

Physical Therapy Episodes for Low Back Pain: Medicare Spending and Intensity of Physical Therapy Services

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Introduction

The Alliance for Physical Therapy Quality and Innovation (APTQI) engaged The Moran Company (TMC) to evaluate a population of Medicare fee for service (FFS) beneficiaries with newly diagnosed low back pain, select the subset who received an identifiable episode(s) of outpatient physical therapy within one year following diagnosis and assess observed differences between the amount of therapy received and Medicare Part A/B spending. To do so, we used a previously studied nationally representative population¹ of beneficiaries with incident lumbago in calendar year (CY) 2014 and focused on the cohort who received physical therapy within 12 months of first diagnosis. Beneficiaries were selected based on the presence of a Centers for Medicare and Medicaid Services (CMS) established Healthcare Common Procedure Coding System (HCPCS) “G” code that identified the outset of a therapy episode. We compiled all Medicare FFS claims across all sites of service for this study population and analyzed relevant metrics to evaluate the hypothesis that patients who receive more therapy have lower overall Medicare Part A/B spending. This analysis is different from our original investigation of incident lumbago beneficiaries as that study focused on the initial treatment intervention that beneficiaries with low back pain received. In this study we focused on beneficiaries with an episode of physical therapy regardless of the initial treatment intervention. We analyzed intensity in terms of number of visits and duration of the episode, and we evaluated Medicare spending in those terms.

Executive Overview

Results from this assessment indicate that in the year following incident diagnosis for lumbago patients with multiple therapy visits are observed to have lower total Medicare Part A/B spending on average than do patients with only one therapy visit.² These findings provide another signal, using a uniform sample of Medicare-aged FFS beneficiaries, that utilization of outpatient therapy services may contribute to lower overall Medicare spending on beneficiaries with low back pain. These findings suggest that intensity of therapy (as defined by number of visits) is inversely related to total Medicare A/B spending and should be investigated further.

Highlights of study findings include:

- A nationally representative study population of 38,260 Medicare fee for service beneficiaries with an incident lumbago diagnosis and an identifiable outpatient physical therapy episode for low back pain in the year following first diagnosis were identified.

¹ The Moran Company (2017). Initial Treatment Intervention and Average Total Medicare A/B Costs for FFS Beneficiaries with an Incident Low Back Pain (Lumbago) Diagnosis in CY 2014. Available at: <http://www.aptqi.com/Resources/documents/APTQI-Complete-Study-Initial-Treatment-Intervention-Lumbago-May-2017.pdf>.

² Given the scope of this project, we did not attempt a detailed statistical analysis of the link between therapy intensity and spending and accordingly do not demonstrate a causal relationship.

- Most of these beneficiaries (94%) had one episode of therapy for low back pain in the year following diagnosis which involved, on average, \$625 in spending on outpatient therapy services.
- Approximately 22% of study beneficiaries utilized a single therapy visit. The remaining beneficiaries utilized, on average, 9.1 therapy visits over the course of approximately 8 weeks (56.2 days).
- Beneficiaries with multiple therapy visits incurred between 14% and 32% lower average total Medicare A/B spending in the year following diagnosis than did beneficiaries with one therapy visit.

These findings point to potential opportunities for incorporating physical therapy into care management processes for low back pain and more broadly into value-based insurance design. The potential of physical therapy utilization as a relatively low-cost option that possibly contributes to less overall spending downstream raises important considerations for benefit design and mechanisms to reduce barriers to access these services. Results from this study complement our prior study findings which suggest that early access to therapy first treatment regimens may be a lower cost alternative compared to more invasive interventions such as surgeries and injections. In addition, the results from our prior work and this study align with various previously published evidence which found that adherence to recommended active forms of physical therapy results in lower healthcare costs due to lower likelihood of receiving opioid prescription medications, epidural injections, follow-up advanced imaging, follow-up physician visits, and other health resource use metrics without compromising patient outcomes.^{3,4,5,6}

Brief Overview of Approach

To conduct this analysis, we began with the database that was created for our prior research on initial treatment intervention using the Medicare 5% Standard Analytic Files (SAFs)⁷ for years 2013-2015 for all patients newly diagnosed with lumbago in CY 2014. From this population, we then identified a sample frame of all patients who received therapy within a year after their first diagnosis of lumbago (n=63,020) regardless of their first treatment intervention. From the sample frame, we then selected all beneficiaries that had claims containing functional reporting HCPCS “G” codes⁸ (n=47,000) and subset to those beneficiaries with claims that included a code that identifies the start of therapy (n=39,000). We then created episodes of physical therapy by identifying the start of the episode with a functional G-code that indicates the outset of therapy, and ends with either a functional G-code that indicates the therapy discharge or identifies the end

³ Fritz JM, Cleland JA, Speckman M, Brennan GP, Hunter SJ. Physical therapy for acute low back pain: Associations with subsequent healthcare costs. *Spine (Phila Pa 1976)*. 2008;33(16):1800-1805.

⁴ Childs JD, Fritz JM, Wu SS, et al. Implications of early and guideline adherent physical therapy for low back pain on utilization and costs. *BMC Health Serv Res*. 2015;15(1):150.

⁵ Fritz JM, Childs JD, Wainner RS, Flynn TW. Primary care referral of patients with low back pain to physical therapy: Impact on future healthcare utilization and costs. *Spine (Phila Pa 1976)*. 2012;37(25):2114-2121.

⁶ Ojha, H. A., Wyrsta, N. J., Davenport, T. E., Egan, W. E., & Gellhorn, A. C. (2016). Timing of Physical Therapy Initiation for Nonsurgical Management of Musculoskeletal Disorders and Effects on Patient Outcomes: A Systematic Review. *Journal of orthopaedic & sports physical therapy*, 46(2), 56-70.

⁷ The 5% SAFs contain all of the final action claims for a 5% nationally representative sample of beneficiaries. The analysis presented here projects results to national levels via standard processes.

⁸ See Appendix Table C1.

of therapy by a 60-day gap in which no further outpatient therapy claims are visible in the data. After excluding any patient who either did not have a functional G-code or who had therapy that was not associated with an episode defined by functional G-codes, a sample of 38,260 patients remained (61% of the sample frame).

