Assessment of Patient Outcomes of Rehabilitative Care Provided in Inpatient Rehabilitation Facilities (IRFs) and After Discharge

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Assessment of Patient Outcomes of Rehabilitative Care Provided in Inpatient Rehabilitation Facilities (IRFs) and After Discharge

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Executive Summary

To qualify for Medicare payment under the inpatient rehabilitation facility (IRF) prospective payment system (PPS) at least 60 percent of an IRF's admissions in a single cost reporting period must be in one or more of 13 clinical conditions specified by the Centers of Medicare & Medicaid Services (CMS) (known as the "60 Percent Rule").[1] As a result of this policy, some Medicare beneficiaries with certain conditions previously treated in the IRF are now treated in an alternative setting, such as a skilled nursing facility (SNF). However, the implication of the 60 Percent Rule on long-term beneficiary health outcomes and health care utilization has not been thoroughly investigated.

The medical rehabilitation care practices between IRFs and SNFs differ significantly.[2] Treatment provided in IRFs is under the direction of a physician trained in rehabilitation medicine and specialized nursing staff.[3] Care plans are structured, focused, and time sensitive to reflect the pathophysiology of recovery, avoid patient deconditioning, and maximize potential functional gain. On the other hand, possibly due to limited presence of an onsite physician and no regulatory rehabilitation standards, SNFs exhibit greater diversity in practice patterns with lower intensity rehabilitation.[4]

Despite clear differences in the Medicare Conditions of Participation and classification criteria between IRFs and SNFs, there have been proposals among policymakers about site-neutral payment that aligns IRF payments with those in SNFs for specific clinical conditions. Some of these are included in the 13 conditions under the 60 Percent Rule, such as major lower extremity joint replacement without complications or comorbidities

When patients are matched on demographic and clinical characteristics, rehabilitation in IRFs leads to lower mortality, fewer readmissions and ER visits, and more days at home (not in a hospital, IRF, SNF, or LTCH) than rehabilitation in SNFs for the same condition. This suggests that the care delivered is not the same between IRFs and SNFs. Therefore, different post-acute care settings affect patient outcomes.

[1] The compliance threshold was originally set at 75 percent and was to be phased in over a three-year period, but compliance was capped at 60 percent following the Medicare, Medicaid, and SCHIP Extension Act of 2007. While the policy has retained its namesake at the "75 Percent Rule" despite the cap at 60 percent, this study refers to it as the "60 Percent Rule".

[2] Keith RA. (1997). Treatment strength in rehabilitation. *Arch Phys Med Rehabil*: 90; 1269-1283.

[3] Harvey RL. (2010, January). Inpatient rehab facilities benefit post-stroke care. *Managed Care.*

[4] DeJong G, Hsieh C, Gassaway J, et al. (2009). Characterizing rehabilitation services for patients with knee and hip replacement in skilled nursing facilities and inpatient rehabilitation facilities. *Arch Phys Med Rehabil*: 90; 1269-1283.

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(CC), hip fracture with CC, and stroke with CC.[5] Another policy revision discussed would raise the current compliance threshold for IRFs from 60 percent to 75 percent, a more restrictive standard.

Study Purpose

The implication of the 60% Rule on long-term beneficiary health outcomes and health care utilization has not been thoroughly investigated.

The ARA Research Institute, an affiliate of the American Medical Rehabilitation Providers Association (AMRPA), commissioned Dobson DaVanzo & Associates, LLC (Dobson | DaVanzo) to investigate the possible impact of the 60 Percent Rule on clinical outcomes and Medicare payment for post-acute care (PAC) beneficiaries during the years immediately following the Rule's implementation.

Dobson | DaVanzo conducted two types of analyses of Medicare beneficiaries: 1) a cross-sectional analysis examining the relative distribution of conditions for patients receiving post-acute care between the years 2005 and 2009, and 2) a longitudinal analysis comparing the long-term (two-year) clinical and Medicare payment outcomes of clinically and demographically similar beneficiaries who received care in either an IRF or a SNF during those years.

Using a 20 percent sample of Medicare beneficiaries (augmented with a 100 percent sample of IRF and LTCH beneficiaries), this study analyzed all Medicare Parts A and B claims across all care settings (excluding physicians and durable medical equipment) from 2005 through 2009.[6] Clinical condition categories were defined to capture all conditions treated within IRFs, based on the Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) Training Manual. While all clinical condition categories were defined, only those with: 1) adequate sample size and 2) well-defined clinical algorithms to confidently identify patients with these conditions in other PAC settings were included in the cross-sectional and longitudinal analyses. Therefore, the results presented in this report focus on a subset of conditions. Within the longitudinal analysis, we focus on 13 conditions, some of which are conditions included in the 60 Percent Rule.

For the cross-sectional analysis, the change in the proportion of patients by clinical condition category was compared across PAC settings (IRFs, SNFs, long-term care hospitals – LTCHs, and home health agencies – HHAs) and years.

For the longitudinal analysis, patient episodes were created to track all Medicare services and payments following discharge from a post-acute rehabilitation stay in an IRF and a SNF. Patients admitted to a SNF following an acute care hospital stay were matched to

[5] The FY 2007 President's Budget included a proposal to reduce the excessive difference in payment between IRFs and SNFs for total knee and hip replacements.

[6] Data was obtained through CMS under DUA #25720.

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clinically and demographically similar IRF patients using a one-to-one propensity score match. Patient outcomes were tracked for two years following discharge from the rehabilitation stay. This study period allowed us to capture the long-term impact of the rehabilitation, including meaningful differences in mortality, use of downstream facility-based care, and patients' ability to remain at home for matched IRF-SNF patients.

This study serves as the most comprehensive national analysis to date examining the long-term clinical outcomes of clinically and demographically similar patient populations treated in IRFs and SNFs, utilizing a sample size of more than 100,000 matched pairs drawn from Medicare administrative claims.

Summary of Findings

Results of the cross-sectional analysis confirmed that the proportion of patients treated in IRFs by clinical condition category shifted significantly between 2005 and 2009. The most significant change in proportion was among lower extremity major joint (hip/knee) replacement patients, which decreased from 25.4 percent of patients treated in IRFs in 2005 to 14.5 percent in 2009. According to the Medicare Payment Advisory Commission (MedPAC), this trend continued through 2013.[7] This decrease was offset by an increase in the proportion of patients treated for hip/knee replacements in SNFs over the same time period.

Results of the longitudinal analysis demonstrated that matched patients treated in IRFs had better long-term clinical outcomes than those treated in SNFs following the implementation of the revised 60 Percent Rule. Over a two-year study period, IRF patients who were clinically comparable to SNF patients, on average:

- Returned home from their initial stay **two weeks earlier** ($p<0.0001$)
- Remained home nearly **two months longer** ($p<0.0001$)
- Stayed alive nearly **two months longer** ($p<0.0001$)

Furthermore, of matched patients treated:

- IRF patients experienced an **8 percentage point lower mortality rate** during the two-year study period than SNF patients ($p<0.0001$)
- IRF patients experienced **5 percent fewer emergency room (ER) visits per year** than SNF patients ($p<0.0001$)
- For five of the 13 conditions, IRF patients experienced **significantly fewer hospital readmissions per year** than SNF patients ($p<0.01$)

[7] Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

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These improved clinical outcomes could be achieved by treating patients in an IRF with an additional cost to Medicare of $12.59 per day (while patients are alive during the two-year study period), across all conditions ($p<0.0001$).

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Study Limitations

First, administrative claims do not contain detailed, medical record-level clinical information. Given this general limitation, our interpretation of beneficiaries' clinical outcomes relied upon outcomes observable in the claims data (e.g., comorbidities, mortality, emergency room utilization, etc.) that may not fully indicate patients' health or functional outcomes as a result of receiving post-acute care.

Second, Medicare fee-for-service claims do not include care covered and reimbursed by Medicaid and third-parties or detailed clinical information. Therefore, non-Medicare services, such as long-term nursing home stays, are not captured in this analysis. This factor may have resulted in an overestimation of the number of days a patient remained at home, and underestimated the cost of their health care to the federal and state governments.

Additionally, the results of this study are not generalizable to the universe of SNF patients within the studied clinical conditions. Analyses suggest that SNF patients who are clinically similar and matched to IRF patients have different health care utilization and Medicare payments than those who were not matched.

Conclusions in Brief:

- **The care provided in IRFs and SNFs differs, as patients treated in IRFs experienced different outcomes than matched patients treated in SNFs.**
- **Patients treated in a SNF as a result of the 60 Percent Rule who could have otherwise been treated in an IRF might be adversely affected by an increased risk of mortality and more ER visits and hospital readmissions.**
- **Continuation or expansion of the 60 Percent Rule or aligning the Medicare payment across the SNF and IRF-PPSs without understanding the impact on patient outcomes could negatively impact Medicare beneficiaries.**

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Introduction

Post-acute care (PAC) refers to a wide range of health care services delivered to patients recently discharged from an acute hospital stay. Unlike patients who return directly to the community following an acute hospitalization, PAC patients require additional treatment that supports either continued recuperation (i.e., as an extension of acute care) or a restoration of functional capabilities that facilitate independent living (i.e., rehabilitation) or both.[8,9]

The Medicare PAC sector grew rapidly after the implementation of the inpatient prospective payment system (IPPS) in 1983. In 2011, the four major PAC providers – inpatient rehabilitation facilities (IRF), skilled nursing facilities (SNFs), home health agencies (HHAs), and long-term care hospitals (LTCHs) – treated 43 percent of Medicare fee-for-service (FFS) patients discharged from acute care hospitals at an estimated cost to Medicare of $61.8 billion (compared to $26.6 billion in 2000).[10] In May 2004, the Centers for Medicare & Medicaid Services (CMS) introduced a revised classification criterion for IRFs treating Medicare beneficiaries. To qualify as an IRF and therefore receive payment under the IRF-PPS, at least 60 percent of a given IRF's Medicare patients in a single cost reporting period must meet one of 13 clinical conditions upon admission to the IRF. The intent of this provision, also referred to as the "60 Percent Rule", was to curtail the volume of less severe patients receiving rehabilitation in IRFs by shifting these cases to lower intensity, lower cost PAC settings, such as SNFs and HHAs.[11]

During the five years immediately following implementation of the new classification criterion and the 60 Percent Rule, patient volume in IRFs decreased by 26.5 percent, spending levels decreased by 8.4 percent, and

> ***"The goal of the Medicare program and these new payment systems is to encourage effective, high-quality care that delivers good clinical outcomes at the lowest cost to society. Without knowing how outcomes are affected by these payment changes it is difficult to judge whether they represent improvements in efficiency or harmful limitations on Medicare beneficiaries' access to PAC"***
>
> - Buntin MB, 2007

[8] Buntin MB. Access to postacute rehabilitation. *Arch Phys Med Rehabil.* 2007; 88:1488-93.

