



HEALTHCARE AND HUMAN SERVICES POLICY, RESEARCH, AND CONSULTING — WITH REAL-WORLD PERSPECTIVE.

Cases: Costs of Alternative Pain Management Paths

Final Report

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Introduction

Chronic pain is a significant public health issue in the United States. According to the latest report by the Institute of Medicine, over 100 million Americans suffer from chronic intractable pain at a cost exceeding \$600 billion a year. However, there are not a sufficient number of healthcare professionals available to address chronic pain.¹ Certified Registered Nurse Anesthetists (CRNAs) are Advanced Practice Registered Nurses (APRNs) educated to the masters or doctoral level in an accredited nurse anesthesia education program, with specialized training, skill, and expertise in the fields of anesthesia and pain management. CRNAs are among the qualified healthcare professionals available to provide these needed services, and referring physicians rely on CRNA expertise in caring for their patients, especially in rural areas.

For well over a decade, Medicare has reimbursed CRNAs directly for essential chronic pain management services. However, patient access to chronic pain management care was put at risk in 2011 when two Medicare administrative contractors serving Medicare patients in 18 states newly began denying reimbursement for CRNA chronic pain management services. This action made it difficult to access care for pain, particularly for patients in rural and underserved parts of the country where CRNA services are the sole source of chronic pain management services. The alternatives for such patients are inferior- to suffer in pain, to travel great distances for care from providers they do not know, to have expensive and invasive surgery, or to be institutionalized.

In this report, we present four case studies based on the real life situations of four individuals living in rural United States. The cases described are based on actual cases, but the descriptions are modified to preserve privacy.

All four cases are about Medicare beneficiaries who suffer from chronic pain for various clinical reasons and who face different challenges in addressing their medical problems. One thing they all have in common is their reliance on their local CRNAs in providing efficient, effective, and quality care in their pain management. For each case, we discuss the current treatment pathway through which the patient is receiving care through a CRNA and then consider alternative pathways that do not include access to a CRNA. We also estimate the costs associated with each pathway for 12 months to demonstrate its economic implications. These costs include not only direct medical costs, but also some of the often poorly understood indirect costs such as costs associated with travel and cost due to earnings forgone by family caregivers. This report makes conservative cost estimates for the alternative pathways to care by the local CRNAs to ensure that the analysis considers only the minimum necessary components of care.

To prevent identification of these real-life cases, we refrain from providing the specific geographic location and the providers' names; neither do we know the patients' real names. For all cases, pseudonyms were created for both the patient and his/her family members.

¹ Institute of Medicine (IOM). *Relieving pain*. Washington, DC: The National Academies Press. 2011.

Case 1: Tom's Case

Tom,² an 86 year old male patient, lives in a small, rural³ town in a western state with his wife. Both Tom and his wife are Medicare beneficiaries and are on a fixed household income of about \$1,400 per month with very limited discretionary income after paying for expenses such as food, utility, home health care, and regular medications.

Tom is diagnosed with progressive lumbar spinal stenosis which caused him to suffer from chronic pain and issues with ambulation. There are no physician anesthesiologists practicing pain management in his local area. Tom's neurosurgeon referred him to the CRNA who has been practicing interventional pain management in Tom's locality since 2000. The referring neurologist pointed out that the treating CRNA is the only local pain treatment professional capable, by training and experience, to perform the pain treatment procedures.

Besides being a patient who is suffering from chronic pain, Tom is also the primary caregiver of his neurologically debilitated octogenarian wife. Three days a week, for an hour each day, the couple receives care from a home health nurse. "Meals On Wheels" arrives each day to deliver food. Tom's daughter Jane is actively involved with her parents' well-being. She travels about 115 miles from her home to Tom's to take him to the CRNA's office in the community hospital to receive his pain treatment. Moreover, Jane works full-time and is only able to accompany Tom to the scheduled visits to the CRNA, which occur three times per year. Travel to all other physician and hospital visits for Tom and his wife are arranged by a local volunteer agency.

Alternatively, Tom could travel to the large city where Jane lives to receive pain management from a physician anesthesiologist or undergo surgery, and in the worst scenario, discontinue his treatment. In the alternative treatment pathways discussed in this case, costs for medical procedures are obtained from Medicare Physician Fee Schedule⁴ and Ambulance Fee Schedule⁵ relevant to the location of the service. Indirect costs include cost for travel, home health care and Tom's daughter's forgone earnings while she takes him for his treatments. Travel includes both mileage for the actual distance traveled (at the GSA Privately Owned Vehicle Mileage Reimbursement Rate⁶), and meals and incidentals if the trip is more than half a day (at the GSA per diem Meals and Incidentals rate⁷). Hourly home health care and daily nursing home costs (semi-private room) are at the local average from the 2010 MetLife Market Survey of Long-Term Care Costs.⁸ Opportunity cost of Jane's forgone earnings is based on local per capita income for the time⁹ (in half-day increments) spent in travel and for Tom's treatment.¹⁰

² Pseudonym.

³ *Defining the Rural Population*. (n.d.). Retrieved August 06, 2012, from Health Resources and Services Administration.

⁴ *Physician Fee Schedule*. (2012, July 12). Retrieved from Centers for Medicare & Medicaid Services.

⁵ *Ambulance Fee Schedule*. (2012, March 5). Retrieved from Centers for Medicare & Medicaid Services.

⁶ *Privately Owned Vehicle (POV) Mileage Reimbursement Rates*. (2012, May 15). Retrieved from U.S. General Services Administration.

⁷ *Meals and Incidental Expenses (M&IE) Breakdown*. (2012, June 18). Retrieved from U.S. General Services Administration.

⁸ *2010 MetLife Market Survey of Long-Term Care Costs*. (2010). What Does Care Cost Where You Live? Retrieved from National Clearinghouse for Long Term Care Information.

⁹ Total working days (235) is net of 10 Federal holidays and 15 days of paid time off

¹⁰ *Personal Income - Supplementary Information*. (2012, April 25). Retrieved from U.S. Department of Commerce Bureau of Economic Analysis.

Below, we describe each of the alternative treatment pathways in detail. We conclude this case by summarizing the costs associated with each pathway.

Current pathway for care

Tom has been receiving fluoroscopically guided lumbar epidural steroid injections from the local CRNA in his hometown. According to his neurosurgeon, the intervention resulted in dramatic improvement in his sciatica and motor deficits, allowing him to independently participate in activities of daily living (ADLs). Just as important, Tom is able to continue taking care of his wife. Currently Tom receives no more than three epidural steroid injections per year. The CRNA confirmed that it is possible that Tom would have to continue receiving interventional pain treatment to maintain ambulation.