Once our population of interest was identified, we pulled all of their Medicare claims from key settings using the carrier, outpatient, inpatient, SNF, and home health SAFs to create a complete analytic dataset for this research. We used HCPCS codes to identify therapy services and included “always” therapy services and “sometimes” therapy services when an applicable modifier was present as per CMS billing requirements and published lists.⁹ We restricted therapy to services associated with a lower back pain related diagnosis.¹⁰

We created four variables to measure intensity of therapy: number of visits, number of episodes, duration of therapy, and number of visits per week of therapy. A visit for therapy is defined as a unique day on which therapy occurred, regardless of the type or quantity. The number of episodes is the count of episodes that occur in one year per patient. The duration of therapy is equal to the last day of therapy for the last episode of the year minus the first day of the first episode of the year plus one day. Seven times the quotient of the number of visits divided by the length of therapy equals the number of visits per week.

While therapy episodes, intensity of therapy, and Medicare spending was the focus of this follow-up analysis, we also evaluated initial treatment intervention (similar to our prior work) for the beneficiaries included in this study population.¹¹ We used HCPCS codes and inpatient procedure (ICD-9) codes to identify the initial treatment intervention received and assessed the use of physical therapy, injections, and lumbar related surgeries to determine if physical therapy was the first line treatment option for the beneficiaries included in this new analysis (i.e., beneficiaries who had an identifiable episode of physical therapy for low back pain). We were unable to assess use of prescription opioids due to limitations of available data in CMS issued limited data sets.

We also considered basic demographic information for this population of beneficiaries with a defined therapy episode. In addition, since we used functional limitation reporting HCPCS G-codes to identify therapy episodes, we also identified the function treated on the first day of therapy, or in cases where multiple functions were treated on day one, created a category representing combinations of functions on day one. See Appendix A for basic demographics on the study population and for information on the first function treated. See Appendix C for additional information on inclusion/exclusion criteria and the technical approach to this study.

⁹ Therapy code list is accessible at:

<https://www.cms.gov/Medicare/Billing-TherapyServices/AnnualTherapyUpdate.html>

¹⁰ Gellhorn AC, Chan L, Martin B, and Friedly J. Management Patterns in Acute Low Back Pain: the Role of Physical Therapy. *Spine*. 2012 Apr 20; 775–782.

¹¹ As compared to our initial study which considered initial treatment intervention for all Medicare fee for service beneficiaries newly diagnosed with lumbago in CY 2014 regardless of whether they received physical therapy.

Details of Our Analysis

Episodes of Outpatient Physical Therapy for Low Back Pain Among Incident Beneficiaries in the Year Following First Diagnosis

Of the 38,260 Medicare FFS beneficiaries included in this analysis, 94% had only one episode of therapy for low back pain in the year following an initial lumbago diagnosis (Table 1). Given that the large majority of study beneficiaries had a single therapy episode, we did not stratify subsequent analysis by number of episodes that occurred in the year following diagnosis.

Table 1. Number of Episodes of Outpatient Physical Therapy for Low Back Pain Among FFS Beneficiaries Newly Diagnosed with Lumbago in CY 2014

Incident Lumbago Beneficiaries		
	N	%
Total	38,260	100%
Maximum Number of Episodes		
One	36,020	94%
Two or more	2,240	6%

2014 5% SAFs, National Estimates Presented

Initial Lumbago Diagnosis Occuring Between 02/01/2014 - 09/30/2014

Intensity of Physical Therapy for Low Back Pain Among Incident Beneficiaries in the Year Following First Diagnosis

Average Number of Physical Therapy Visits

We examined the distribution of the number of physical therapy visits for low back pain including the average number of visits overall and for beneficiaries with 2 or more visits (segmented as 2-4, 5-8, 9-12, 13+ visits). For the entire study population, the overall average number of visits was 7.3, with a fairly wide distribution of visit counts. Approximately 22% of beneficiaries had only one outpatient therapy visit. When these patients are excluded, the average number of visits increased to 9.1. Table 2 below provides beneficiary counts for five classifications of visits analyzed.

Table 2. Number of Therapy Visits for FFS Beneficiaries with a Defined Therapy Episode for Newly Diagnosed Low Back Pain (Lumbago)

Incident Lumbago Beneficiaries		
	N	%
Total	38,260	100%
Average number of visits (std dev)	7.3 (7.7)	
Average number of visits of patients with more than one visit (std dev)	9.1 (7.8)	
1	8,600	22%
2 to 4	9,720	25%
5 to 8	7,460	19%
9 to 12	5,700	15%
13 or more visits	6,780	18%

2014-2015 5% SAFs, National Estimates Presented

Initial Lumbago Diagnosis Occurring Between 02/01/2014 - 9/30/2014

Duration of Physical Therapy

The average duration of therapy for the collective study population was 43.8 days or approximately 6 weeks. For those beneficiaries with more than one therapy visit, the average duration of therapy occurred over 56.2 days or approximately 8 weeks. The distribution of the duration of therapy for this population of beneficiaries is shown in Table 3.

Table 3. Duration of Physical Therapy for FFS Beneficiaries with a Defined Therapy Episode for Newly Diagnosed Low Back Pain (Lumbago)

Incident Lumbago Beneficiaries		
	N	%
Total	38,260	100%
Average length of therapy in days (std dev)	43.8 (60.5)	
Average length of therapy in days of patients with more than one visit (std dev)	56.2 (63.6)	
One Day	8,600	22%
2 to 14 days	3,640	10%
15 to 30 days	8,740	23%
31 - 60 days	9,700	25%
61 to 120 days	4,840	13%
121 + days	2,740	7%