[9] Kane RL. Assessing the effectiveness of postacute care rehabilitation. *Arch Phy Med Rehabil*, 2007; 88:1500-4.

[10] Medicare Payment Advisory Commission (Testimony). Medicare post-acute care reforms. June 2013.

[11] Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

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average payments per case increased by nearly one-quarter (24.5 percent).[12] The relative mix of patient conditions over this period also appeared to shift, with the most marked change seen in the proportion of lower extremity joint (hip or knee) replacement IRF admissions. Under the new criteria, compliant lower extremity joint replacement cases were restricted to more severe and narrowly defined diagnoses, a change that likely caused these admissions to fall from 28 percent of IRF cases in 2004 to 14 percent in 2008. Not surprisingly, average case severity over this period increased, presumably as IRFs began to limit admission of less severe cases.[13] What was not known, however, was the clinical impact on the patients who were diverted to less intense PAC settings from IRFs during the years following the implementation of the 60 Percent Rule.

Study Purpose

Although the degree to which these trends were driven by the new criterion is not entirely clear (i.e., several other PAC payment reforms were also implemented in the late 1990s and early 2000s), researchers and policymakers monitoring these data generally agree that the observed decline in overall patient volume and change in case-mix reflected a provider response to the 60 Percent Rule.[14,15,16] As noted above, there is little understanding of the Rule's impact on patient clinical outcomes. Specifically, there is little research on whether shifting beneficiaries, who in the absence of the Rule would have been admitted to an IRF but were treated in alternative PAC settings, experienced different clinical outcomes.

The ARA Research Institute, an affiliate of the American Medical Rehabilitation Providers Association (AMRPA), commissioned Dobson DaVanzo & Associates, LLC (Dobson | DaVanzo) – an independent health economics and policy consulting firm – to investigate the possible impact of the new criteria on clinical outcomes and Medicare payment for PAC beneficiaries during the years immediately following the Rule's implementation.

Dobson | DaVanzo conducted two types of analyses of Medicare beneficiaries: 1) a cross-sectional analysis examining the relative distribution of conditions for patients receiving post-acute care between the years 2005 and 2009, and 2) a longitudinal analysis comparing the long-term (two-year) clinical and Medicare payment outcomes of

[12] Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

[13] Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

[14] Snood N, Huckfeldt PJ, Grabowski DC, et al. The effect of prospective payment on admission and treatment policy: Evidence from inpatient rehabilitation facilities. *J Health Econ*. 2013; 32:965-79.

[15] Grabowski DC, Huckfeldt PJ, Snood N, et al. Medicare postacute care payment reforms have potential to improve efficiency, but may need changes to cut costs. *Health Aff (Milwood)*. 2012; 31(9):1941-50.

[16] Huckfeldt PJ, Sood N, Romley JA, et al. Medicare payment reform and provider entry and exit in the post-acute care market. *Health Serv Res.* 2013; 48(5): 1557-80.

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clinically and demographically similar cohorts of beneficiaries who received care in either an IRF or a SNF during those years.

Results from these analyses are intended to provide a better understanding of the impact of the new criterion and Rule on clinical outcomes and Medicare costs. In light of recent discussions around introducing additional payment reform in the PAC sector, this study is also intended to inform policymakers of the potential for adverse beneficiary health outcomes when payment regulations alter certain patient populations' trajectories of care and/or site(s) of service. Disentangling differences in patient outcomes due to the treatment provided in the various PAC settings (as opposed to difference in patient characteristics) requires a statistical methodology that can control for clinical and demographic differences of patient populations.

Study Objectives:

- **Cross-sectional analysis: To identify the patient groups most affected by Medicare policy changes that have shifted patients from IRFs to other PAC settings during the five years following implementation of the revised IRF-PPS (between the years 2005 and 2009).**
- **Longitudinal analysis: To explore the long-term (two-year) clinical and payment outcomes of clinically and demographically similar IRF and SNF patients following implementation of the 60 Percent Rule (between the years 2005 and 2009).**

Differences in Conditions of Participations and Classification Criteria for SNF and IRFs

In considering the extent to which patients were shifted out of IRFs into other PAC settings, the Medicare Conditions of Participation and classification criteria, as well as the services provided in these settings should be noted. Each PAC provider must meet specific Conditions of Participation, and, in some cases, specific additional criteria, in order to be reimbursed by the Medicare program. IRFs must meet the hospital Conditions of Participation plus additional criteria referred to by CMS as classification criteria. As discussed below, these Conditions of Participation and criteria for providing care in an IRF are not the same as for the care provided in a SNF.

Medicare beneficiaries admitted to an IRF must be able to tolerate and benefit from at least three hours of rehabilitative therapy per day. A physician trained in rehabilitative medicine must establish a plan of care before the IRF initiates any treatment (42 C.F.R. §485.58(b)). At a minimum, a coordinated rehabilitation program must include physicians' services, physical therapy services, and social or psychological services.

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The services in an IRF must be furnished by personnel who meet the qualifications of 42 C.F.R. §485.70 and the number of qualified (licensed) personnel must be adequate for the volume and diversity of services offered. Personnel who do not meet these qualifications may be used by the facility in assisting qualified staff; however, a qualified individual must be on the premises and must instruct these individuals in appropriate patient care techniques and retain responsibility for their activities.[17] Physicians with specialized training in rehabilitation medicine see patients throughout their stay in an IRF, often every day.

The regulations for SNF care are very different from those regulating IRFs.[18] In a SNF, "staff" is defined as licensed nurses (registered nurses – RNs and/or licensed practical/vocational nurses – LPNs/LVNs) and nurse aides. These licensed personnel and nurse aides (who are required to have some training and competency) are able to provide services prior to (or without) the consultation or formal care plan of a rehabilitation physician, as required in an IRF. SNF residents must be seen by a physician at least once every 30 days for the first 90 days after admission, and at least once every 60 days thereafter.[19] RN services must be available in a SNF eight consecutive hours per day, seven days a week (unless this requirement has been waived). "Supervising the medical care of residents" in a SNF refers to a physician providing consultation or treatment when requested by the facility.

The presence of multiple coverage criteria and definitional standards regarding either the types of patients or processes of care provided in each of the PAC settings has raised concerns among policymakers. Despite clear differences in the Medicare Conditions of Participation and classification criteria between IRFs and SNFs in terms of staffing requirements and the type of care provided, recent policy discussions in reforming PAC have included site-neutral payment proposals to align IRF payments with those paid to a SNF.[20]

Impact of Site of Service on Patient Outcomes

While the Conditions of Participation, classification criteria, treatment protocols, and staffing requirements differ across PAC settings, targeted research has been conducted to compare the outcomes for patients treated in an IRF to those treated in a SNF. While evidence for differences in patient outcomes based on the PAC rehabilitation setting is mixed for some patient conditions, it is more conclusive for others.

[17] 48 FR 56293, Dec. 15, 1982, as amended at 56 FR 8852, Mar. 1, 1991; 57 FR 7137, Feb. 28, 1992; 73 FR 69941, Nov. 19, 2008

[18] Buntin MB. Access to postacute rehabilitation. *Arch Phys Med Rehabil.* 2007; 88:1488-93.

[19] State Operations Manual, Appendix PP. Guidance to Surveyors for Long Term Care Facilities.

[20] The FY 2007 President's Budget included a proposal to reduce the excessive difference in payment between Inpatient Rehabilitation Facilities (IRFs) and Skilled Nursing Facilities for total knee and hip replacements.

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For lower extremity joint replacement patients, several studies examining the setting effects between IRF and SNF care observe minimal or no differences in functional independence gains between rehabilitated patients despite differences in length of stay and cost.[21,22,23,24] Other studies of improvement in several functional independence metrics indicate differences in long-term outcomes that favored IRF over SNF rehabilitation, but the benefits based on other metrics were not consistently observed.[25,26,27]

The effect of PAC placement on outcomes for stroke and hip fracture patients is clearer. Several comparative studies indicate better recovery, lower mortality, and higher likelihood of returning home for stroke patients that received IRF rehabilitation compared to nursing home care and SNF rehabilitation.[28,29,30] Similarly, in a study of hip fracture patients, IRF rehabilitated patients were nearly two times more likely to be discharged home and four and a half times less likely to require extended nursing home care than comparable SNF hip fracture patients.[31,32]

Where there appears to be evidence of setting effects driving differences in patient outcomes, two general explanations have been offered: 1) differences in PAC patient-level characteristics (i.e., demographic and clinical characteristics); and 2) differences in provider-level factors, such as variation in the intensity of therapy delivered (i.e., frequency and duration of rehabilitation sessions and physician-led care) are leading to differences in outcomes. The contribution of this study is that the propensity score matching of IRF and SNF patients controls for observed differences in patient characteristics, thereby isolating the impact of the PAC setting.

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[21] Tian W, DeJong G, Horn SD, et al. Efficient rehabilitation care for joint replacement patients: skilled nursing facility or inpatient rehabilitation facility? *Med Decis Making*. 2012; 32:176-87.

[22] Mallinson T, Deutsch A, Bateman J, et al. A comparison of discharge functional status after rehabilitation in skilled nursing, home health, and medical rehabilitation settings for patients after lower-extremity joint replacement surgery. *Arch Phys Med Rehabil*. 2011; 92:712-20.

[23] Tribe KL, Lapsley HM, Cross MJ, et al. Selection of patients for inpatient rehabilitation or direct home discharge following total joint replacement surgery: a comparison of health status and out-of-pocket expenditure of patients undergoing hip and knee arthroplasty for osteoarthritis. *Chronic Illness*. 2005; 1:289-302.

[24] Buntin MB, Deb P, Escarce J, et al. Comparison of Medicare spending and outcomes for beneficiaries with lower extremity joint replacements. RAND Health. June 2005.

[25] Herbold JA, Bonistall K, Walsh MB. Rehabilitation following total knee replacement, total hip replacement, and hip fracture: A case-controlled comparison. *J Geriatr Phys Ther*. 2011; 34:155-60.

[26] Dejong G, Hsieh CH, Gassaway J, et al. Characterizing rehabilitation services for patients with knee and hip replacement in skilled nursing facilities and inpatient rehabilitation facilities. *Arch Phys Med Rehabil*. 2009; 90:1269-83.