Tom's CRNA and referring neurologist regularly communicate and coordinate care strategies. Each visit to the CRNA consists of a conversation with Tom to understand his needs, the treatment procedure, and the CRNA explaining the procedures and their effects. Tom travels only about a mile to visit the CRNA.¹¹

Costs associated with receiving pain management from the local CRNA include cost of the procedures for the epidural steroid injection and fluoroscopic guidance, travel (Jane's 230 miles round-trip travel from her home to Tom's and the two-mile round-trip from Tom's home to the CRNA's office), home health care for Tom's wife for the two hours he is away from home (40 minutes treatment time, in addition to time to travel to the CRNA's office), and Jane's opportunity cost of half-a-day's forgone earnings (three hours total travel time to and from Tom's home,¹² Tom's treatment time, and time for travel to the CRNA from Tom's home). For the 12-month period, total direct medical costs are estimated to be \$823 and total indirect costs are estimated to be \$722 for a total cost of \$1,545. See Table 1 in the Conclusion section of this case.

Alternative Treatment Pathway A: Travel to the Nearest Large City

The referring neurologist pointed out that in the vicinity of Tom's town, the treating CRNA is the only one who is trained and experienced to perform the pain treatment procedures that would help Tom. The county where Tom resides is small and rural, with a population under 10,000 and with only about 13 people per square mile. So it is not surprising that if Tom were to receive interventional pain management from a physician anesthesiologist practicing pain management, he would have to travel 100 miles or more to the nearest large city. Since Tom's daughter Jane is the only person who is able to drive him for his appointments out of town, the most "convenient" option would be to find an anesthesiologist in the large city where Jane lives, about 115 miles away. As mentioned by Tom's treating CRNA, this would require Tom to make conservatively four trips in total – one for the initial physician office visit and three for treatment.

For each of Tom's trips to the larger town, Jane would have to drive from her home to Tom's to pick him up, and then drive him to the city where she lives. Once treatment is completed, Jane would have to drive Tom home, and then travel the 115 miles back home. She would have to

¹¹ Distance measured from city center to the community hospital where Tom is treated by the CRNA

¹² At state speed limit for rural highways

take the entire day off from work to drive the total of 460 miles for over six hours,¹³ which does not include Tom's treatment time.

The 12-month direct medical cost for this alternative is \$928. This includes the one-time office visit to the physician anesthesiologist for evaluation and the three fluoroscopically guided epidural steroid injections similar to those that he could receive at the local CRNA's office. Indirect cost items include travel (460 mile trip for each visit and meals for two), home health care for Tom's wife for eight hours and Jane's day off from work. Total indirect cost is estimated to be \$2,629, which is 264% higher than in the current scenario where the CRNA is the pain treatment provider. The difference is largely driven by the difference in travel distance, the number of trips (four) and Jane's forgone earnings for four days. Total cost, including direct medical costs and indirect costs, for this treatment pathway is \$3,557. (See Table 1)

Since costs for traveling to the larger town to receive pain treatment from an anesthesiologist is significantly higher for Tom and his family than receiving the same procedures in his hometown, it is very likely that the combination of the increased travel distance, the new environment, and new providers would be a daunting challenge for this 86-year old. Tom's neurosurgeon noted that this would "quickly result in loss of independent living status not only for Tom, but also for his wife." In addition, the distance and their unfamiliarity with each other would make it difficult for the referring physician and the anesthesiologist in the large city to regularly communicate about Tom's care.

Alternative Treatment Pathway B: Surgery

Another alternative pathway that is theoretically available to Tom is undergoing an invasive surgery in the large city where Jane lives. Tom's spinal stenosis might be corrected by decompressive laminectomy and spinal fusions. A hospital stay of three to four days is required after the surgery.¹⁴ Tom will not be able to withstand the 115 mile car ride home from the hospital that is able to perform the surgery in the nearest large city¹⁵, and therefore medical transportation will be needed.

Jane would have to accompany Tom to his surgery, and to his pre-operative and post-operative consultations. Home health care will have to be arranged to take care of Tom's wife while he is away from home (eight hours during the consultations and for 24 hours a day, for five days during his surgery and hospital stay). The neurosurgeon predicted that Tom's recovery will take up to a year. Home health care will have to be arranged for the recovery time to help both Tom and his wife and several sessions of physical therapy would be needed to help Tom recover.

It is difficult to account for all possible costs that may be associated with a surgery. Therefore, conservative assumptions are made to estimate the cost of surgery to fuse the lumbar spines. Basic, non-complicated procedures (surgery and consultations), anesthesia, and ambulance (non-emergency) are estimated based on the appropriate Medicare professional and facility fee

¹³ At state speed limit for rural highways

¹⁴ Penn State Milton S. Hershey Medical Center. (2012, June 7). *Spinal fusion*. Retrieved from A.D.A.M Multimedia Encyclopedia.

¹⁵ Mayo Clinic staff. (2011, July 7). *Laminectomy*. Retrieved from Mayo Clinic.

schedules. As shown in Table 1, total direct medical cost for the surgery that might correct Tom's spinal stenosis is estimated to be at a minimum \$25,193.^{16,17} Indirect costs associated with the surgery are mostly driven by the cost of home health care (\$54,564¹⁸) during his year-long recovery. Other costs include travel (Jane's two 460-mile trips for the consultations and a 230-mile trip to pick Tom up to admit him into the hospital for the surgery), food during travel and opportunity cost of Jane's two and a half days off from work (one day for each consultation and half-day for the surgery). A conservative estimate of the total cost, including direct medical costs and indirect costs, is \$88,109. (See Table 1)

If Tom is determined to be qualified for surgery, the CRNA believes that due to Tom's advanced age, the surgery will involve undertaking a significant amount of risk,¹⁹ which includes lengthy recovery time, possible hospital readmission and infections, side effects and financial burden of appointing home health care, and additional financial burden such as cost of post-surgery physical therapy and medication. He fears that the older patients may never recover, may suffer from cognitive deficits and physical morbidities. If these costs are considered, total cost associated with a surgery is likely to surpass the estimated \$88,109.

Untreated pain

The CRNA believes that a third possible option available for Tom is discontinuing his pain treatment altogether. As Tom's neurologist acknowledged, Tom is unable to take pain medications due to side effects and lack of the treatment or surgery will result in Tom's loss of ambulation. Since Tom is the primary caregiver of his neurologically debilitated wife, within a short period of time both Tom and his wife would have to be admitted to a nursing home.