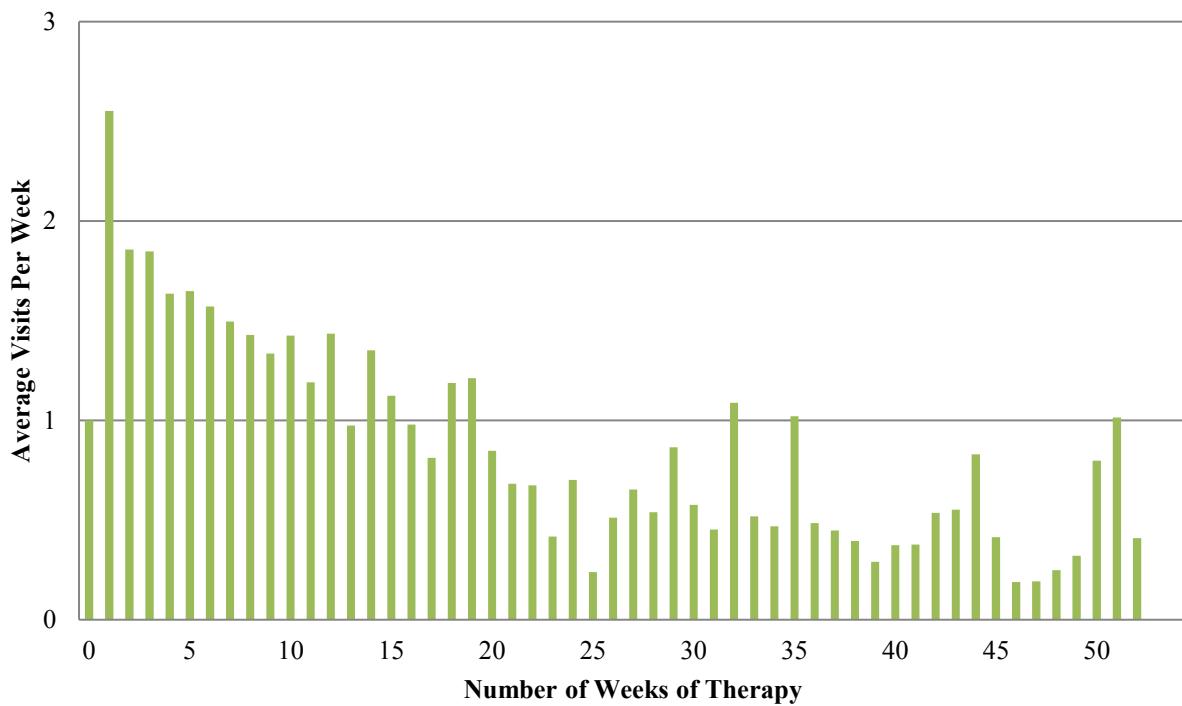
2014-2015 5% SAFs, National Estimates Presented

Initial Lumbago Diagnosis Occurring Between 02/01/2014 - 09/30/2014

Average Number of Visits by Duration of Physical Therapy in Weeks

The below graph shows the average number of visits per week by the duration of therapy in weeks and suggests that the average number of visits ranged between one and two for nearly all weeks up to 19 weeks. Thereafter, one visit per week was typical (Figure 1).

Figure 1: Average Therapy Visits Per Week by Weeks of Therapy



Medicare Spending by Therapy Intensity

We analyzed average total Medicare Part B spending on an outpatient therapy episode for low back pain and Part B spending on therapy by number of visits (segmented as 2-4, 5-8, 9-12, 13+ visits).¹² We then analyzed overall (Parts A/B) spending in the year following diagnosis by the same therapy visit categories to assess whether different levels of therapy signal differences in overall Medicare costs.

Average Medicare Part B Spending on Outpatient Therapy Per Episode

We tabulated total Medicare Part B spending attributable to outpatient physical therapy for low back pain and found that an episode of therapy was \$625 on average for all beneficiaries in the study population (Table 4). For the small portion of beneficiaries with more than one outpatient therapy episode, average Medicare spending for subsequent episode(s) of low back pain related therapy was slightly less at \$606.

¹² Throughout this analysis Medicare spending reflects total Medicare Part A/B spending for the beneficiaries included in this study as measured by allowed charges which includes the beneficiary portion.

Table 4. Average Part B Spending per Outpatient Low Back Pain Therapy Episode

Episode of Physical Therapy for Low Back Pain	Average Part B Spending on Outpatient Therapy for Low Back Pain		
	Number of Beneficiaries	Average	Std Dev
Average Per Episode Spending for Therapy Related to Lower Back Pain	36,020	\$626	\$680
Average Per Episode Spending for Therapy in Subsequent Episodes	2,240	\$606	\$570
Average Per Episode Spending for Therapy Related to Lower Back Pain Overall	38,260	\$625	\$675

2014-2015 5% SAFs, National Estimates Presented

Average Medicare Part B Spending on Outpatient Therapy by Number of Therapy Visits
 Average Medicare Part B spending on outpatient therapy for low back pain is shown by number of therapy visits in the year following diagnosis in Table 5 below.

Table 5. Average Medicare Part B Spending on Outpatient Therapy by Number of Therapy Visits

Number of Therapy Visits Following Diagnosis	Beneficiaries	Part B Outpatient Therapy Spending	
		Average	Std Dev
1	8,600	\$124	\$80
2 to 4	9,720	\$267	\$131
5 to 8	7,460	\$579	\$196
9 to 12	5,700	\$923	\$238
13 or more visits	6,780	\$1,784	\$932

2014-2015 5% SAFs, National Estimates Presented

Medicare Part A/B Spending One Year Post Diagnosis by Number of Therapy Visits

We also analyzed overall spending by tabulating average total Medicare Part A spending, Medicare Part B spending and total A/B spending on a beneficiary in the year following lumbago diagnosis and considered the observed difference in total average spending by the number of therapy visits beneficiaries received in the year. As shown in Table 6 below, beneficiaries who had multiple therapy visits all had lower average Medicare Part A, Part B and total Part A/B spending than did beneficiaries with one therapy visit (see also Figure 2).

Table 6. Average Total Medicare Part A/B Spending One Year After Incident Low Back Pain (Lumbago) Diagnosis by Number of Therapy Visits and Difference in Average Total Spending Between One and Multiple Visits

Number of Visits	N	Part A	Part B	Total A/B	(Total A/B)	Average Difference in Total A/B Spending	
						Std Dev	Difference
							Percent
1	8,600	\$6,102	\$8,852	\$14,954	\$19,819		
2 to 4	9,720	\$5,665	\$7,248	\$12,912	\$19,038	\$ (2,042)	-14%
5 to 8	7,460	\$3,890	\$6,471	\$10,361	\$15,813	\$ (4,594)	-31%
9 to 12	5,700	\$3,393	\$6,828	\$10,221	\$12,888	\$ (4,733)	-32%
13 or more visits	6,780	\$3,738	\$8,275	\$12,013	\$14,317	\$ (2,942)	-20%

