2016

Daniel Edward Wessell, MD, PhD: American College of Radiology: Board or committee member; Submitted on: 11/20/2016

Hayes Wilson, MD: Abbvie: Paid presenter or speaker; American Family Physician: Editorial or governing board; Amgen: Paid presenter or speaker; Atlanta Medicine: Editorial or governing board; Mallinckrodt: Paid presenter or speaker; Medical Association of Atlanta: Board or committee member; Submitted on: 11/21/2016