Nursing home is not only an expensive alternative for Tom's care, but it will also limit his independence and lower the quality of life for this able person. In the state where Tom lives, nursing home for two people for a 12-month period will cost a total of \$124,100.²⁰

Conclusion

In Tom's case, all three alternative treatment pathways are more costly, less convenient, and involve more human suffering. Treatment by the anesthesiologist in the distant city not only increases financial burden, but also creates difficulties for a senior patient like Tom and leads to additional sacrifices by his caregiver due to the multiple trips to the large city. Surgery is simply a more costly alternative, and as mentioned previously, cannot guarantee pain-free outcomes. Untreated pain is perhaps an alternative best left unexplored. It is extremely expensive to the

¹⁶ Inpatient payment for surgery is based on analysis by Mendenhall Associates, Inc. of FY 2012 national operating amounts and capital payment used to calculate Diagnosis-related Group payment by CMS.

¹⁷ It is assumed that the spinal fusion is not a major complication/comorbidity (No MCC) at a hospital that does not receive add-on payments for indirect medical expenditure or disproportionate share payments.

¹⁸ Total cost of home health care for recovery is calculated to be the cost additional to Tom and his wife's current utilization of home health care at three hours per week

¹⁹ Faciszewski, T., Winter, R., Lonstein, J., Denis, F., & Johnson, L. (1995). The surgical and medical perioperative complications of anterior spinal fusion surgery in the thoracic and lumbar spine in adults. A review of 1223 procedures. *Spine*, 1592-1599.

²⁰ 2010 *MetLife Market Survey of Long-Term Care Costs*. (2010). What Does Care Cost Where You Live? Retrieved from National Clearinghouse for Long Term Care Information.

system and results in loss of independence for Tom. It is the costliest alternative and possibly the patient's least preferred route of care. Table 1 summarizes the costs of each of the alternative pathways of pain treatment. It is important to note that typically Medicare Part B will pay for 80% of procedure costs and Part A will pay 100% of inpatient costs with the exception of a deductible.²¹ Treatment by the local CRNA is most cost efficient both for Tom and Medicare, since medical, and indirect costs are the lowest among all four scenarios. Also, the dollars alone do not capture the value of quality of life, convenience and the patient's ability to be treated in his hometown by someone he knows and trusts.

Table 1: Cost of treatment for Tom's alternatives

Pathway for Care	Local CRNA	Anesthesiologist In Another City	Surgery	Untreated
Direct Medical Costs				
Inject spine lumbar, sacral (caudal) (CPT: 62311)	\$209	\$209		
Fluoroscopic guidance for spine injection (CPT: 77003)	\$65	\$65		
Office/outpatient visit, new patient (CPT: 99203)		\$106		
Surgery			\$23,976	
Ambulance (hospital to Tom's home)			\$1,091	
Pre and post-operative consultations			\$125	
Nursing home (Tom and wife)				\$124,100
Total direct medical costs – 12-month period	\$823	\$928	\$25,193	\$124,100
Indirect Costs				
Travel (Tom and daughter)	\$129	\$357	\$842	
Postoperative Nursing Home Care (Tom and wife)			\$7,140	
Home health care (Tom and wife)	\$38	\$152	\$54,564	
Opportunity cost (Daughter)	\$74	\$148	\$370	
Total indirect costs – 12-month period	\$722	\$2,629	\$62,916	
Total overall cost – 12-month period	\$1,545	\$3,557	\$88,109	\$124,100

²¹ Centers for Medicare & Medicaid Services. (2012, May 7). *Medicare & You 2012*. Retrieved August 6, 2012, from Medicare.gov

Case 2: Jason's Case

Jason²² is an 81 year old man living in a rural²³ southeastern county with his wife. His orthopedic surgeon diagnosed him with lumbar spinal stenosis with L (left) leg radiculopathy, and prescribed a lumbar epidural steroid injection to relieve Jason's pain. He is a self-sufficient, healthy man for his age, and is able to perform activities of daily living and including driving short distances around town. Both Jason and his wife are retirees, Medicare beneficiaries and on fixed income.

Currently Jason travels about 10 miles to receive treatment from the CRNA, who has been helping patients like Jason in this community for 27 years. This CRNA is one of the five nurse anesthetists serving the area. Advanced practice nurses play a significant role in providing care in this rural community.

If unable to access care from a CRNA, Jason's alternative would be to seek pain treatment from a physician anesthesiologist practicing pain management. In that case, he would have to travel to the closest large city, which is about 30 miles away. Since the area is visited by a large number of tourists at any given time of the year, the trip will likely take longer than what might be expected from a typical rural area. In addition to seeking care outside Jason's hometown, the option of forgoing treatment with eventual admission into a nursing home remains.

In the alternative treatment pathways discussed in this case, costs for medical procedures are obtained from Medicare Physician Fee Schedule.²⁴ Cost for travel, which is the indirect cost associated with care, includes both mileage for the actual distance traveled,²⁵ and meals and incidentals²⁶ for one-third of a day. In the scenario of untreated pain where Jason might have to be institutionalized, nursing home costs are calculated assuming a semi-private room and at local average.²⁷ Table 2 shows the 12-month costs associated with each treatment pathway.

Current pathway for care

Jason's CRNA has performed the first of the three fluoroscopically guided lumbar epidural steroid injections. According to the CRNA, Jason tolerated the procedures well and enjoyed complete pain relief. Two weeks from this initial treatment, Jason is scheduled to receive his second injection and four weeks from that, his third. The CRNA stated that three epidural steroid injections in a year provide optimal pain relief. It is likely that if the pain returns, he would have to revisit the procedures in the future. Jason travels about 10 miles to the CRNA's office. Since patients are not permitted to drive immediately after the injections, his wife accompanies him for each visit. Patients, who live alone or are not able to acquire a driver for the trip back home after

²² Pseudonym

²³ *Defining the Rural Population*. (n.d.). Retrieved August 06, 2012, from Health Resources and Services Administration.

²⁴ *Physician Fee Schedule*. (2012, July 12). Retrieved from Centers for Medicare & Medicaid Services.

²⁵ *Privately Owned Vehicle (POV) Mileage Reimbursement Rates*. (2012, May 15). Retrieved from U.S. General Services Administration.

²⁶ *Meals and Incidental Expenses (M&IE) Breakdown*. (2012, June 18). Retrieved from U.S. General Services Administration.

²⁷ *2010 MetLife Market Survey of Long-Term Care Costs*. (2010). What Does Care Cost Where You Live? Retrieved from National Clearinghouse for Long Term Care Information.

treatment, have their transportation arranged by the hospital. Each of Jason's visits to the CRNA includes both evaluation and treatment, taking between 30 to 45 minutes.