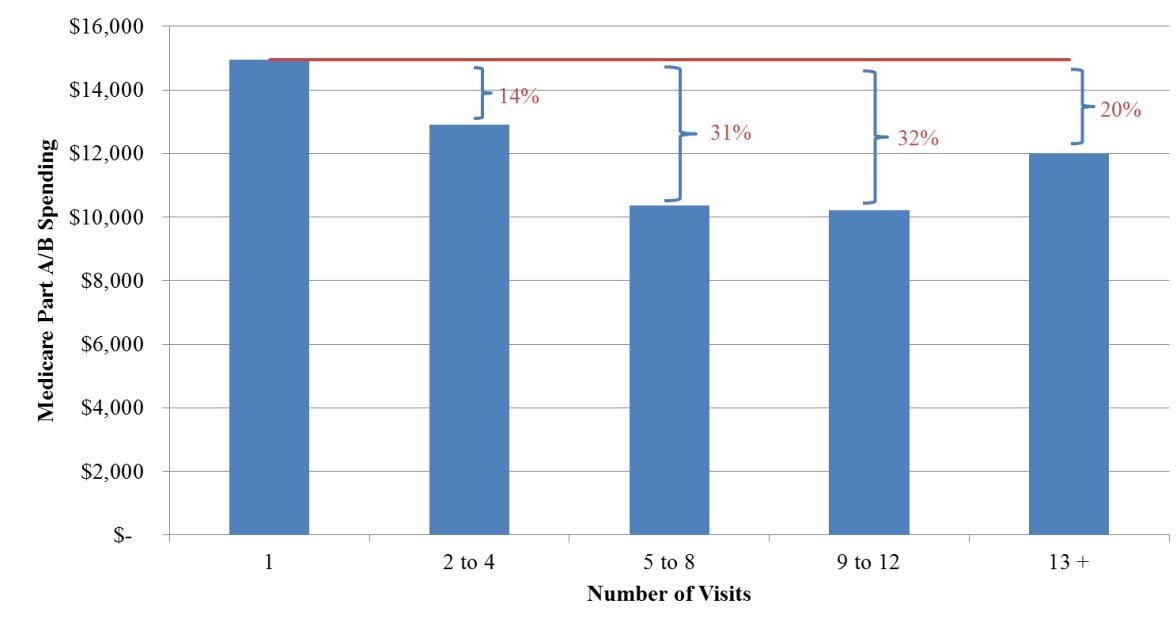
2014-2015 5% SAFs, National Estimate Presented

Spending on Beneficiaries with One Therapy Visit versus Multiple Therapy Visits

As shown in Table 6, when spending on beneficiaries with one therapy visit was compared to the spending on beneficiaries with multiple visits, spending for the former group was always higher.¹³ Specifically, beneficiaries with one therapy visit in the year following lumbago diagnosis incurred, on average, \$14,954 in total Medicare spending. Comparatively, beneficiaries in the 2 to 4 visit segments incurred \$12,912 in total spending, which is approximately 14% less on average than the single therapy visit group. Total Medicare spending continues to decline with additional therapy visits. For example, beneficiaries with 5 to 8 visits are observed to incur 31% less in spending than beneficiaries with a single therapy visits. Beneficiaries with 9 to 12 visits had the lowest average total Medicare Part A/B spending (\$10,221) than any other group and approximately 32% less than the single visit beneficiaries. Although all categories of beneficiaries with more than one visit have lower spending than did those with only one visit, this difference closes as the number of therapy visits climbs to 13 or more. See Appendix B for additional detail on Medicare spending broken out by Medicare program.

¹³ We did not assess the risk profile of beneficiaries in the study (e.g., one visits group versus others), further investigation in this regard could be warranted.

Figure 2. Comparing the One Visit Average Total Medicare Part A/B Spending One Year After Incident Low Back Pain (Lumbago) Diagnosis to Other Visit Categories



Initial Treatment Intervention Among Beneficiaries with an Identifiable Episode of Therapy for Low Back Pain in the Year Following Incident Diagnosis

As suggested from our prior research overall Medicare Part A/B spending can be influenced by initial treatment intervention employed. We accordingly applied a similar evaluation of select initial treatment interventions (injections first, surgery first, therapy first) among this study population. As shown in Table 8 below almost 84% of the beneficiaries included in this analysis received therapy as the initial treatment intervention approximately 12% received injections as the initial treatment intervention (before receiving therapy) and less than 4% received a lumbar related surgery as the first treatment option.

Table 7. Initial Treatment Intervention for FFS Beneficiaries Treated with Therapy Newly Diagnosed with Low Back Pain (Lumbago)

Initial Intervention	Incident Lumbago Beneficiaries	
	N	%
Injections	4,620	12%
Surgery	1,360	4%
Therapy	32,280	84%
Total	38,260	

2014-2015 5% Carrier and Outpatient SAFs, National Estimates Presented

Initial Lumbago Diagnosis Occurring Between 02/01/2014 - 09/30/2014

Medicare Spending by Initial Treatment Intervention among Beneficiaries with an Identifiable Episode of Therapy for Low Back Pain in the Year Following Incident Diagnosis

We also analyzed average total Medicare Part A/B spending in the year following beneficiaries' incident lumbago diagnosis for all beneficiaries included in this analysis by the first intervention utilized (surgery, injections, or therapy). Consistent with the larger population analyzed in our prior work, average total Medicare Part A/B spending was lower for beneficiaries with an identifiable therapy episode in the year following diagnosis among those who began treatment with therapy. These beneficiaries had, on average, total Medicare Part A/B spending of \$10,827, \$6,216 lower (~36% lower) than those with injections, and \$20,689 less than beneficiaries who began treatment with surgery (~66%).

Table 8. Average Total Medicare Part A/B Spending One Year After Incident Lumbago Diagnosis by Initial Treatment and Average Difference Between Interventions

Initial Treatment	Beneficiaries	Average Difference in Total Part A/B Spending Between Therapy and Other Initial Treatments							
		Part A				Part B			
		N	Average	Std Dev	Average	Std Dev	Average	Std Dev	Difference
Therapy	32,280	\$3,946	\$12,100	\$6,881	\$7,188	\$10,827	\$15,969		
Injections	4,620	\$6,142	\$12,778	\$10,900	\$8,971	\$17,042	\$18,213	\$6,216	36%
Surgery	1,360	\$18,744	\$20,774	\$12,772	\$6,609	\$31,516	\$23,889	\$20,689	66%

2014-2015 5% SAFs, National Estimates Presented

Opioids as a Treatment Intervention for Low Back Pain

In this study and in our prior work, we are not able to assess the use of opioids as part of overall Medicare spending as Part D prescription drug data are not available in a limited data set format. We note though, that according to an Office of Inspector General (OIG) data brief,¹⁴ of those beneficiaries with Medicare prescription drug coverage, approximately 30% (12 million beneficiaries) received a prescription for at least one commonly abused opioid and typically received five scripts for these drugs throughout the year of study. The OIG documented

¹⁴ Opioids in Medicare Part D: Concerns and Extreme Use and Questionable Prescribing. <https://oig.hhs.gov/oei/reports/oei-02-17-00250.pdf>

significant increases in Medicare Part D spending on opioids and highlighted growth in spending for commonly abused opioids which reached \$4.1 billion in 2015.