[27] Munin MC, Seligman K, Dew MA, et al. Effect of rehabilitation site on functional recovery after hip fracture. *Arch Phys Med Rehabil*. 2005; 86:367-72.

[28] Chan L, Sandel ME, Jette AM, et al. Does postacute care site matter? A longitudinal study assessing functional recovery after a stroke. *Arch Phys Med Rehabil*. 2013; 94:622-9.

[29] Kramer AM, Steiner JF, Schlenker RE, et al. Outcomes and costs after hip fracture and stroke. *JAMA*. 1997; 277(5):369-404.

[30] Kane RL, Chen Q, Finch M, et al. Functional outcomes of post-hospital care for stroke and hip fracture patients under Medicare. *J Am Geriatr Soc*. 1998; 46:1525-33.

[31] Deutsch A, Granger CV, Fiedler RC, et al. Outcomes and reimbursement of inpatient rehabilitation facilities and subacute rehabilitation programs for Medicare beneficiaries with hip fracture. *Med Care*. 2005; 43(9):892-901.

[32] Munin MC, Seligman K, Dew MA, et al. Effect of rehabilitation site on functional recovery after hip fracture. *Arch Phys Med Rehabil*. 2005; 86:367-72.

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Introduction

Report Structure

This report presents the methodology and results of both the cross-sectional and longitudinal analyses. The methodology for both analyses, as well as a description of the data sources and algorithms used to construct clinical condition categories across PAC settings, are presented in the next chapter. We then present the results of the cross-sectional analysis, followed by the results of the longitudinal analysis. The report concludes with a discussion of the impact of the 60 Percent Rule on Medicare beneficiaries during the years 2005 through 2009.

Additional research studying patient outcomes for the years 2010 through 2012 is planned.

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Methodology

This study consisted of two separate analyses: 1) analysis of the distribution of clinical conditions across settings in the years following the implementation of the 60 Percent Rule ("cross-sectional analysis"), and 2) a retrospective cohort study of the long-term clinical outcomes and total Medicare payments for patients who received rehabilitation services in the IRF compared to those who received rehabilitation in the SNF ("longitudinal analysis").

Both analyses were completed using Medicare fee-for-service claims for Part A and Part B services obtained from CMS through a data use agreement (DUA).[33] All claims from 2005 through 2009 were received from CMS for a representative 20 percent sample of Medicare beneficiaries. An additional file was employed that included all claims from 2005 through 2009 for 100 percent of beneficiaries who received care in an IRF or LTCH (anytime between 2005 and 2009). This time period was selected for the study because it covers the period immediately following the implementation of the 60 Percent Rule,[34] allowing us to examine its immediate effects on clinical outcomes and payments. The care settings in the datasets included inpatient hospitals, outpatient hospitals, IRFs, SNFs, LTCHs, and HHAs. Physician and durable medical equipment (DME) claims were not included in this analysis.

A clinical advisory panel consisting of practicing post-acute care clinicians and clinical researchers was convened at study initiation to aid in the interpretation and clinical validation of this analysis. The panel's role was to provide clinical input, feedback, and validation throughout the analyses.

[33] Claims data were received through CMS under DUA #25720.

[34] An additional study is currently underway that extends the study period for both analyses through 2012.

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Identification of Clinical Condition Categories

Both the cross-sectional and longitudinal analyses required consistent classification of clinical conditions across multiple care settings. The IRF-PAI Training Manual[35] identifies the MS-DRGs, ICD-9, CPT, and HCPCS used by CMS to determine the assignment of UDS_{MR}™ Impairment Group Codes and RIC for each IRF patient. Since SNFs, LTCHs, and HHAs do not use RICs or impairment group codes, the criteria for identifying each condition needed to be deconstructed so it could be applied to patients in alternate settings in a consistent way. In many instances, the algorithms to identify the clinical condition categories rely on a patient's historical diagnostic information or care that he/she received prior to admission to the post-acute care settings (i.e., prior to or during the preceding acute care hospital stay). Since the IRF-PAI Training Manual only classifies conditions treated in IRFs, conditions that may be unique to SNFs, LTCHs, and HHAs, were excluded from both the cross-sectional and longitudinal analyses. While most condition categories were easily identified using the ICD-9s contained in the IRF-PAI Training Manual, the classification of cases that qualified under multiple condition groups required clinical expertise from the advisory panel to interpret secondary and tertiary ICD-9 information in order to accurately classify these cases.

The definition for each clinical condition category is contained in Appendix A. Some of the conditions included were ones specified in the 60 Percent Rule (e.g., hip/knee replacements, stroke, brain injury), and others were not (e.g., cardiac disorders, major medical complexity). While all clinical condition categories were defined, only those with: 1) adequate sample size and 2) well defined clinical algorithms that allowed us to confidently identify patients with these conditions in other settings were included in the cross-sectional and longitudinal analyses. Therefore, the results presented in this report focus on a subset of conditions. Within the longitudinal analysis, we focus on 13 conditions, many of which are contained in the 13 conditions specified in the 60 Percent Rule. The conditions included in the longitudinal analysis are shown in Exhibit 2.1, including their inclusion or exclusion in the 60 Percent Rule.

The clinical advisory panel was heavily involved in the development and validation of the algorithms used to identify the clinical condition categories. Clinical advisory panel members with first-hand experience in identifying patient's RICs or impairment codes were consulted to confirm the logic used to identify patients across settings. Additionally, the relationship between each of the clinical condition categories was reviewed to ensure

[35] IRF-PAI Training Manual, Appendix B: ICD-9-CM Codes Related to Specific Impairment Groups.

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patients were classified by the most accurate condition (in the event a patient presented with more than one clinical condition category).

Exhibit 2.1: Clinical Condition Categories included in Longitudinal Analysis

Clinical Condition Category	RIC	Impairment Group	Included in 60 Percent Rule?*
Amputation	AMPNLE (11) AMPLE (10)	Amputation of Limb	Yes
Brain Injury	TBI (02), NTBI (03)	Brain Dysfunction	Yes
Cardiac Disorder	Cardiac (14)	Cardiac Disorders	No
Hip Fracture	FracLE (07)	Orthopedic Conditions	Yes
Hip/Knee Replacement	ReplLE (08), Ortho (09)	Orthopedic Conditions	Yes
Major Medical Complexity	Misc (20)	Medically Complex Conditions	No
Major Multiple Trauma	MMT-BSCI (18), MMT-NBSCI (17)	Major Multiple Trauma	Yes
Neurological Disorders	Neuro (06)	Neurological Conditions	Yes
Other Orthopedic	Ortho (09)	Orthopedic Conditions	No
Pain Syndromes	Pain (16)	Pain Syndromes	No
Pulmonary Disorders	Pulmonary (16)	Pulmonary Disorders	No
Spinal Cord Injuries	NTSCI (05), TSCI (04)	Spinal Cord Dysfunction	Yes
Stroke	Stroke (01)	Stroke	Yes
Other Conditions not Included in Analyses			
Osteoarthritis	OsteoA (12), RheumA (13)	Arthritis	Yes
Debility	Debility (16)	Debility	No
Neurological Conditions (Guillain-Barre Syndrome)	GB (19)	Neurological Condition (Guillain-Barre Syndrome)	No
Congenital Deformities	Misc (20)	Congenital Deformities	Yes
Developmental Disability	Misc (20)	Developmental Disability	No
Other Disabling Conditions	Misc (20)	Other Disabling Conditions	No
Systemic Vasculidities	Misc (20)	Medically Complex Conditions	Yes
Burns	Burns (21)	Burns	Yes

* The indicator for whether the condition is included in the 60 Percent Rule does not imply that every patient within that condition meets 60 Percent Rule eligibility. For example, while hip/knee replacement is a condition included in the 60 Percent Rule, only patients who meet specific clinical criteria (i.e., over 85 years old, received bilateral replacement surgery, or patient with BMI >50) are included towards a provider's 60 percent threshold. Two of the 13 conditions contained within the 60 Percent Rule are included within the Arthritis Impairment Group, therefore the chart only identifies 12 impairment groups with a "Yes" indicator.

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Cross-Sectional Analysis

Cross sectional analyses compare the distribution of clinical conditions across PAC settings, years, and geographic areas following the implementation of the 60 Percent Rule. The goal of this analysis is to determine the extent to which the 60 Percent Rule shifted patients treated in IRFs with certain conditions to alternative care settings, including SNFs, LTCHs, or HHAs. This analysis is conducted for each year between 2005 and 2009 using a 100 percent sample of IRF and LTCH patients,[36] and a representative 20 percent sample of SNF and HHA patients.

Developing Patient Episodes for Cross-Sectional Analysis

In conducting this analysis, episodes of care were developed for all patients identified using the clinical condition category algorithms. Only patients who were discharged from the short term acute care hospital (STACH) and admitted to one of the post-acute care settings within three days of hospital discharge were included in the analysis, ensuring that patients were at a similar stage in their rehabilitation care. This analysis does not control for patient risk within or across settings; rather, it determines the change in the proportion of patients treated in each setting by condition category, by year.

Exhibit 2.2 below shows the framework of the cross-sectional patient episodes. Patients who fit this framework were included in the analysis regardless of the care they received prior to their STACH stay (referred to as the "look back period"). The anchor date refers to the patient's admission to an IRF, SNF, LTCH, or HHA. At the time of the anchor date, the patient episode is defined either by the clinical condition category identified for which admission to the PAC is required or by the clinical diagnosis that initiated the preceding STACH admission. In the event that the clinical condition that initiated the acute care hospital admission differed from the clinical condition driving the need for post-acute care, the condition for which the patient is treated in the PAC setting is used to clinically define him/her.

[36] 100 percent of patients treated in either an IRF or LTCH was included in this analysis due to their relative low volume among Medicare beneficiaries, compared to SNF and HHA patients.

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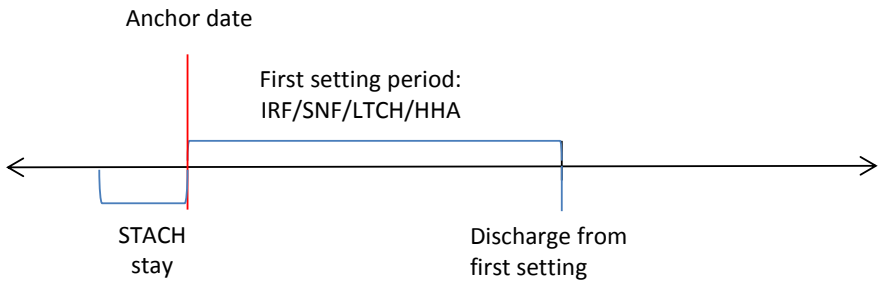
Exhibit 2.2: Patient Episode Framework for Cross-Sectional Analysis



Conducting Cross-Sectional Analysis

Using the patient episodes, defined by clinical condition categories, we determined the proportion of patients by condition by year for each setting (IRF, SNF, LTCH, and HHA). The analysis then compared the changes in the proportions over time within and across settings. Further sub-analyses were conducted that compared the changes in the distribution of conditions by geographic area, using the four census regions (i.e., Northeast, South, Midwest, and West).