Currently, total direct medical cost for a 12-month period, which includes three treatment sessions, is estimated to be \$753. His travel cost per trip is about \$11, and since both he and his wife are retired, there are no forgone earnings to consider. Total 12-month cost associated with local CRNA care is \$787. (See Table 2)

The practitioners involved in Jason's care work as a team to manage his chronic pain treatment strategy. The physician diagnoses and prescribes the treatment, the CRNA evaluates the patient to make sure that he concurs with the physician's strategy and after the treatment communicates with the prescribing physician about the patient's care. The community hospital follows up with the patients after each treatment to ensure that they received the desired effects from the treatment and to answer questions. The CRNA claims that his patients' experience in this rural clinic is far superior to that in the larger cities. The patients appreciate the quality of care and personal service at the community hospital.

Alternative Treatment Pathway A: Travel to the Nearest Large Town

The first alternative pathway for Jason's care is to receive the pain injections from a physician anesthesiologist practicing pain management. His hometown is in a mostly rural county with a population of about 90,000, and includes a micropolitan statistical area where Jason's CRNA's office is located. The nearest urban area, where Jason would be able to receive care from a physician anesthesiologist, is about 31 miles away. This out-of-town physician is not part of the closely knit care team that has been working collaboratively to provide care for this patient. It is likely that the new provider will want to repeat a few of the evaluation and diagnostic tests prior to beginning treatment.

Total cost for out-of-town care is higher than in the current scenario where Jason is being treated by the CRNA in the community. Although direct medical cost does not differ greatly between these two alternatives (\$851 vs. \$753) it is the much higher cost of travel which makes this second alternative more expensive. In total, the couple would have to travel to the large city four times (initial consultation and three treatments). Total travel cost for the four trips is estimated to be \$271, which is over eight times more expensive for this retired couple on fixed income, compared to the current scenario. Overall the total annual cost associated with this alternative is \$1,122 (direct medical cost \$851 and indirect cost \$271). (See Table 2)

Jason's local pain care team is concerned about the couple driving out of town considering their advanced age. They will likely experience difficulty in navigating their way in less familiar territory, negotiating with new providers, and bearing the additional costs associated with this alternative. The care team fears that the couple may decide against traveling to the large city altogether due to the inconvenience, which is augmented by the traffic congestions caused by tourists visiting the area. The CRNA also mentioned that not only Jason, but many of his elderly patients might forgo pain treatment if their only alternative is to travel out of their community for care.

Untreated pain

If a patient cannot feasibly travel to receive pain treatment, another alternative that is available, is to live with the pain, untreated. According to the local CRNA, for whom 60% of the patients are older adults and Medicare beneficiaries like Jason, this can potentially result in his patients' loss of mobility which might cause them to seek nursing home care. He believes that Jason will be one of the many that might have to end up in a nursing home much sooner than he would under continued local care, because of lack of accessible pain treatment. A 12-month stay at a nursing home is estimated to cost about \$60,225. (See Table 2) Furthermore, it is important to consider the possible psychological strain on Jason's wife if she must witness her spouse helplessly suffering from untreated chronic pain.

Nursing home care is remarkably expensive. Admission to a nursing home is considered to be a poor alternative to living in the community for older adults, since it is associated with loss of independent living and poor quality of care.²⁸ Depression is common among nursing home residents.²⁹ The CRNA concurs with the literature and is afraid that if Jason's pain is untreated, isolation and lack of ambulation will force this healthy, active man into being institutionalized.

Conclusion

Table 2 illustrates the costs associated with each of the two alternatives and the current scenario where Jason is able to receive pain treatment from the CRNA right in his community. For older patients that have difficulty traveling, like Jason, the rural facility is immensely beneficial. The difference in cost of travel between the current treatment and visiting a physician anesthesiologist in another city is a few hundred dollars annually for this retired patient. And this estimate alone does not show the risks and inconvenience associated with the elderly couple making long trips to the anesthesiologist every few months. Finally, untreated pain is the worst possible alternative both in terms of actual costs to the healthcare system and in terms of quality of life for the patient and his family.

²⁸ Lefante, C. M., Alam, N., & Ahmed, A. (2007). Depression and Nursing Home Admission Among Hospitalized Older Adults with Coronary Artery Disease: A Propensity Score Analysis. *The American Journal of Geriatric Cardiology*, 76-83.

²⁹ Kramer, D., Allgaier, A., Fejtкова, S., Mergl, R., & Hegerl, U. (2009). Depression in nursing homes: prevalence, recognition, and treatment. *International Journal of Psychiatry in Medicine*, 345-358.

Table 2: Cost of treatment for Jason's alternatives

Pathway for Care	Local CRNA	Anesthesiologist In Another City	Untreated
Direct Medical Costs			
Inject spine lumbar, sacral (caudal) (CPT: 62311)	\$191	\$191	
Fluoroscopic guidance for spine injection (CPT: 77003)	\$60	\$60	
Office/outpatient visit, new patient (CPT: 99203)		\$98	
Nursing home (Tom and wife)			\$60,225
Total direct medical costs – 12-month period	\$753	\$851	\$60,225
Indirect Costs			
Travel	\$11	\$68	
Total indirect costs – 12-month period	\$33	\$271	
Total overall cost – 12-month period	\$787	\$1,122	\$60,225

Case 3: Judy's Case

50-year old Judy³⁰ from a very small, rural³¹ town in a western state was having trouble performing activities of daily living (ADLs) due to severe posterior cervicalgia. This neck pain made it extremely difficult for her to drive long distances, bend forward and work in her garden. Judy sought care for a few years through her primary care physician, but her pain always returned. She discovered the pain clinic right in her hometown, where, according to the CRNA involved in her care, she received the correct diagnosis and treatment. Judy's x-ray and MRI of the cervical spine confirmed her diagnosis of facet arthropathy at C4-5-6 levels with radiculopathy in bilateral arms.

Judy is the primary caregiver of her disabled husband, while she herself is a Medicare beneficiary due to her disability. When she is not suffering from the pain in her neck, she is able to perform ADLs and to lead a relatively healthy life as expected from this young patient. She lives with her husband and the family is on fixed income.

If Judy was not able to receive treatment from the CRNA in her community, she would have to travel out of her hometown to receive care. Residents of this rural town of less than 20,000 people do not have the access to a physician anesthesiologist practicing pain management in their locality. Judy's alternative to treatment by the CRNA would be to travel at least 165 miles to the nearest large city under treacherous travel conditions on a two-lane highway. Instead, patients tend to travel about 230 miles to the next best option, simply to avoid the highway to the nearer large town.