The Centers for Disease Control and Prevention (CDC) issued guidelines for prescribing opioids for chronic pain and as part of its extensive review found evidence indicating that non-pharmacologic therapies for pain control, including physical therapy, reduce pain and improve function over a sustained period of time and should accordingly be used as alternatives to opioids in certain instances.¹⁵ The CDC also noted that other therapies, including physical therapy, are associated with lower annual costs compared to the annual cost of opioids. Accordingly, CMS implemented programs to promote medication safety, monitor overutilization and align with CDC opioid prescribing guidelines.¹⁶

We note this as it bears significant relevance to assess the use of opioids among Medicare beneficiaries with low back pain and consider the benefit physical therapy may provide - including from a Medicare spending perspective. While we were unable to assess this due to limitations of the data available for public research, utilization of sufficient levels of physical therapy and appropriate adherence should likely be considered as a strategy to improve outcomes and reduce spending.

Conclusions

This analysis of newly diagnosed beneficiaries with low back pain who received an episode of physical therapy for treatment suggests downstream cost reductions with greater therapy intensity. The findings suggest less overall spending on average in the year following diagnosis when the beneficiary participated in multiple therapy visits during the episode. The largest difference in spending (32% less) was observed for beneficiaries with 9-to-12 physical therapy visits when compared to those with a single visit. While a prescribed treatment regimen cannot be gleaned from these healthcare claims databases, it might be reasonable to assume that treatment protocols would minimally be several visits in length. These findings suggest that adherence to a multiple treatment regimen could have downstream healthcare savings. The finding that intensity of therapy is inversely related to healthcare spending contributes to our understanding of the role that physical therapy can play in care management, resource use and cost savings. While many studies in the published literature reach similar conclusions, further investigation of these findings is relevant and may be used to demonstrate a causal relationship.

¹⁵ CDC Guideline for Prescribing Opioids for Chronic Pain – United States, 2016.

<https://www.cdc.gov/mmwr/volumes/65/rr/rr6501e1.htm>

¹⁶ Centers for Medicare & Medicaid Services (CMS) Opioid Misuse Strategy 2016. <https://www.cms.gov/Outreach-and-Education/Outreach/Partnerships/Downloads/CMS-Opioid-Misuse-Strategy-2016.pdf>

Appendix A: Basic Demographics on Study Population and First Function Treated

Study Population Demographics

The average age of FFS beneficiaries first diagnosed with lumbago in CY 2014 who subsequently received therapy as part of an identifiable episode in the year following diagnosis was 68.3 years of age, relatively young for a Medicare population. The distribution of age was fairly even, with the plurality of patients, aged between 65 and 74. The majority of the patients were white (82%). In these respects, the sample does not differ substantially from the Medicare population. The clear majority of the patients in our sample (65%) are female, larger than the overall percent of 55% female enrolled in Medicare FFS reported by CMS for 2016.¹⁷

Table A1. Demographic Profile of Study Population: FFS Beneficiaries Newly Diagnosed with Low Back Pain (Lumbago) in CY 2014 and Treated with Therapy in the Year Following Diagnosis

Demographic Category	Incident Lumbago Beneficiaries	
	N	%
Age (mean, std dev)	68.3	12.7
< 65	9,660	25%
65 - 74	16,600	43%
75 - 84	9,200	24%
85 +	2,800	7%
Male	13,440	35%
Race		
White	31,400	82%
Black	4,280	11%
Other	2,580	7%

2014 5% SAFs, National Estimates Presented

Initial Lumbago Diagnosis Occurring Between 02/01/2014 - 09/30/2014

First Function Treated

As previously stated, the population studied in this analysis had an identifiable episode of therapy for low back pain in the year following incident lumbago diagnosis. Episodes were identified using functional limitation reporting HCPCS G-codes that identified the onset of therapy. We accordingly also tabulated the function treated in the first day of therapy for the study population. As shown in Table A2 below, the majority of beneficiaries (65%) included in this study with an identifiable episode of therapy for low back pain were first treated for functions related to mobility.

¹⁷ 2016 CMS Statistics, US Department of Health and Human Services <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/CMS-Statistics-Reference-Booklet/index.html>

Table A2. First Function Treated by Therapy for Study Population

	N	%
Number of Beneficiaries Diagnosed with Lumbago with an Identifiable Episode of Therapy*	38,260	100%
Function Treated in First Episode**		
Mobility	24,860	65%
Body	6,760	18%
Movement	1,580	4%
Self Care	840	2%
Other	2,360	6%
Combination of two or more functions	1,860	5%

*All patients with a G-code that indicates the start of therapy.

**There are patients with up to four episodes, but in numbers too small to report.

Appendix B: Additional Detail on Medicare Spending by Program Component

Comparison of Medicare Part B Spending One Year Post Diagnosis by Therapy Visits

Average Medicare Part B spending followed a similar pattern, as did total spending described above, with the beneficiaries utilizing a single therapy visit incurring more Part B spending than all other segments of study beneficiaries. As shown in Table B1 when Part B spending is analyzed net of therapy payments, Part B payments remain lower for all groups of beneficiaries with two or more visits than for those with one visit. As can be seen in Figure B1, the largest difference in Part B payments from those patients with one visit are those who received 5-to-8 visits (a 27% decrease) followed closely by patients with 9-to-12 visits (a 23% decrease).