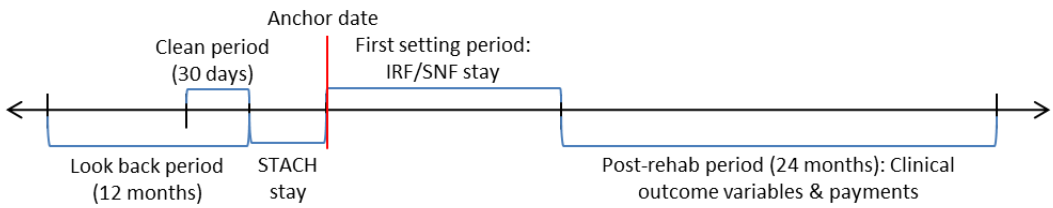
Longitudinal Analysis

The longitudinal analysis compares the long-term clinical outcomes and Medicare payments for patients who received rehabilitation services in the IRF compared to those who received rehabilitation in the SNF. Through the development of patient episodes using Medicare claims data for a 100 percent sample of IRF patients and a 20 percent sample of SNF patients from 2005 through 2009, we were able to risk-adjust the patients treated in each setting and compared their long-term clinical outcomes and Medicare payments.

Developing Patient Episodes for Longitudinal Analysis

Episodes of care were developed for all patients treated in either an IRF or SNF that could be identified using the clinical condition category algorithms. Exhibit 2.3 below shows the framework of the longitudinal patient episodes.

Exhibit 2.3: Patient Episode Framework for Longitudinal Analysis



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Methodology

All patient episodes contained the following key features:

- **STACH stay**: The STACH stay represents the acute care hospital admission that results in the need for post-acute care. Diagnostic and MS-DRG information was used to define each patient's clinical condition category and to risk-adjust the two patient populations. Similar to the cross-sectional analysis, only patients who were discharged from a STACH and admitted to an IRF or SNF within three days were included in the analysis, ensuring that patients were at a similar stage in their rehabilitation care (i.e., the time between the discharge from the acute care hospital and the anchor date is three or fewer days).
- **Anchor date**: The anchor date refers to the patient's admission to the IRF or SNF following discharge from the STACH. The patient episode is defined by the clinical condition category for which the patient was treated in the preceding acute care hospital admission or the category in the PAC setting.
- **Look back period**: The look back period captures health care utilization and clinical characteristics for one year (12 months) prior to admission to the acute care hospital. During the look back period, acute care hospitalizations or medical events related to the patient's clinical condition were used during the propensity score matching process to control for patient severity across the two settings (discussed further below). Diagnostic information (ICD-9s), procedural information (CPT and HCPCS from outpatient claims), and prior stays in facility-based settings are examples of the variables captured during the look back period.
- **Clean period**: Only patients with no facility-based care (STACH, IRF, SNF, or LTCH) within the 30 days immediately preceding the patient's admission to the STACH were considered for this analysis (referred to as the "clean period"). The purpose of the clean period is to ensure that the STACH admission is not a readmission from a prior admission and to ensure that the patient was not receiving facility-based care prior to the hospitalization. This is an important component of the episode as it better ensures appropriate attribution of outcomes to the rehabilitation care that follows hospital discharge.
- **First setting period:** The intervening days between admission to the IRF and SNF and discharge to another PAC setting or the community describe an episode's "first setting period." The length of the first setting period will vary by patient and setting. We examined the claims that occurred during this period in order to understand the care that the patient received during the first setting and its impact on clinical outcomes and Medicare payment.

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- **Post-rehabilitation period:** The post-rehabilitation period is initiated by discharge from the IRF or SNF setting, and extends for 24 months. Claims during this period are examined to determine outcomes and Medicare episode payment. In order to be included in the analysis, each patient must have the opportunity for 24 months of claims to be available. That is, even if a patient expired during the two-year study period there needed to have been an opportunity for two years of service use if the patient had survived.

Based on this episode framework, we developed patient episodes for IRF and SNF first setting patients for each of the clinical condition categories. In the next section, we discuss how we controlled for patient demographics and severity and how we matched SNF to IRF patients.

Developing Patient Cohorts

Based on the patient episode framework described above, we identified two patient cohorts for each clinical condition category: 1) those who received care in an IRF as their first setting (i.e., the study group), and 2) those who received care in a SNF as their first setting (i.e., the comparison group). The comparison group was matched to the study group through propensity score matching techniques based on patient characteristics, comorbidities, and historical health care utilization one year prior to the admission to the acute care hospital stay.

Propensity score matching techniques are widely used in observational studies when randomized controlled trials (RCTs) are not possible or able to be generalized to the population, or are unethical or impractical to administer.[37] Literature suggests that applying these techniques to observational studies removes observable selection bias among treatment and comparison groups and can replicate findings produced by RCTs.[38,39,40,41]

We used propensity scores to create a one-to-one match across study group and comparison group patients within each clinical condition. We used an optimized "nearest neighbor" method that iteratively increased the caliper width used to identify patient matches. Consistent with the methods traditionally used in the literature, any matched pair with a difference in propensity scores beyond 0.2 standard deviations of the logit

[37] Trojano M, Pellegrini F, Paolicelli D, Fuiani A, Di Renzo V: Observational studies: propensity score analysis of non-randomized data. *International MS Journal.* 2009; 16:90-7.

[38] Austin PC: An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behavioral Research.* 2011; 46:399-424.

[39] Kuss O, Legler T, Borgermann J: Treatments effects from randomized trials and propensity score analyses were similar in similar populations in an example from cardiac surgery. *J Clin Epidemiol.* 2011; 64(10):1076-84.

[40] Dehejia R, Wahba S: Propensity score-matching methods for nonexperimental causal studies. *The Review of Economics and Statistic.* 2002; 84(1):151-61.

[41] Rosenbaum PR, Rubin DB: The central role of the propensity score in observational studies for causal effects. *Biometrika.* 1983; 70(1):41-55.

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function was excluded from the analysis.[42] The rigor of the matching techniques isolated the effect of site of service from other correlated observable effects. Patients who were not able to be matched were excluded from the analysis.

The variables used to determine the propensity score are presented in Exhibit 2.4. These variables were collected during the look back period or during the acute care hospitalization. Each clinical condition category used a slightly different equation to determine the propensity score based on the clinical algorithms, but all condition categories used the same variables in the claims to determine the patient matches (to the extent that a given variable was significant in determining the propensity score). Mortality was not used in the matching process to control for patient severity across settings because it was used as a clinical outcome.

Exhibit 2.4: Variables Used to Determine Propensity Score for Each Clinical Condition Category

Covariates
Age
Gender
Race
Hierarchical Condition Categories (HCC) and Community, Institutional, and New Enrollee Scores
Specific HCC Categories e.g., Major complications of medical care and trauma; Schizophrenia; Seizure disorders and convulsions
Berenson-Eggers Type of Service (BETOS) Code (clustering of procedure codes – CPTs & HCPCS) e.g., Standard imaging; Laboratory tests; Minor procedures
Clinical Classification Software (CCS) Code (clinical clustering of ICD-9s) e.g., Diabetes mellitus without complication; Essential hypertension; Coronary atherosclerosis
Charges by Revenue Center e.g., Pharmacy; Operating room; Imaging; Therapy (Physical, Occupational, and Speech)

Generally, due to the difference in volume of patients treated in IRFs and SNFs, SNF patients within each clinical condition category were able to be matched to IRF patients with the same demographic or clinical characteristics (i.e., there were enough SNF patients to find a match for each IRF patient). However, additional restrictions were made during the matching process, as appropriate. For example, within the brain injury condition category, a patient treated in an SNF for ***traumatic*** brain injury was matched only to a patient treated in an IRF for a traumatic brain injury (as opposed to a *non-traumatic* brain injury). In the example of the lower extremity major joint replacement condition category, hip replacement patients were only matched to other hip replacement patients, as opposed to knee replacement patients.

[42] Austin PC: Optimal caliper widths for propensity-score matching when estimating differences in means and differences in proportions in observational studies. *Pharm Stat.* 2011; 10:150-161.

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Since a one-to-one match was used, the number of matched pairs was limited by the number of IRF patients. As IRFs are the smaller of the two PAC settings, this did not allow for all clinically-similar SNF patients to be included in the analysis.

Exhibit 2.5 below shows the number of IRF and SNF patients by clinical condition category before and after matching. Across all condition categories, 100,491 matched pairs were created, which represents 89.6 percent of all IRF patients and 19.6 percent of SNF patients contained within the 20 percent sample of Medicare beneficiaries. Across clinical condition categories, the percent of SNF patients able to be matched to clinically and demographically similar IRF patients ranged between 71.5 percent (neurological disorders and pain syndromes) and 100 percent (cardiac disorders and major medical complexity). However, due to the volume of SNF patients, between 3.2 percent (major medical complexity) and 50.9 percent (major multiple trauma) of SNF patients contained within the 20 percent sample of beneficiaries were able to be matched to clinically and demographically similar IRF patients.

Exhibit 2.5: Distribution of Matched Pairs by Clinical Condition Category and Percent of IRF Universe and SNF Sample of Patients

	Unmatched (Total Patients)		Matched	Matched Pairs as a % of Unmatched	
Condition	**IRF**	**SNF**	**Pairs**	**IRF**	**SNF**
Amputation	1,971	6,234	1,756	89.1%	28.2%
Brain Injury	6,231	19,459	5,364	86.1%	27.6%
Cardiac Disorder	5,197	89,219	5,195	100.0%	5.8%
Hip Fracture	21,190	59,884	20,970	99.0%	35.0%
Hip/Knee Replacement	22,744	46,650	21,485	94.5%	46.1%
Major Medical Complexity	5,675	177,835	5,675	100.0%	3.2%
Major Multiple Trauma	1,681	3,142	1,600	95.2%	50.9%
Neurological Disorders	6,676	10,552	4,771	71.5%	45.2%
Other Orthopedic	6,311	11,949	6,030	95.5%	50.5%
Pain Syndromes	6,676	10,552	4,771	71.5%	45.2%
Pulmonary Disorders	1,827	34,107	1,821	99.7%	5.3%
Spinal Cord Injuries	4,669	8,594	4,068	87.1%	47.3%
Stroke	21,268	35,379	16,985	79.9%	48.0%
Overall	**112,116**	**513,556**	**100,491**	**89.6%**	**19.6%**

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Notes: In the IRF-PAI training Manual, Hip Fracture and Hip/Knee Replacement are sub-categories within Orthopedic Conditions, and Major Medical Complexity is referred to as "Medically Complex Conditions."