The alternative treatment pathways discussed in this case consider both medical and indirect costs associated with the alternatives. Medicare Physician Fee Schedule³² is the source of direct medical costs relevant to the location of the service. Indirect costs include cost for travel, home health care and escort. Cost of escort's time is based on per capita income of the town.³³ Travel includes mileage for the actual distance traveled³⁴, and meals and incidentals³⁵ for Judy and her escort for the out-of-town trips. State average costs are used to calculate the cost for home health care and a semi-private room in a nursing home.³⁶ Table 3 shows the 12-month treatment costs associated with each treatment pathway.

Below, each of the alternative treatment pathways is described. The final section summarizes the costs associated with each pathway.

³⁰ Pseudonym

³¹ *Defining the Rural Population*. (n.d.). Retrieved August 06, 2012, from Health Resources and Services Administration.

³² *Physician Fee Schedule*. (2012, July 12). Retrieved from Centers for Medicare & Medicaid Services.

³³ Total working days (235) is net of 10 Federal holidays and 15 days of paid time off

³⁴ *Privately Owned Vehicle (POV) Mileage Reimbursement Rates*. (2012, May 15). Retrieved from U.S. General Services Administration.

³⁵ *Meals and Incidental Expenses (M&IE) Breakdown*. (2012, June 18). Retrieved from U.S. General Services Administration.

³⁶ *2010 MetLife Market Survey of Long-Term Care Costs*. (2010). What Does Care Cost Where You Live? Retrieved from National Clearinghouse for Long Term Care Information.

Current pathway for care

Judy has been receiving pain treatment from the CRNA who practices in her local rural community. She received medial branch nerve block injections at C4-5 and C5-6, bilaterally. According to the CRNA, the injection on the left side was very successful with pain relief lasting four months after the treatment. At the time of her next appointment at the four-month mark, a second round was not necessary on the left side. The first round of injection on the right side was about 80% successful and was repeated during that visit resulting in immediate pain relief. After her third visit at the five-month mark, Judy's pain completely disappeared and she was discharged from the clinic. She enjoyed improved functions and total absence of pain in her arms. Because of her remarkable progress, her concurrent pain medication could be reduced from narcotics to over-the-counter medications on an as-needed basis.

Total direct medical cost for the three treatment sessions was \$942. Her travel costs were minimal (6.2 miles round-trip³⁷) due to the fact that she received care in her town. Since she is the primary caregiver for her husband, she arranged for home health care for the hour (30 minutes treatment time and a maximum of 30 minutes for travel) she would not be home with him. Judy seeks the help of a friend or a neighbor to accompany her to the pain clinic, as she is not allowed to drive after the treatment. Assuming that Judy pays her escort for his or her time, the cost of company for two hours is estimated to be \$40. Total direct medical cost for visiting the local CRNA, which resulted in complete pain relief, is \$942 and total indirect cost for Judy is estimated to be \$197. Overall total cost, including direct medical costs and indirect costs, is \$1,139. (See Table 3)

The pain management team responsible for Judy's care consists of the CRNA and a physician specialized in physical medicine and rehabilitation. The CRNA evaluated Judy to ensure that the treatment plan is the most appropriate for her. He stated that the pain management team exemplifies the bio-psychosocial model of care that helped Judy to restore her functions and improve the quality of life through proper treatment and medication.

The performing CRNA claims that he knows Judy and his other patients personally. In addition to providing high quality treatment to residents of this rural community for the past six years, he spends time with his patients to get to know them, to explain the procedures and their benefits, and even to teach them about anatomy using spine models. All these factors contribute to higher patient satisfaction in this small clinic compared to that in the busy practices in large cities. In fact, he recalls that the few local patients who could and did try the pain facilities in the large cities confirmed that they preferred the personable and high quality service in this small town clinic at just a stone's throw from home.

Alternative Treatment Pathway A: Travel to the Second-Nearest Large Town

If Judy could not access care for her cervicgia in her hometown, her next best alternative would be to travel 230 miles each way to receive care from a physician anesthesiologist. In addition to the higher cost of travel, Judy would have to pay her escort for the whole day. In a small community such as the one in which Judy resides, it is much easier to find company for a short

³⁷ From the city center to the CRNA's clinic

trip in the same town, in comparison to a seven-plus hour trip.³⁸ Furthermore, Judy would have to arrange home health care for her disabled husband for the day. Finally, seeking care from an anesthesiologist would mean that she would have to travel a total of four times to the large city – once for the initial consultation and three subsequent times for the procedures.

Direct medical cost for out-of-town care is quite similar to that of care by the CRNA. However, both the greater distance and the longer duration of time away from home would require Judy to spend over fourteen times more (\$2,778) in indirect costs in comparison to the cost of travel within her locality (\$197). Overall total cost of this care pathway is \$3,736. This is a significant increase in costs to receive care for a patient who is on a fixed income. (See Table 3)

Alternative Treatment Pathway B: Radiofrequency Ablation

The CRNA noted that surgery is not a viable means to help Judy's facet arthropathy. Therapeutic injections, which relieved her from pain completely in five months, are her best option. However, another alternative, albeit inconvenient considering her current situation, is radiofrequency ablation (RFA). RFA is an outpatient procedure that uses radio waves to create heat to kill the nerves that cause the pain. It provides pain relief that can last from six months to a year and sometimes longer. If and when the nerves grow back, the procedure will have to be repeated.³⁹

The downside is that RFA involves Judy traveling the 230 miles to the large city. In comparison to pain treatment by a physician anesthesiologist, the upside is that, conservatively, Judy would be required to make only two trips to the large city – once for consultation and once for the procedure. However, as both literature and her CRNA suggest, the pain might return as quickly as in six months and Judy will have to repeat the RFA procedure or seek another alternative to treat her pain. For the sake of being conservative with the cost estimation of alternatives, we assume that no more than one round of RFA procedure will be required in the 12-month period.

Although the total direct medical cost associated with the procedure is about \$2,176, the higher costs and inconvenience associated with traveling to the large city might deter her from choosing this procedure. In addition to the cost of travel and of home health care for her husband while she is away from home for the procedure, Judy will face additional costs for her day-long recovery period. Since she will be required to rest during her recovery,⁴⁰ she will have to pay for home health care to care for her disabled husband. If Judy were to make the two trips out of town, receive the RFA treatment and rest as instructed, her total indirect costs will be about \$2,445. This is additional to the direct medical costs of \$2,176. Total of medical and indirect costs for this alternative would amount to be about \$4,620. (See Table 3)

Alternative Treatment Pathway C: Untreated pain

Judy's CRNA opined that because of her limited resources from fixed income, travel to appointments outside her hometown is a very costly option that she may not be able to consider. If her options are limited, i.e., if she is unable to receive pain treatment in her community, she

³⁸ At state speed limit for rural highways

³⁹ *Cervical Block / Radiofrequency Ablation*. (2012). Retrieved from Cedars-Sinai.