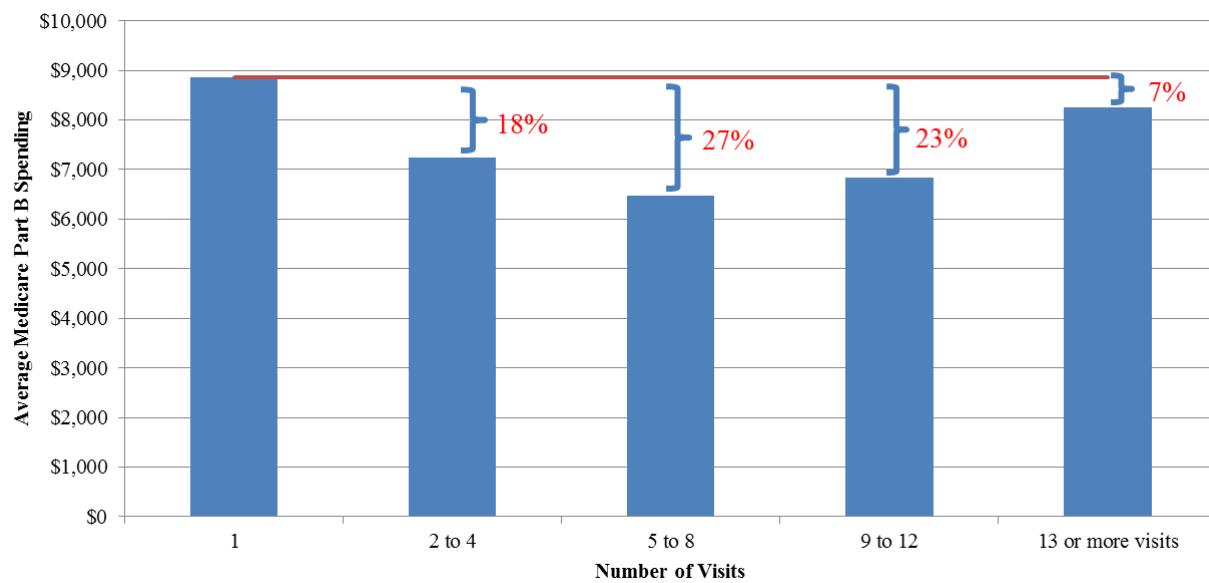
Table B1. Average Medicare Part B Spending in the Year Following Incident Low Back Pain (Lumbago) Diagnosis by Number of Visits

Number of Visits	Beneficiaries	Total		Total Net of Therapy		Total for Therapy	
		N	Average	Std Dev	Average	Std Dev	Average
1	8,600	\$8,852	\$9,468	\$8,728	\$9,450	\$124	\$80
2 to 4	9,720	\$7,248	\$7,378	\$6,981	\$7,379	\$267	\$131
5 to 8	7,460	\$6,471	\$6,240	\$5,891	\$6,247	\$579	\$196
9 to 12	5,700	\$6,828	\$5,993	\$5,904	\$5,998	\$923	\$238
13 or more visits	6,780	\$8,275	\$7,471	\$6,486	\$7,381	\$1,784	\$932

2014-2015 5% SAFs, National Estimates Presented

Initial Lumbago Diagnosis Occurring Between 02/01/2014 - 9/30/2014

Figure B1. Amount of Part B Spending in the Year Following Incident Low Back Pain (Lumbago) and Percent Difference Compared to Patients with 1 Visit



Comparison of Medicare Part A Spending One Year Post Diagnosis by Therapy Visits
The average spending on Medicare Part A health services also declines as the number of visits to therapy increases (Table B2). The average spending on Part A health services in the year following diagnosis is \$6,102 for beneficiaries with one visit. This figure does not change much for beneficiaries with 2-to-4 therapy visits. However, average Part A spending drops between 36% and 44% thereafter as shown in Figure B2.

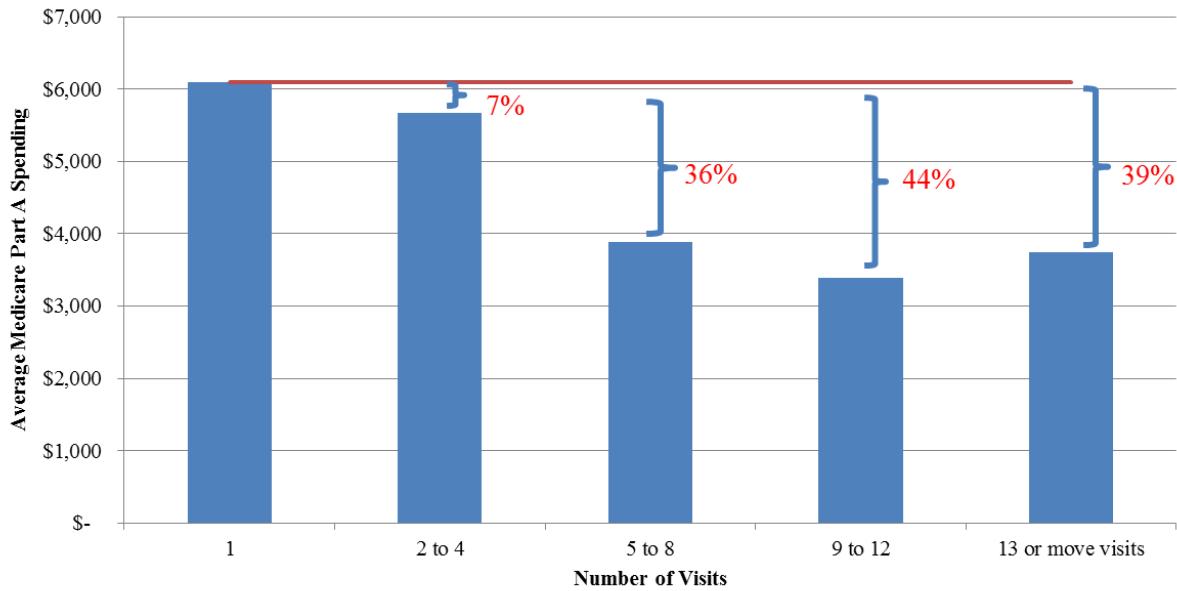
Table B2: Average Medicare Part A Spending in the Year Following Incident Low Back Pain (Lumbago) Diagnosis by Number of Visits

Number of Visits	Beneficiaries		Total	
	N	Average	Std Dev	
1	8,600	\$ 6,102	\$ 15,108	
2 to 4	9,720	\$ 5,665	\$ 14,436	
5 to 8	7,460	\$ 3,890	\$ 12,178	
9 to 12	5,700	\$ 3,393	\$ 9,690	
13 or more visits	6,780	\$ 3,738	\$ 10,065	

2014-2015 5% SAFs, National Estimates Presented

Initial Lumbago Diagnosis Occurring Between 02/01/2014 - 9/30/2014

Figure B2. Amount of Part A Spending in the in the Year Following Incident Low Back Pain (Lumbago) and Percent Difference Compared to Patients with 1 Visit



Appendix C: Additional Detail on Technical Approach

For this analysis, we used Medicare Part A and B limited dataset (LDS) standard analytic file (SAF) 5% sample data from the CMS carrier, outpatient, inpatient, skilled nursing facility, home health agency, hospice, and durable medical equipment claims data files and Medicare beneficiary information in the denominator data files covering the years 2013 through 2015 to construct the analytic files for the project. These CMS SAF 5% data files are based on a 5% nationally representative sample of Medicare fee-for-service (FFS) beneficiaries and include 100 percent of their Medicare claims. We project final results for this study to the national level per the standard CMS weighting processes.