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Calculating Descriptive Statistics and Analyzing Overall Patient Medicare Expenditures

Descriptive statistics were calculated for the study and comparison cohorts after the propensity score matching. Long-term health care utilization and outcomes were compared across the IRF and SNF patient cohorts and clinical condition categories, and the differences were tested for statistical significance. The study and comparison groups were compared on two types of outcomes. First, clinical indicators were used, which included mortality rate, average number of days in the home/community and facility-based care days, prevalence of falls with injuries, pressure ulcers, and emergency room and hospital admissions.

Second, the groups were compared on utilization and per-member-per-month (PMPM) Medicare payments, as well as the average Medicare episode payment per day.

The outcome variables are defined in Exhibit 2.6.

Exhibit 2.6: Outcomes used to Compare Long-Term Impact of IRF Compared to SNF Care

Outcome	Definition
Mortality rate	Percent of patients who died within two-year study period
Average additional days of life	Average days of life per person over two-year study period, including patients who died
Length of stay during first setting	Average length of stay in initial IRF/SNF stay
Number of facility-based days	Average number of days per patient over two-year episode spent in a hospital, IRF, SNF, or LTCH
Number of community-based days (days at home)	Average number of days per patient over two-year episode not spent in a hospital, IRF, SNF, or LTCH. (Lack of nursing home claims in the data may overestimate the calculated number of days at home)
Emergency room and hospital admissions per 1,000 beneficiaries per year	Average number of emergency room visits and hospital admissions per 1,000 beneficiaries per year
Per-member-per-month (PMPM) payment by setting	Sum of the payments divided by the sum of the member months
Average Medicare episode payment per day	Total Medicare payment across all settings (including the anchor) divided by total number of patient days

Data Limitations

Our analyses have several key limitations that may affect the interpretation of our results. First, while administrative claims data offer a robust and representative study population, these data do not contain detailed, medical record-level clinical information. Given this general limitation, our interpretation of beneficiaries' clinical outcomes relied upon outcomes observable in the claims data (e.g., comorbidities, mortality, emergency room

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utilization, etc.) that may not fully indicate patients' health or functional outcomes as a result of receiving post-acute care. Although we used rigorous propensity matching techniques to control for patient demographic characteristics and severity, the lack of clinical information may exclude or may bias certain characteristics that are not observed within the claims.

Second, the data files used in this analysis could not be augmented with the PAC assessment data, which could have allowed us to compare beneficiaries' functional independence changes (during and/or) following rehabilitation. For instance, using claims data we were unable to identify beneficiaries' live-alone status, which is a social characteristic that studies have shown to correlate with patients' PAC discharge destination.[43]

Lastly, Medicare fee-for-service claims do not include care covered and reimbursed by Medicare Advantage plans, Medicaid, or third-party payers. Thus, non-Medicare services, such as long-term nursing home care, were not captured in this analysis. This omission may have overestimated the calculated number of days a patient remained at home, and underestimated the cost of their health care to the federal and state governments.

In the next chapters, we present the results of our cross-sectional and longitudinal analysis.

[43] Pablo PD, Losina E, Phillips CB, et al. Determinants of discharge destination following elective total hip replacement. *Arthritis Rheum* 2004; 51(6):1009-14.

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Cross-Sectional Analysis Results

The purpose of the cross-sectional analysis is to determine the distribution of clinical condition categories within IRFs and other PAC settings, and to identify any trends or changes in this distribution during the five years following implementation of the 60 Percent Rule. This analysis serves as the first analytic step towards the broader study goal of understanding the differences in long-term patient outcomes based on where patients receive rehabilitative care. A shift in the distribution of clinical condition categories within and across PAC settings following the implementation of the 60 Percent Rule would provide insight into how PAC providers changed practice patterns to adhere with the revised IRF-PPS.

This analysis was performed across the four PAC settings (IRFs, SNF, LTCHs, and HHA). Only the clinical condition categories with algorithms that could accurately be applied to non-IRF settings were included in this analysis. Therefore, the proportions presented do not reflect all patient cases treated in SNFs, LTCHs, and HHAs, but are representative of IRF conditions.

Distribution of Clinical Condition Categories among IRFs

The distribution of IRF clinical condition categories between 2005 and 2009 is shown in Exhibit 3.1. In 2005, the three largest clinical condition categories – lower extremity joint replacement (hip/knee replacement), stroke, and fracture of lower extremity (hip fracture) – represented 60.4 percent of all IRF admissions. Hip/knee replacement patients represented 25.4 percent, while stroke and hip fracture patients represented 18.3 percent and 16.7 percent of total IRF admissions in 2005, respectively. All other condition categories represent less than 6 percent of all IRF patients with clinical condition categories included in this analysis.

The relative proportion of the three largest condition categories steadily decreased, and by 2009 represented only 52.4 percent of all IRF patients. This trend was driven by the

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marked 10.9 percentage point decrease in the proportion of patients treated for hip/knee replacements. While the proportion of other conditions fluctuated over the study period, no other condition category experienced such a large change.

Appendix B presents results for the other individual PAC setting – SNFs, HHAs, and LTCHs.

Exhibit 3.1: Distribution of Clinical Condition Categories among IRFs (2005-2009) (Ranked by Proportion in 2005)

Clinical Condition Category	2005	2006	2007	2008	2009	Percentage Point Change (2005-2009)
Hip/Knee Replacement (Lower Extremity Joint Replacement)	25.4%	21.1%	18.1%	15.5%	14.5%	-10.9%
Stroke	18.3%	20.0%	20.3%	20.5%	20.3%	2.0%
Hip Fracture (Fracture of Lower Extremity)	16.7%	17.9%	18.5%	18.1%	17.5%	0.8%
Major Medical Complexity	5.6%	5.7%	6.2%	7.2%	7.5%	1.9%
Cardiac Disorder	5.6%	5.2%	5.4%	6.0%	6.3%	0.7%
Neurological Disorders	5.5%	6.3%	6.8%	7.2%	7.9%	2.3%
Other Orthopedic	5.3%	5.6%	5.8%	6.4%	6.6%	1.3%
Brain Injury	4.9%	5.8%	6.5%	6.8%	7.1%	2.1%
Spinal Cord Injury	4.3%	4.4%	4.4%	4.1%	4.3%	0.0%
Amputation	2.6%	2.6%	2.5%	2.5%	2.5%	-0.2%
Pulmonary Disorders	2.1%	2.0%	2.0%	2.2%	2.2%	0.1%
Pain Syndromes	1.9%	1.8%	1.6%	1.6%	1.4%	-0.6%
Major Multiple Trauma	1.3%	1.5%	1.6%	1.7%	1.8%	0.5%
Debility	0.3%	0.2%	0.2%	0.2%	0.2%	-0.1%
All Other	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%

Percentages may not total 100 percent due to rounding.
Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

The large decrease in lower extremity joint replacement cases is offset by smaller proportional increases in other condition categories (Exhibit 3.2). Between 2005 and 2009, stroke, major medical complexity, neurological disorders, and brain injury condition categories each increased by approximately two percentage points. This produced a more even distribution of clinical condition categories each year following the implementation of the 60 Percent Rule.

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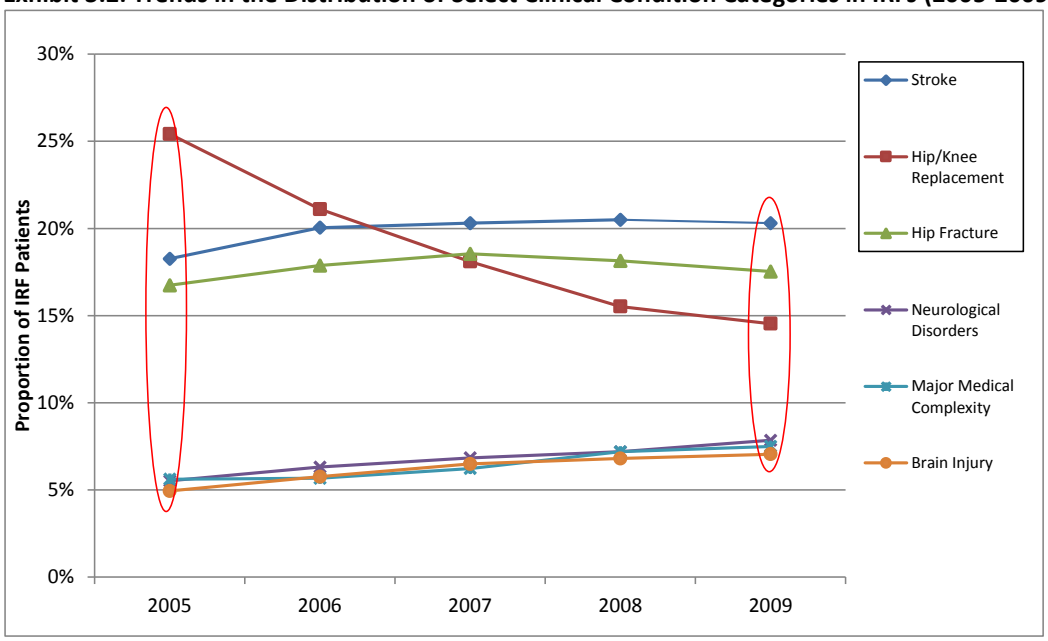
Exhibit 3.2: Trends in the Distribution of Select Clinical Condition Categories in IRFs (2005-2009)



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Comparison of the Distribution of Clinical Condition Categories between IRFs and SNFs

Researchers and policymakers anticipated that the implementation of the 60 Percent Rule would lead to a relative decrease in patients with certain conditions in IRFs, offset by an increase in corresponding patient conditions in SNFs. Exhibit 3.3 presents the distribution of clinical condition categories in IRFs and SNFs by year.

Similar to the distribution of clinical condition categories in IRFs, three condition categories represented almost two-thirds of SNF admissions in a given year. In 2005, major medical complexity (33.8 percent), cardiac conditions (18.1 percent), and hip fractures (10.2 percent) collectively represented 62.1 percent of all SNF admissions. By 2009, the proportion of SNF admissions representing these conditions increased to 64 percent.