⁴⁰ *Cervical Block / Radiofrequency Ablation*. (2012). Retrieved from Cedars-Sinai.

might have to surrender and live with the pain. This would definitely have an adverse effect on the quality of her life. It is also likely that if she lives with untreated severe pain she might have to eventually be institutionalized in a nursing home along with her spouse, since the pain would limit her ability to care for her spouse. Nursing home care for two people in her state will cost \$145,270 in a 12-month period. (See Table 3)

Conclusion

Medical and indirect costs associated with each of the alternatives are summarized in Table 3. It is clear that pain treatment from the local CRNA is overall the most cost effective alternative. Judy's trips to the CRNA's office are not only convenient, but it is also the least costly option for her, where indirect costs are concerned. Although the direct medical cost for the RFA procedure is lower than receiving pain injections from either the local CRNA or a physician anesthesiologist, the indirect costs of this option is in fact higher. In addition, the travel itself is a significant inconvenience. Her family is on fixed income and, therefore, it is much easier for her to spend the \$197 to travel to visit the local CRNA than to spend about \$2,400 in costs beyond direct medical costs to receive the RFA procedure from another city. Untreated pain would be an extremely costly option. There could be no viable argument in favor of spending over \$145,000 in long-term care services when the alternative solution of treatment by the local CRNA is significantly less costly and more attractive to the patient.

Table 3: Cost of treatment for Judy's alternatives

Pathway for Care	Local CRNA	Anesthesiologist In Another City	RFA	Untreated
Direct Medical Costs				
Injection(s), paravertebral facet joint; single level (CPT: 64490)	\$212	\$192		
Injection(s), paravertebral facet joint; second level (CPT: 64491)	\$102	\$94		
Office/outpatient visit, new patient (CPT: 99203)		\$101	\$169	
Destruction by neurolytic agent paravertebral facet joint nerve, single facet joint (CPT: 64633)			\$752	
Destruction by neurolytic agent paravertebral facet joint nerve, each additional facet joint (CPT: 64634)			\$252	
Nursing home (Judy and husband)				\$145,270
Total direct medical costs – 12-month period	\$942	\$959	\$2,175	\$145,270
Indirect Costs				
Travel (Judy and escort)	\$3	\$357	\$357	
Home health care (Judy and husband)	\$22	\$176	\$704	
Escort	\$40	\$161	\$161	
Total indirect costs – 12-month period	\$197	\$2,778	\$2,445	
Total Overall Cost – 12-month period	\$1,139	\$3,736	\$4,620	\$145,270

Case 4: Adam's Case

Adam,⁴¹ a 91-year old war-hero, is a very well-known in his rural⁴² midwestern hometown. Despite his age, he is an active man. He plays golf and enjoys fishing. He lives with his daughter Sarah, who works full-time. Adam is a Medicare beneficiary and is on fixed income.

The patient has a long-standing history of spinal stenosis and neurogenic claudication. His comorbidities include coronary artery disease, diabetes and decreased renal function. His family practitioner referred him to the CRNA in the local pain clinic for epidural steroid injections. If he were unable to receive treatment from the CRNA in the pain clinic in his community, his alternative pathway for care would be traveling at least 45 miles to the nearest urban area where physician anesthesiologists practice pain management. In fact, this would be his only alternative, next to living with untreated pain, temporarily subdued by pain medications. His age and health do not qualify him for surgery or any other procedure to correct his spinal stenosis.

Both medical and indirect costs associated with each alternative are considered in this case. Direct medical cost information is obtained from Medicare Physician Fee Schedule.⁴³ Indirect costs include cost for travel, and Sarah's forgone earnings while she takes her father for his treatments to the large city. Travel cost is based on the distance traveled.⁴⁴ Since the out-of-town trips will likely take less than half a day, meals and incidentals are not considered in travel costs. Sarah's forgone earnings are based on local per capita income.^{45,46}

Below, we describe the alternatives available to Adam. Table 4 in the Conclusion summarizes the 12-month costs associated with each alternative pathway.

Current pathway for care

Adam has been receiving the epidural steroid injections from the CRNA located 15 miles away from home, twice a year since mid-2009. Previously, when his pain was worse, he received the treatment once in every four months. Each visit to the CRNA takes between 30 minutes to an hour; the latter includes a formal office visit component. Regardless of the length, in each visit, the CRNA assesses his pain, monitors the effects of treatment and performs the procedure.

Due to his advanced age, Adam does not drive himself for his pain treatments. However being a popular member of the community, he never has trouble finding someone among his family and friends who would be happy to drive him to the pain clinic and back. Even though Adam does not pay the driver, the cost to the volunteer is calculated to be his or her combined travel cost and opportunity cost for the time spent driving.

⁴¹ Pseudonym

⁴² *Defining the Rural Population*. (n.d.). Retrieved August 06, 2012, from Health Resources and Services Administration.

⁴³ *Physician Fee Schedule*. (2012, July 12). Retrieved from Centers for Medicare & Medicaid Services.

⁴⁴ *Privately Owned Vehicle (POV) Mileage Reimbursement Rates*. (2012, May 15). Retrieved from U.S. General Services Administration.

⁴⁵ *Personal Income - Supplementary Information*. (2012, April 25). Retrieved from U.S. Department of Commerce Bureau of Economic Analysis.

⁴⁶ Total working days (235) is net of 10 Federal holidays and 15 days of paid time off

A 12-month treatment plan for Adam currently involves two visits to the CRNA's office to receive his injection. Therefore, total direct medical cost associated with his pain management is \$548. Each visit includes both re-evaluation of his history and examination, in addition to the pain injection. Total cost (medical and indirect) for the current care pathway is \$657. (See Table 4)

The treating CRNA is not only very familiar with Adam's conditions, but he also has developed a rapport with this patient. In fact, the CRNA in this community pain clinic claims that it is very common for his patients become personal friends. Because he is very familiar with the patients and their families, his patients often ask questions regarding their treatment, when they see him outside the care facility. Additionally, because the local pain clinic's staff has a personal relationship with the patients, it stays open late to accommodate the schedule of its patients and their escorts. The CRNA believes that such amicable relationship between a provider and his patients would not be possible in a large city.

Alternative Treatment Pathway A: Travel to the Second-Nearest Large Town

Since Adam resides in a very rural area, where less than 18,000 people live in the county, he does not have access to a physician anesthesiologist who practices pain management in the local area. If Adam's access to the local CRNA pain provider is restricted or denied, he would have to travel at least 45 miles to one of the three nearest large cities to receive care from a physician anesthesiologist.