For this study we used a previously identified FFS beneficiary population that had a low back pain lumbago (ICD-9 diagnosis code 724.2) diagnosis in the outpatient and carrier SAFs during the period between Feb 1, 2014 and Sept 30, 2014. This time frame was originally selected as part of our prior work as it allowed us to analyze total Medicare spending including Medicare payments as well as beneficiary out-of-pocket costs (i.e., co-insurance, co-payments, deductibles, other payer payments, etc.) in the year following the incident diagnosis. For a beneficiary with an incident lumbago diagnosis to be included in the study and ensure that we fully captured their cost information, the beneficiary needed to be continuously enrolled as a FFS beneficiary over the three-year period (e.g., no dropping of Medicare Part A or B coverage, and no Medicare Part-C coverage).

In addition, beneficiaries were excluded from the original population if they died during the study period or utilized hospice services. Technical exclusions were further applied such as when the gender or age of the beneficiary were unknown, or the beneficiary was not mapped to a valid unique patient identifier. Finally, to identify beneficiaries with a new low back pain (i.e., lumbago) diagnosis, the original sample selection excluded beneficiaries if they had lower back related surgeries, injections, or therapy in the year prior to the index lumbago diagnosis we identified, or if patients had a complicating diagnosis such as cancer, were pregnant, or had spine related chronic diseases, infections, accidents, fractures, etc.¹⁸

The analysis presented here is based on a subpopulation of our original study sample based on the presence of an outpatient therapy claim in the year following incident diagnosis. As detailed in the overview of approach section above, this sample frame was then subset down based on the presence of functional reporting HCPCS G-codes and further subset to those beneficiaries with a claim for a G-code that identified the onset of a therapy episode. Table C1 below lists the functional reporting G-codes and the associated function treated category. Those codes labeled with “start of therapy” were used to identify therapy onset and those codes labeled with “end of therapy” were used to identify the end of a therapy episode. If a G-code identifying the end of therapy was not present in the claims data, the end of therapy was identified by a 60-day “clean period” with no visible outpatient therapy claims in the data.

¹⁸ See Cherkin DC, Deyo RA, Volinn E, and Loeser JD. Use of the International Classification of Diseases (ICD-9-CM) to identify hospitalizations for mechanical low back problems in administrative databases. *Spine*. 1992 Jul 17; 817–825, as cited and used by Gellhorn AC, Chan L, Martin B, and Friedly J. Management Patterns in Acute Low Back Pain: the Role of Physical Therapy. *Spine*. 2012 Apr 20; 775–782.

Table C1. Functional Reporting G-Codes of Interest

HCPCS	Description
G8978	Mobility - Start of Therapy
G8979	Mobility - Goal Status
G8980	Mobility - End of Therapy
G8981	Body Position - Start of Therapy
G8982	Body Position - Goal Status
G8983	Body Position - End of Therapy
G8984	Carrying, Moving Objects - Start of Therapy
G8985	Carrying, Moving Objects - Goal Status
G8986	Carrying, Moving Objects - End of Therapy
G8987	Self Care - Start of Therapy
G8988	Self Care - Goal Status
G8989	Self Care - End of Therapy
G8990	Other Primary - Start of Therapy
G8991	Other Primary - Goal Status
G8992	Other Primary - End of Therapy
G8993	Other Subsequent - Start of Therapy
G8994	Other Subsequent - Goal Status
G8995	Other Subsequent - End of Therapy

Once this study population was selected and episode(s) of therapy for low back pain identified, we estimated the number of therapy episodes beneficiaries were observed to incur in the year following diagnosis. As noted, the majority of beneficiaries included in this study had a single episode of therapy for low back pain with small numbers incurring up to four episodes in the year following diagnosis. These were not separately reported due to data confidentiality and blinding requirements associated with use of Medicare limited data sets. We tabulated average outpatient therapy spending per episode. Given that the large majority of beneficiaries incurred only a single therapy episode in the year following diagnosis we did not segment further analysis by number of episodes. We did compute mean spending and standard deviations by number of therapy visits in segments suggested to us by APTQI (2-4, 5-8, 9-12, 13+ visits). For each category we examined total Medicare spending in the year following diagnosis. To trim the data for outliers, we identified and excluded cases where total Medicare spending was greater than three standard deviations from the geometric mean of total Medicare spending in the year following diagnosis.

While the emphasis of this study was on spending by therapy intensity, we also applied a basic initial treatment intervention assessment similar to what was done in our prior work. Consistent with that, we identified the initial intervention (i.e., therapy, injections, surgery) utilized. Tables C2 & C3 list HCPCS codes used to identify injections and surgeries; see Table C4 for ICD-9

procedure codes used to identify surgeries and injections in the inpatient setting. Therapy services were defined based on CMS' lists of therapy codes for the applicable years (see list in Table C5).

Table C2. HCPCS Codes Used to Identify Low Back Related Surgeries**Surgical Procedures of Interest**

	2013	2014	2015
Laminectomy			
Remove spine lamina 1/2 lmbr	63005	63005	63005
Remove lamina/facets lumbar	63012	63012	63012
Remove spine lamina >2 lmbr	63017	63017	63017
Laminotomy			
Low back disk surgery	63030	63030	63030
Spinal disk surgery add-on	63035	63035	63035
Laminotomy single lumbar	63042	63042	63042
Laminotomy addl lumbar	63044	63044	63044
Percutaneous Laminotomy/laminectomy			
Perq lamot/lam lumbar	0275T	0275T	0275T
Laminection, facetectomy and foraminotomy			
Remove spine lamina 1 lmbr	63047	63047	63047
Remove spinal lamina add-on	63048	63048	63048
Laminection w myelotomy			
Incise spinal cord tract(s)	63170	63170	63170
Percutaneous Vertebroplasty			
Perq lumbosacral injection	22521	22521	22511
Vertebroplasty addl inject	22522	22522	22512
Lumbar Spine Fusion			
Lumbar spine fusion	22558	22558	22558
Lat lumbar spine fusion	22533	22533	22533
Lat thor/lumb addl seg	22534	22534	22534
Prescrl fuse w/ instr l5-s1	22586	22586	22586
Lumbar spine fusion	22612	22612	22612
Spine fusion extra segment	22614	22614	22614
Lumbar spine fusion	22630	22630	22630
Spine fusion extra segment	22632	22632	22632
Lumbar spine fusion combined	22633	22633	22633
Spine fusion extra segment	22634	22634	22634
Prescrl fuse w/o instr l5/s1	0195T	0195T	0195T
Prescrl fuse w/o instr l4/l5	0196T	0196T	0196T
Prescrl fuse w/ instr l4/l5	0309T	0309T	0309T