Across all years, major medical complexities was the largest clinical condition category treated in SNFs, representing at least one third of all admissions across each year. The proportion of SNF admissions for this condition category increased from 33.8 percent in 2005 to 37.5 percent in 2009. Although major medical complexities represented a significantly smaller proportion of IRF admissions, the relative proportion of this condition also increased, from 5.6 percent to 7.5 percent.

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However, the relative change in proportion among SNF patients treated for cardiac conditions may be related to the 60 Percent Rule. As a condition not included in the Rule, the decrease in proportion of cardiac patients treated in SNFs from 2005 to 2009 (a change from 18.1 percent in 2005 to 16.7 percent in 2009) coincided with an increase in IRFs (from 5.6 percent to 6.3 percent). A similar trend was evident among stroke patients. The increased proportion of patients treated in IRFs for stroke (a condition included in the 60 Percent Rule) was accompanied by a decrease in the proportion of patients treated in SNFs, which decreased from 7.1 percent in 2005 to 6.2 percent in 2009.

The significant decrease in the proportion of hip/knee replacement patients in IRFs from 2005 through 2009 was not accompanied by a comparable increase in the proportion of these conditions in SNFs over the same period. From 2005 through 2009, the proportion of patients treated for hip/knee replacements among SNFs only increased from 7.4 percent to 8.0 percent, while the proportion of these patients treated in IRFs decreased from 25.4 percent to 14.5 percent. Our analysis of HHAs, however, shows the distribution of hip/knee replacement cases increased from 10.4 percent in 2005 to 12.8 percent in 2009 (see Appendix B).

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Cross-Sectional Analysis Results

Exhibit 3.3: Comparison of IRF and SNF Distribution of Clinical Condition Categories (2005-2009) (Ranked by IRF Proportion in 2005)

	2005		2006		2007		2008		2009		Percentage Point Change (2005-2009)	
Clinical Condition Category	**IRF**	**SNF**	**IRF**	**SNF**	**IRF**	**SNF**	**IRF**	**SNF**	**IRF**	**SNF**	**IRF**	**SNF**
Stroke	18.3%	7.1%	20.0%	6.7%	20.3%	6.5%	20.5%	6.3%	20.3%	6.2%	2.0%	-0.9%
Hip Fracture	16.7%	10.2%	17.9%	10.1%	18.5%	10.1%	18.1%	9.9%	17.5%	9.8%	0.8%	-0.4%
Hip/Knee Replacement	25.4%	7.4%	21.1%	7.3%	18.1%	7.5%	15.5%	7.6%	14.5%	8.0%	-10.9%	0.6%
Neurological Disorders	5.5%	1.9%	6.3%	2.0%	6.8%	2.0%	7.2%	2.0%	7.9%	1.9%	2.4%	0.0%
Brain Injury	4.9%	3.5%	5.8%	3.5%	6.5%	3.5%	6.8%	3.5%	7.1%	3.3%	2.2%	-0.2%
Other Orthopedic	5.3%	1.9%	5.6%	2.0%	5.8%	2.2%	6.4%	2.3%	6.6%	2.3%	1.3%	0.4%
Cardiac Disorder	5.6%	18.1%	5.2%	17.8%	5.4%	17.2%	6.0%	17.0%	6.3%	16.7%	0.7%	-1.4%
Spinal Cord Injury	4.3%	1.5%	4.4%	1.5%	4.4%	1.6%	4.1%	1.6%	4.3%	1.6%	0.0%	0.1%
Debility	0.3%	1.9%	0.2%	1.8%	0.2%	1.8%	0.2%	1.8%	0.2%	1.7%	-0.1%	-0.2%
Major Medical Complexity	5.6%	33.8%	5.7%	35.3%	6.2%	36.6%	7.2%	36.9%	7.5%	37.5%	1.9%	3.7%
Amputation	2.6%	2.1%	2.6%	1.7%	2.5%	1.0%	2.5%	0.9%	2.5%	0.9%	-0.1%	-1.2%
Pulmonary Disorders	2.1%	7.5%	2.0%	7.0%	2.0%	6.8%	2.2%	7.0%	2.2%	6.8%	0.1%	-0.7%
Major Multiple Trauma	1.3%	0.5%	1.5%	0.6%	1.6%	0.6%	1.7%	0.6%	1.8%	0.6%	0.5%	0.1%
Pain Syndromes	1.9%	2.4%	1.8%	2.5%	1.6%	2.5%	1.6%	2.5%	1.4%	2.5%	-0.5%	0.1%
All Other	0.1%	0.3%	0.2%	0.3%	0.1%	0.3%	0.1%	0.1%	0.2%	0.2%	-0.5%	0.1%

Percentages may not total 100 percent due to rounding.
Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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Comparison of Results to MedPAC Published Estimates

Results from our cross-sectional analysis of the distribution of IRF admissions by clinical condition category are consistent with published MedPAC analyses for the 10 most common IRF conditions (Exhibit 3.4). While the absolute proportions of each clinical condition do not align perfectly, directionally, the results appear consistent, validating the algorithms we used to define each clinical condition category.

The major trends identified in our analysis – the significant decline in the proportion of hip/knee replacements and the increase in the proportion of stroke patients, neurological disorders, and brain injury cases – are also observed in MedPAC's analyses (Exhibit 3.4).

A notable discrepancy across all study years is the difference in the observed proportion of beneficiaries admitted with debility. This large difference is likely due to difficulty defining debility without using the RIC or impairment group codes contained in IRF claims. In our methodology, admissions are classified into clinical condition categories using diagnostic information, not IRF payment classifications. This is a methodological prerequisite, as the conditions needed to be consistently classified in the other PAC settings. Thus, our cross-sectional results do not accurately capture the relative proportion of debility cases across PAC settings. In each setting, the proportion of debility cases is likely underestimated, possibly slightly effecting the relative proportions of all other conditions.

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Exhibit 3.4: Comparison of the Distribution of Clinical Condition Categories in Dobson | DaVanzo and MedPAC Analyses (2005-2009)

	2005		2006		2007		2008		2009	
Clinical Condition Category	**D|D**	**MedPAC**	**D|D**	**MedPAC**	**D|D**	**MedPAC**	**D|D**	**MedPAC**	**D|D**	**MedPAC[1]**
Stroke	18.3%	19.0%	20.0%	20.3%	20.3%	20.8%	20.5%	20.5%	20.3%	20.6%
Hip Fracture	16.7%	15.0%	17.9%	16.1%	18.5%	16.4%	18.1%	16.3%	17.5%	15.5%
Hip/Knee Replacement	25.4%	21.3%	21.1%	17.8%	18.1%	15.0%	15.5%	13.2%	14.5%	11.4%
Neurological Disorders	5.5%	6.2%	6.3%	7.0%	6.8%	7.8%	7.2%	7.9%	7.9%	9.0%
Brain Injury	4.9%	5.2%	5.8%	6.0%	6.5%	6.7%	6.8%	6.9%	7.1%	7.3%
Other Orthopedic	5.3%	5.1%	5.6%	5.2%	5.8%	5.5%	6.4%	5.8%	6.6%	6.3%
Cardiac Conditions	5.6%	4.2%	5.2%	4.0%	5.4%	4.2%	6.0%	4.6%	6.3%	4.9%
Spinal Cord Injury	4.3%	4.5%	4.4%	4.6%	4.4%	4.6%	4.1%	4.3%	4.3%	4.3%
Debility*	0.3%	5.8%	0.2%	6.2%	0.2%	7.7%	0.2%	9.1%	0.2%	9.2%
Other**	13.7%	13.8%	13.5%	12.8%	14.0%	11.3%	15.2%	11.4%	15.4%	11.5%

Percentages may not total 100 percent due to rounding.

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2012.

[1] Represents data taken from January through June 2009.

*Defined by the presence of the following ICD-9 codes: 728.2, 728.9, 780.71, 780.79. Due to the difficulty in consistently defining debility using administrative claims across settings, this definition underestimates this patient population, potentially impacting the proportion of patients across all conditions.

**Dobson | DaVanzo column: includes amputation, major multiple trauma, pain syndrome, major medical complexity, pulmonary disorders, rheumatoid arthritis, burns, congenital deformities, and developmental disorders. MedPAC: includes amputations, major multiple trauma, and pain syndrome, but possibly may include additional categories that are not explicitly identified.

This report focuses on the time period immediately following the implementation of the 60 Percent Rule (2005 and 2009). However, distribution of clinical condition categories both within and across PAC settings continues to change following the Rule. MedPAC has continued to track the distribution of clinical condition categories through the first six months of 2013 (Exhibit 3.5). The relative proportion of the three largest clinical condition categories (stroke, hip fracture, and hip/knee replacement) continued to change in proportion from 45.9 percent of total IRF admissions in 2010 to 40.8 percent in 2013. All three condition categories have demonstrated decreases in their proportion of IRF admissions between 2010 and 2013, despite the trends evidenced between 2005 and 2009.

Of these three conditions, hip/knee replacement was the only clinical condition category that decreased in proportion from 2005 through 2009. This trend continued from 2010 through 2013 (from 11.5 percent to 8.8 percent).

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The proportion of patients treated for hip fractures and strokes declined from 2010 through 2013, despite the increase in the proportions of these condition categories from 2005 through 2009.

Exhibit 3.5: MedPAC Analysis of Most Common IRF Cases (2010-2013)

Clinical Condition Category	2010	2011	2012	2013[1]	Percentage Point Change (2010-2013)
Stroke	20.1%	19.6%	19.4%	19.4%	-0.7%
Hip Fracture	14.3%	13.8%	13.0%	12.6%	-1.7%
Hip/Knee Replacement	11.5%	10.7%	10.1%	8.8%	-2.7%
Neurological Disorders	9.8%	10.3%	11.6%	12.5%	2.7%
Brain Injury	7.3%	7.6%	7.9%	8.1%	0.8%
Other Orthopedic	6.7%	7.1%	7.5%	7.6%	0.9%
Cardiac Conditions	4.9%	5.1%	5.3%	5.4%	0.5%
Spinal Cord Injury	4.3%	4.5%	4.6%	4.5%	0.2%
Debility	10.0%	10.3%	10.0%	10.3%	0.3%
Other*	11.1%	10.9%	10.6%	10.7%	-0.4%

Percentages may not total 100 percent due to rounding.
Source: Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.
*Includes conditions such as: amputations, MMT, and pain syndrome.