To make the trip possible, Adam would have to rely on his daughter Sarah to drive him to his appointments. Compared to local pain clinic that would stay open late to accommodate Sarah's schedule, the large city facilities will not likely to be as flexible. This means that she would not be able to fit her father's treatment around her work schedule, rather she would have to take at least three hours off from work for each of his treatments. This includes over an hour of total travel time and about an hour of treatment time. Moreover, Adam would have to make at least three trips to the large city, where two of them would be for the treatments and one for the initial physician office visit.

Although direct medical cost for anesthesiologist care is only slightly higher (\$594) compared to that of care by the local CRNA (\$548), the cost and difficulty of travel is significantly higher. Travel cost for the 90-mile round-trips, and Sarah's time-off from work for each trip, is estimated to cost about \$319. This is \$319 more expensive for Adam as he does not pay the volunteer to drive him to the local CRNA's office. The total cost for traveling to receive care by the anesthesiologist in the large city is \$912. (See Table 4)

Alternative Treatment Pathway B: Untreated pain

Adam has already considered surgery; however, such an invasive procedure could not be performed on him due to his age and concurrent medical conditions. If Adam is unable to receive the pain treatment from the CRNA in his rural hometown, because of the multitude of difficulties associated with the travel to the larger city and being a proud man in his 90s, Adam may choose to forgo pain treatment procedure of any sort. It is highly believable that untreated pain for an active man like Adam will have both physical and psychosocial consequences.

Adam's CRNA is opposed to placing his patient on prescription pain medications as an alternative to treatment. The medications would not be as effective as receiving epidural steroid injections and may cause this viable man to be inactive. There could potentially be adverse medical consequences of drug therapy through narcotic pain medications. Furthermore, falls and resulting injuries among older elderly can be life-threatening,⁴⁷ the CRNA is fearful that pain medications might increase Adam's chances of falling.

If Adam is unable to receive convenient treatment to alleviate his pain, nursing home care might be in his near future. This will likely cost \$49,640 in a 12-month period in his state. (See Table 4) For a person who greatly values freedom and independence, staying in a nursing home, away from his family, friends, and community might be a very poor alternative.

Conclusion

Table 4 shows the costs associated with each alternative that Adam is able to explore. The current scenario, where he receives pain injections from the CRNA in his community, who he is personally familiar with and who he can get to with minimal trouble, is the most cost effective option. Similar to all other cases, the costs do not reflect the inconvenience for a 91 year old man to make multiple long trips. Untreated pain and eventual admission into a nursing home is not a reasonable solution to chronic pain for this active man. Not only will this cost the health system more than the other alternatives, it will also limit his independence the most.

Table 4: Cost of treatment for Adam's alternatives

Pathway for Care	Local CRNA	Anesthesiologist In Another City	Untreated
Direct Medical Costs			
Inject spine lumbar, sacral (caudal) (CPT: 62311)	\$209	\$190	
Fluoroscopic guidance for spine injection (CPT: 77003)	\$65	\$59	
Office/outpatient visit, new patient (CPT: 99203)		\$97	
Nursing home			\$49,640
Total direct medical costs – 12-month period	\$548	\$594	\$49,640
Indirect Costs			
Travel	\$17	\$50	
Opportunity cost (Driver)	\$37	\$56	
Total indirect costs – 12-month period	\$108	\$319	
Total Overall Cost – 12-month period	\$657	\$912	\$49,640

⁴⁷ 2010 MetLife Market Survey of Long-Term Care Costs. (2010). What Does Care Cost Where You Live? Retrieved from National Clearinghouse for Long Term Care Information.

Conclusion

Through the lens of each case, we have seen the importance of the services that the CRNAs provide, especially to patients in rural areas. The alternatives for these patients in rural communities are often more expensive, inconvenient, and sometimes significantly affect the quality of the patients' life. Although each patient's story is unique, the theme is common. They have been receiving high quality care at a lower cost in their community.

If the patients are not able to receive care from the CRNA in their community, they will be forced to travel to a larger city where physician anesthesiologists practice. In the four cases presented, this distance varies from 31 miles to 230 miles. This makes the total cost significantly higher if the patient receives care from the distant providers. The costs of the alternatives are conservative estimates. It is likely that in addition to the direct medical cost of treatment, there will be costs for diagnostic tests, since the patient is new to the physician's care. It is possible that the patient would have to visit the physician's office more frequently, than the estimates used in the cases. Higher cost of treatment means higher cost to Medicare and higher out-of-pocket costs for the patient. At times, surgery or radiofrequency ablation (RFA) can be an alternative pathway to treat chronic pain however at higher cost and with increased inconvenience than receiving care from local CRNAs. Finally, living with untreated pain and consequently, nursing home admission would be the most expensive alternative from an economic perspective.

In addition to out-of-pocket costs, the patients and their families bear the cost of traveling to the physician anesthesiologist in the nearest large city. Although the indirect cost varies among cases, it is always higher for out-of-town treatment. The patients and sometimes their family members have to bear the costs associated with traveling to the large city. Such travel also calls for an escort, because a patient is not allowed to drive after treatment. Taking time off can create substantial opportunity cost for the escort. If the patient is someone's caregiver, further cost is involved in terms of arranging home health care for the person the patient gives care for. In addition to costs associated with travel, time away from home and opportunity costs, other alternatives that the patients may have – surgery and RFA – are more invasive than receiving pain injections. Finally, untreated pain, resulting in nursing home admission reduces the patient's independence and affects the quality of the patient's life and often that of their families.

It is imperative to consider both the monetary and non-monetary costs the patient must pay if they could not receive pain treatment in their community. The CRNAs not only provide high quality care, they spend time with their patients to build relationship of trust, empathy and understanding, all within the local community. Being a local area provider, they are able to communicate with the referring physician to coordinate the patients' care. These attributes are invaluable to a patient's treatment and well-being. If the patients were to seek care elsewhere, it might be time-consuming and more difficult for the elderly patients to develop the rapport and trust with the new providers in a new environment.

The cases show the limitation of options that are currently available to these patients suffering from chronic pain, if they do not have access to a CRNA in their rural community. All of the alternatives to pain management by a CRNA result in higher direct medical costs, higher indirect costs both to patient and those who assist the patient in terms of travel costs and lost productivity, and greater inconvenience. In some instances, the alternative is for the patient to live with pain,

and at a reduced quality of life. The costs and the inconvenience could be greatly mitigated, if the patients have the option to continue receiving care from the local CRNAs.