Table C3. HCPCS Used to Identify Low Back Related Injections**Pain Management Injection Procedures of Interest**

	2013	2014	2015
Epidural Steroid Injections			
Inject spine lumbar/sacral	62311	62311	62311
Inject spine w/cath lmb/scrl	62319	62319	62319
Inj foramen epidural l/s	64483	64483	64483
Inj foramen epidural add-on	64484	64484	64484
Njx tfrml eprl w/us lumb/sac	0230T	0230T	0230T
Njx tfrml eprl w/us lumb/sac	0231T	0231T	0231T
Paravertebral Facet Joint/ Nerve Injections			
Inj paravert f jnt l/s 1 lev	64493	64493	64493
Inj paravert f jnt l/s 2 lev	64494	64494	64494
Inj paravert f jnt l/s 3 lev	64495	64495	64495
Njx paravert w/us lumb/sac	0216T	0216T	0216T
Njx paravert w/us lumb/sac	0217T	0217T	0217T
Njx paravert w/us lumb/sac	0218T	0218T	0218T
Trigger Point Injections			
Inj trigger point 1/2 muscl	20552	20552	20552
Inject trigger points 3/>>	20553	20553	20553
Sacroiliac Joint Injection			
Inject sacroiliac joint	27096	27096	27096
	G0260	G0260	G0260

Table C4. ICD-9 Procedure Codes Used to Identify Inpatient Procedures of Interest

ICD-9 Procedure Codes	
Reopening of laminectomy site	03.02
Other exploration and decompression spinal canal	03.09
Injection of anesthetic into spinal canal for analgesia	03.91
Injection of other agent into spinal canal	03.92
Excision of intervertebral disc	80.51
Spinal fusion, NOS	81.00
Lumbar and lumbosacral fusion of the anterior column, anterior techniq	81.06
Lumbar and lumbosacral fusion of the posterior column, posterior tech	81.07
Lumbar and lumbosacral fusion of the anterior column, posterior techn	81.08
Fusion or refusion of 2-3 vertebrae	81.62
Fusion or refusion of 4-8 vertebrae	81.63
Fusion or refusion of 9 or more vertebrae	81.64
Percutaneous Vertebroplasty	81.65
Injection of therapeutic substance into joint or ligament	81.92
Injection of steroid	99.23
Injection or infusion of other therapeutic or prophylactic substance	99.29

Table C5. Type of Therapy HCPCS Code Designation

HCPCS	Short Description	Always/Sometimes
		Therapy
64550	Apply neurostimulator	Sometimes
90901	Biofeedback train any meth	Sometimes
90911	Biofeedback peri/uro/rectal	Sometimes
92507	Speech/hearing therapy	Always
92508	Speech/hearing therapy	Always
92520	Laryngeal function studies	Sometimes
92521	Evaluation of speech fluency	Always
92522	Evaluate speech production	Always
92523	Speech sound lang comprehen	Always
92524	Behavral qualit analys voice	Always
92526	Oral function therapy	Always
92597	Oral speech device eval	Always
92605	Ex for nonspeech device rx	Always
92606	Non-speech device service	Always
92607	Ex for speech device rx 1hr	Always
92608	Ex for speech device rx addl	Always
92609	Use of speech device service	Always
92610	Evaluate swallowing function	Sometimes
92611	Motion fluoroscopy/swallow	Sometimes
92612	Endoscopy swallow tst (fees)	Sometimes
92614	Laryngoscopic sensory test	Sometimes
92616	Fees w/laryngeal sense test	Sometimes
92618	Ex for nonspeech dev rx add	Always
95831	Limb muscle testing manual	Sometimes
95832	Hand muscle testing manual	Sometimes
95833	Body muscle testing manual	Sometimes
95834	Body muscle testing manual	Sometimes
95851	Range of motion measurements	Sometimes
95852	Range of motion measurements	Sometimes
95992	Canalith repositioning proc	Sometimes
96105	Assessment of aphasia	Sometimes
96111	Developmental test extend	Sometimes
96125	Cognitive test by hc pro	Always
97001	PT evaluation	Always
97002	PT re-evaluation	Always
97003	OT evaluation	Always
97004	OT re-evaluation	Always
97010	Hot or cold packs therapy	Always

HCPCS	Short Description	Always/Sometimes Therapy
97012	Mechanical traction therapy	Always
97016	Vasopneumatic device therapy	Always
97018	Paraffin bath therapy	Always
97022	Whirlpool therapy	Always
97024	Diathermy eg microwave	Always
97026	Infrared therapy	Always
97028	Ultraviolet therapy	Always
97032	Electrical stimulation	Always
97033	Electric current therapy	Always
97034	Contrast bath therapy	Always
97035	Ultrasound therapy	Always
97036	Hydrotherapy	Always
97039	Physical therapy treatment	Always
97110	Therapeutic exercises	Always
97112	Neuromuscular reeducation	Always
97113	Aquatic therapy/exercises	Always
97116	Gait training therapy	Always
97124	Massage therapy	Always
97139	Physical medicine procedure	Always
97140	Manual therapy 1/> regions	Always
97150	Group therapeutic procedures	Always
97530	Therapeutic activities	Always
97532	Cognitive skills development	Sometimes
97533	Sensory integration	Always
97535	Self care mngmnt training	Always
97537	Community/work reintegration	Always
97542	Wheelchair mngmnt training	Always
97597	Rmvl devital tis 20 cm/<	Sometimes
97598	Rmvl devital tis addl 20cm/<	Sometimes
97602	Wound(s) care non-selective	Sometimes
97605	Neg press wound tx </=50 cm	Sometimes
97606	Neg press wound tx >50 cm	Sometimes
97610	Low frequency non-thermal us	Sometimes
97750	Physical performance test	Always
97755	Assistive technology assess	Always
97760	Orthotic mgmt and training	Always
97761	Prosthetic training	Always
97762	C/o for orthotic/prosth use	Always
97799	Physical medicine procedure	Always

HCPCS	Short Description	Always/Sometimes
		Therapy
0019T	Extracorp shock wv tx ms nos	Sometimes
G0281	Elec stim unattend for press	Always
G0283	Elec stim other than wound	Always
G0329	Electromagntic tx for ulcers	Always
G0451	Devlopment test interpt&rep	Sometimes
G0456	Neg pre wound <=50 sq cm	Sometimes
G0457	Neg pres wound >50 sq cm	Sometimes