For illustrative purposes, we combine our cross-sectional results of 2005 through 2009 IRF data for hip/knee replacement, stroke, and hip fracture cases with MedPAC's analyses of the same conditions from 2010 through 2013 (Exhibit 3.6). Despite our results being approximately two percentage points above MedPAC's results for hip fractures and hip/knee replacements due to methodological differences, this graph shows the general trends of these conditions through 2013.

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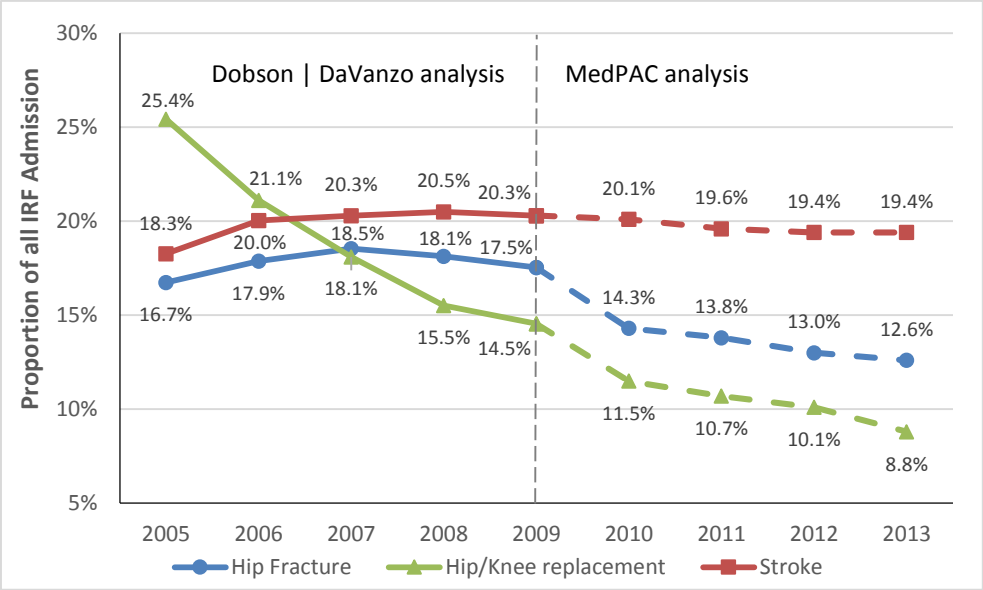
Exhibit 3.6: Change in Distribution of Clinical Condition Categories among IRFs – Dobson | DaVanzo (2005-2009) and MedPAC (2010-2013) Estimates for Select Conditions



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.
Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.
Note: MedPAC estimates for hip fractures and hip/knee replacements are generally lower than Dobson | DaVanzo's estimates by about two percentage points due to methodology differences. Therefore, a portion of the decrease between 2009 and 2010 may not reflect true decreases in volume in these conditions.

Comparison of the Distribution of IRF Clinical Condition Categories by Geographic Region

To determine if the overall IRF provider response to the 60 Percent Rule was a national trend or driven by select geographic regions, we examined the distribution of IRF conditions by the four census regions: Northeast, South, Midwest, and West. Detailed results of this analysis are presented in Appendix B. These data show that the relative proportion of IRF patients by clinical condition category across census regions reflect the nationwide distribution for each study year. In each region, hip/knee replacement, stroke, and hip fracture conditions represented the greatest relative proportion of IRF cases. The marked decline in the proportion of hip/knee replacements is also observed across census regions, although this change appears somewhat less pronounced in the Northeast (a reduction in proportion of 6.5 percent) compared to the Midwest, South, and West, with a reduction in proportions of 11.5 percent, 12.6 percent, and 11.6 percent, respectively.

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Cross-Sectional Analysis Summary and Discussion

Our analysis of the Medicare claims data following implementation of the 60 Percent Rule (2005 through 2009) shows the relative change in the distribution of clinical condition categories across settings. The most notable trend is the significant decrease in the relative proportion in the hip/knee replacement clinical condition category among IRFs, which is offset by smaller proportional increases in stroke, major medical complexity, neurological disorder, and brain injury in the same condition category among SNFs. Additionally, as the proportion decreases within IRFs, other condition categories show a modest relative increase from 2005 through 2009. Despite the relative decline in lower extremity joint replacement cases, the three most common conditions – hip/knee replacement, stroke, and hip fractures – continued to represent the majority of all IRF admissions during the study period.

In extending our analyses using MedPAC's published estimates, the results suggest that the trends evidenced from 2005 through 2009 continued through 2013. As noted above, the strongest evidence for patient shifting from IRFs to other PAC settings is seen among the hip/knee replacement clinical condition category. While our analysis and MedPAC's data appear to show declining volume of IRF hip fracture cases from 2007 through 2013, corresponding changes are not observed in other PAC settings.

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Longitudinal Analysis Results

The goal of our longitudinal analysis is to compare the long-term clinical outcomes and Medicare payments for patients who received rehabilitation services in the IRF to those who are clinically and demographically similar but received rehabilitation in the SNF. In this analysis, we compare the length of the initial rehabilitation stay of these two patient populations, but focus on the examination of longer-term outcomes during the two-year study period following discharge from the initial rehabilitation stay.

Differences in Length of Stay during the Initial Rehabilitation Stay

The focus of the longitudinal analysis is to compare selected patient outcomes and Medicare spending for the two-year study period after discharge from the initial rehabilitation stay (IRF versus SNF). However, the care that is provided during the initial rehabilitation stay positions the patient for the continued rehabilitation progress upon discharge. Exhibit 4.1 shows the average length of stay by clinical condition category for patients treated in an IRF as compared to a SNF. On average across all conditions, patients treated in an IRF have a length of stay that is less than half as long as those treated in a SNF (12.4 days for IRF patients compared to 26.4 days for SNF patients). The shorter average length of rehabilitation stay observed in this study is consistent with published literature that notes shorter average stays for IRF hip/knee replacement[44,45,46] and hip fracture[47,48]

[44] DeJong G, Tian W, Smout RJ, et al. Long-term outcomes of joint replacement rehabilitation patients discharged from skilled nursing and inpatient rehabilitation facilities. *Arch Phys Med Rehabil*. 2009; 90:1306-16.

[45] Tian W, DeJong G, Horn SD, et al. Efficient rehabilitation care for joint replacement patients: skilled nursing facility or inpatient rehabilitation facility? *Med Decis Making*. 2012; 32:176-87.

[46] Walsh MB, Herbold J. Outcome after rehabilitation for total joint replacement at IRF and SNF: A case controlled comparison. *Am J Phys Med Rehabil*. 2006; 85(1):1-5.

[47] Munin MC, Seligman K, Dew MA, et al. Effect of rehabilitation site on functional recovery after hip fracture. *Arch Phys Med Rehabil*. 2005; 86:367-72.

[48] Herbold JA, Bonistall K, Walsh MB. Rehabilitation following total knee replacement, total hip replacement, and hip fracture: A case-controlled comparison. *J Geriatr Phys Ther*. 2011; 34:155-60.

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patients than comparable SNF patients' stays. These investigators suggest that this two-week shorter length of stay (13.9 days; $p<0.0001$) may be attributable to more intensive rehabilitation provided in IRFs compared to that provided in SNFs. The longer length of stay within the SNF may be due, in part, to per diem payments in addition to patient copayments commencing on day 21 of the SNF stay.

This trend is consistent within all clinical condition categories. The differences in the average length of stay ranges from 5.3 fewer days for IRF patients treated for hip/knee replacements to 23.1 fewer days for patients treated in IRFs for multiple medical complexity. These differences are statistically significant for every condition category.

Exhibit 4.1: Difference in Average Length of Stay for Initial IRF/SNF Rehabilitation Stay: Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P-value
Amputation	14.0	29.6	-15.7	<.0001
Brain Injury	13.7	30.7	-16.9	<.0001
Cardiac Disorder	11.2	23.1	-11.9	<.0001
Hip Fracture	13.3	32.7	-19.4	<.0001
Hip/Knee Replacement	9.3	14.7	-5.3	<.0001
Major Medical Complexity	12.0	24.9	-12.9	<.0001
Major Multiple Trauma	14.5	37.7	-23.1	<.0001
Neurological Disorders	13.0	32.2	-19.2	<.0001
Other Orthopedic	11.8	26.2	-14.3	<.0001
Pain Syndromes	10.7	25.2	-14.5	<.0001
Pulmonary Disorders	11.3	24.3	-13.0	<.0001
Spinal Cord Injuries	13.5	22.2	-8.7	<.0001
Stroke	15.5	32.1	-16.5	<.0001
Overall Average	**12.4**	**26.4**	**-13.9**	**<.0001**

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Differences in Clinical Outcomes during the Post-Rehabilitation Period

The longitudinal analysis primarily focuses on longer term patient outcomes for matched cohorts of clinically and demographically comparable IRF and SNF patients following discharge from the initial rehabilitation stay. Since results indicate that patients who are treated in an IRF are discharged nearly two weeks earlier than patients treated in a SNF, the post-rehabilitation period starts at different times in the patients' recovery. Generally, results suggest that patients treated in IRFs had better long-term clinical outcomes (over the two-year study period) on a series of validated outcome measures than those treated in SNFs following the implementation of the 60 Percent Rule.

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Mortality Rates and Additional Days Preserved

Risk of mortality and the additional days of life are two measures used to compare the long-term outcomes of patients treated in IRFs to clinically and demographically comparable patients treated in SNFs. As shown in Exhibit 4.2, patients who were treated in an IRF experienced a 7.9 percentage point lower mortality rate during the two-year study period than SNF patients ($p<0.0001$). Again, the results are directionally consistent across all clinical condition categories, with significantly lower mortality rates among IRF patients than SNF patients.

The largest difference in mortality rates was among brain injury patients, in which 35.1 percent of patients died within two years after discharge from the IRF, while 50.7 percent of patients died after discharge from the SNF (a difference of 15.5 percentage points). As patients were matched based on demographics and clinical severity, the severity level of the patients was highly comparable.

Another large difference in mortality rates was among stroke patients, in which 34.2 percent of patients died within two years of discharge from the IRF, while 48.4 percent of patients died within discharge from the SNF (a difference of 14.3 percentage points).

Other conditions had smaller, yet significant differences in mortality rates, such as patients treated for hip/knee replacements, other orthopedic conditions, and major multiple trauma.