Bibliography

- 2010 MetLife Market Survey of Long-Term Care Costs. (2010). *What Does Care Cost Where You Live?* Retrieved from National Clearinghouse for Long Term Care Information: http://www.longtermcare.gov/LTC/Main_Site/Tools/State_Costs.aspx
- Ambulance Fee Schedule*. (2012, March 5). Retrieved from Centers for Medicare & Medicaid Services: <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AmbulanceFeeSchedule/index.html>
- Cervical Block / Radiofrequency Ablation*. (2012). Retrieved from Cedars-Sinai: <http://www.cedars-sinai.edu/Patients/Programs-and-Services/Pain-Center/Head-and-Neck-Pain/Cervical-Block---Radiofrequency-Ablation.aspx>
- Meals and Incidental Expenses (M&IE) Breakdown*. (2012, June 18). Retrieved from U.S. General Services Administration: <http://www.gsa.gov/portal/content/101518>
- Personal Income - Supplementary Information*. (2012, April 25). Retrieved from U.S. Department of Commerce Bureau of Economic Analysis: <http://www.bea.gov/regional/docs/income/>
- Physician Fee Schedule*. (2012, July 12). Retrieved from Centers for Medicare & Medicaid Services: <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeeSched/index.html?redirect=/PhysicianFeeSched/>
- Privately Owned Vehicle (POV) Mileage Reimbursement Rates*. (2012, May 15). Retrieved from U.S. General Services Administration: <http://www.gsa.gov/portal/content/100715>
- Centers for Medicare & Medicaid Services. (2012, May 7). *Medicare & You 2012*. Retrieved August 6, 2012, from Medicare.gov : <http://www.medicare.gov/Library/PDFNavigation/PDFInterim.asp?Language=English&Type=Pub&PubID=10050>
- Defining the Rural Population*. (n.d.). Retrieved August 06, 2012, from Health Resources and Services Administration: http://www.hrsa.gov/ruralhealth/policy/definition_of_rural.html
- Faciszewski, T., Winter, R., Lonstein, J., Denis, F., & Johnson, L. (1995). The surgical and medical perioperative complications of anterior spinal fusion surgery in the thoracic and lumbar spine in adults. A review of 1223 procedures. *Spine*, 1592-1599.
- Institute of Medicine. (2011). *Relieving Pain in America: A Blueprint for Transforming*. Washington D.C.: The National Academies Press.
- Kramer, D., Allgaier, A., Fejtikova, S., Mergl, R., & Hegerl, U. (2009). Depression in nursing homes: prevalence, recognition, and treatment. *International Journal of Psychiatry in Medicine*, 345-358.
- Lefante, C. M., Alam, N., & Ahmed, A. (2007). Depression and Nursing Home Admission Among Hospitalized Older Adults with Coronary Artery Disease: A Propensity Score Analysis. *The American Journal of Geriatric Cardiology*, 76-83.
- Mayo Clinic staff. (2011, July 7). *Laminectomy*. Retrieved from Mayo Clinic: <http://www.mayoclinic.com/health/laminectomy/MY00674>
- Mendenhall Associates, Inc. (2011). FY 2012 CMS Payment Update. *Orthopedic Network News*, 2.
- Penn State Milton S. Hershey Medical Center. (2012, June 7). *Spinal fusion*. Retrieved from A.D.A.M Multimedia Encyclopedia: <http://pennstatehershey.adam.com/content.aspx?productId=117&pid=1&gid=002968>

- 2010 MetLife Market Survey of Long-Term Care Costs. (2010). *What Does Care Cost Where You Live?* Retrieved from National Clearinghouse for Long Term Care Information: http://www.longtermcare.gov/LTC/Main_Site/Tools/State_Costs.aspx
- Ambulance Fee Schedule*. (2012, March 5). Retrieved from Centers for Medicare & Medicaid Services: <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AmbulanceFeeSchedule/index.html>
- Cervical Block / Radiofrequency Ablation*. (2012). Retrieved from Cedars-Sinai: <http://www.cedars-sinai.edu/Patients/Programs-and-Services/Pain-Center/Head-and-Neck-Pain/Cervical-Block---Radiofrequency-Ablation.aspx>
- Meals and Incidental Expenses (M&IE) Breakdown*. (2012, June 18). Retrieved from U.S. General Services Administration: <http://www.gsa.gov/portal/content/101518>
- Personal Income - Supplementary Information*. (2012, April 25). Retrieved from U.S. Department of Commerce Bureau of Economic Analysis: <http://www.bea.gov/regional/docs/income/>
- Physician Fee Schedule*. (2012, July 12). Retrieved from Centers for Medicare & Medicaid Services: <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeeSched/index.html?redirect=/PhysicianFeeSched/>
- Privately Owned Vehicle (POV) Mileage Reimbursement Rates*. (2012, May 15). Retrieved from U.S. General Services Administration: <http://www.gsa.gov/portal/content/100715>
- Centers for Medicare & Medicaid Services. (2012, May 7). *Medicare & You 2012*. Retrieved August 6, 2012, from Medicare.gov : <http://www.medicare.gov/Library/PDFNavigation/PDFInterim.asp?Language=English&Type=Pub&PubID=10050>
- Defining the Rural Population*. (n.d.). Retrieved August 06, 2012, from Health Resources and Services Administration: http://www.hrsa.gov/ruralhealth/policy/definition_of_rural.html
- Faciszewski, T., Winter, R., Lonstein, J., Denis, F., & Johnson, L. (1995). The surgical and medical perioperative complications of anterior spinal fusion surgery in the thoracic and lumbar spine in adults. A review of 1223 procedures. *Spine*, 1592-1599.
- Institute of Medicine. (2011). *Relieving Pain in America: A Blueprint for Transforming*. Washington D.C.: The National Academies Press.
- Kramer, D., Allgaier, A., Fejtikova, S., Mergl, R., & Hegerl, U. (2009). Depression in nursing homes: prevalence, recognition, and treatment. *International Journal of Psychiatry in Medicine*, 345-358.
- Lefante, C. M., Alam, N., & Ahmed, A. (2007). Depression and Nursing Home Admission Among Hospitalized Older Adults with Coronary Artery Disease: A Propensity Score Analysis. *The American Journal of Geriatric Cardiology*, 76-83.
- Mayo Clinic staff. (2011, July 7). *Laminectomy*. Retrieved from Mayo Clinic: <http://www.mayoclinic.com/health/laminectomy/MY00674>
- Mendenhall Associates, Inc. (2011). FY 2012 CMS Payment Update. *Orthopedic Network News*, 2.
- Penn State Milton S. Hershey Medical Center. (2012, June 7). *Spinal fusion*. Retrieved from A.D.A.M Multimedia Encyclopedia: <http://pennstatehershey.adam.com/content.aspx?productId=117&pid=1&gid=002968>