Exhibit 4.2: Mortality Rate across Two-Year Study Period: Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	36.6%	48.4%	-11.8%	<0.0001
Brain Injury	35.1%	50.7%	-15.5%	<0.0001
Cardiac Disorder	34.1%	44.9%	-10.7%	<0.0001
Hip Fracture	25.4%	33.7%	-8.3%	<0.0001
Hip/Knee Replacement	5.2%	5.9%	-0.7%	0.0016
Major Medical Complexity	42.8%	51.8%	-9.0%	<0.0001
Major Multiple Trauma	19.1%	24.1%	-5.0%	0.0006
Neurological Disorders	32.3%	39.6%	-7.3%	<0.0001
Other Orthopedic	18.1%	22.6%	-4.4%	<0.0001
Pain Syndromes	19.8%	29.5%	-9.7%	<0.0001
Pulmonary Disorders	45.3%	51.9%	-6.6%	<0.0001
Spinal Cord Injuries	19.4%	26.1%	-6.7%	<0.0001
Stroke	34.2%	48.4%	-14.3%	<0.0001
Overall Average	**24.3%**	**32.3%**	**-7.9%**	**<0.0001**

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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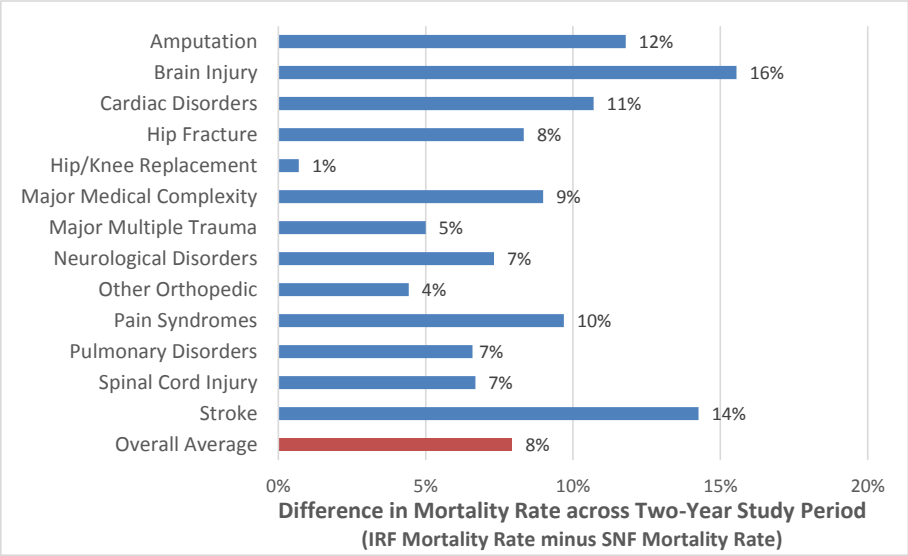
Overall, four conditions had a difference in mortality rate of more than 10 percentage points – amputations, brain injury, cardiac disorders, and stroke (Exhibit 4.3).

Exhibit 4.3: Percentage Point Difference in Mortality Rate* across Two-Year Study Period: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.
*All differences are statistically significant at p<0.001.

Consistent with the reduced mortality rate of patients treated in an IRF, IRF patients survived nearly two months longer (51.9 days) than comparable patients treated in a SNF over the two-year period (Exhibit 4.4).[49] On average, IRF patients survive 621.0 days (about 20.7 months) after discharge from the initial rehabilitation stay while SNF patients survive 569.1 days (18.9 months).

It is important to note that this analysis only compares the number of days alive during the two-year study period. Therefore, if the study period were to be extended, the differences between the settings could change. This was an important outcome measure to compare, as a large average difference in the number of days alive between the settings may indicate a systematic difference in the timing of the patients' death (i.e., death later, as opposed to earlier, in the study period).

The results are directionally consistent for each clinical condition category, but values vary significantly. By clinical condition category, IRF patients treated for hip/knee replacements are alive an average of 3.9 days longer than SNF patients, while IRF

[49] This algorithm calculates the average days alive for each patient (including those who survived the entire episode), then calculates an average within each clinical condition category.

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patients treated for strokes are alive an average of 96.8 days longer than SNF patients during the two-year study period. The results across all clinical condition categories are significant ($p<0.001$).

Exhibit 4.4: Average Days Alive Following Discharge from Initial Rehabilitation Stay: Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	562.9	485.3	77.7	<.0001
Brain Injury	561.5	468.3	93.2	<.0001
Cardiac Disorder	568.4	501.7	66.7	<.0001
Hip Fracture	622.4	567.3	55.1	<.0001
Hip/Knee Replacement	712.2	708.3	3.9	<.0001
Major Medical Complexity	527.0	455.7	71.3	<.0001
Major Multiple Trauma	648.5	613.2	35.2	0.0036
Neurological Disorders	585.6	542.1	43.5	<.0001
Other Orthopedic	653.0	623.3	29.7	<.0001
Pain Syndromes	646.4	596.8	49.6	<.0001
Pulmonary Disorders	515.0	473.0	42.0	<.0001
Spinal Cord Injuries	637.8	592.5	45.3	<.0001
Stroke	572.2	475.5	96.8	<.0001
Overall Average	**621.0**	**569.1**	**51.9**	**<.0001**

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Patients treated in IRFs for two clinical condition categories – brain injury and stroke – stayed alive more than three months longer on average than those treated in SNFs (Exhibit 4.5). Patients treated in IRFs for three additional clinical condition categories – amputations, cardiac disorders, and major medical complexity – stay alive over two months longer on average than those treated in SNFs.

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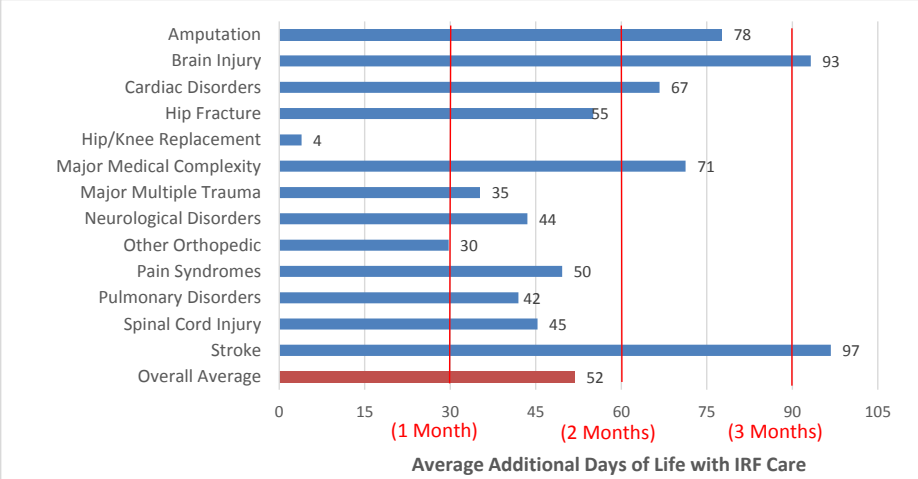
Exhibit 4.5: Average Additional Days of Life when Receiving IRF Care: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Ability to Remain at Home

One measure used to determine the long-term impact of the rehabilitative care was the length of time patients were able to reside in their homes without facility-based care. Over the two-year study period, IRF patients who were clinically comparable to SNF patients remained home, on average, almost two months longer (51.5 days) than patients treated in SNFs (Exhibit 4.6). Days at home represent the average number of days per patient not spent in a hospital, IRF, SNF, or LTCH over a two-year episode.[50] These days may not necessarily be continuous; rather, they are the average total number of days throughout the episode. On average, IRF patients remained at home 582.3 days (about 19.4 months), while SNF patients remained at home 530.8 days (about 17.6 months).

While all clinical condition categories showed directionally the same results – patients treated in the IRFs had more days at home – the range of days and statistical significance varied. For three clinical condition categories – amputations, brain injury, and stroke – IRF patients remained at home on average three months (90.8 days) longer than SNF patients ($p<0.0001$). For several conditions – hip/knee replacements, major multiple trauma, and other orthopedic conditions – the difference in the number of days at home was not statistically significant.

However, as discussed in the Methodology section, the claims data used in these analyses only contain services covered by fee-for-service Medicare. Therefore, Medicaid services,

[50] This algorithm factors in patient death, in that the number of days at home is calculated for each patient based on the number of days alive within the two-year episode, then averaged across all patients within the clinical condition category.

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such as nursing home services, are not considered in the calculation of facility-based care days. To the extent that SNF patients convert and receive nursing home services, the number of days a patient remained at home may be overestimated for the patients.

Exhibit 4.6: Difference in Number of Days at Home:* Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	510.6	425.2	85.4	<.0001
Brain Injury	517.0	422.0	95.0	<.0001
Cardiac Disorder	529.5	457.4	72.1	<.0001
Hip Fracture	581.2	528.4	52.8	<.0001
Hip/Knee Replacement	698.0	693.9	4.1	0.5188
Major Medical Complexity	478.7	405.9	72.8	<.0001
Major Multiple Trauma	611.2	576.4	34.8	0.0626
Neurological Disorders	533.0	487.6	45.4	<.0001
Other Orthopedic	616.3	587.5	28.8	0.0707
Pain Syndromes	602.9	546.0	56.9	<.0001
Pulmonary Disorders	464.0	416.2	47.7	<.0001
Spinal Cord Injuries	597.9	556.8	41.0	<.0001
Stroke	518.4	426.4	92.0	<.0001
Overall Average	**582.3**	**530.8**	**51.5**	**<.0001**

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

*Days in the home represents the average number of days per patient over two-year episode not spent in a hospital, IRF, SNF, or LTCH.

When factoring in the average days alive by condition for the two patient cohorts, results suggest that patients treated in both settings have comparable use of facility-based care and the additional days at home is a function of remaining alive a larger portion of the two-year study period. As shown in Exhibit 4.4, patients treated in IRFs are alive 621.0 days, of which 582.3 days are spent at home (Exhibit 4.6). Therefore, on average, IRF patients reside in facility-based care 38.7 days over their post-rehabilitation episode. Similarly, patients treated in SNFs are alive 569.1 days, of which 530.8 days are spent at home. Therefore, these patients are in facility-based care for about 38.3 days.

The average difference in the number of facility-based care days varies by clinical condition category (data not shown). For example, patients treated for an amputation in an IRF have about 52.3 facility-based care days, compared to 60.0 facility-based care days for patients treated in a SNF. On the other hand, patients treated for spinal cord injuries or stroke in the IRF have slightly more facility-based care days over the two-year study period than patients treated in a SNF (4.3 and 4.7 more facility-based care days, respectively).

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Emergency Room and Readmission Rates

Emergency room (ER) and readmission rates are sometimes used as a proxy for unsuccessful patient recovery. The rate of emergency room visits per 1,000 patients per year was compared for matched patients treated in IRFs and SNFs. Across all clinical condition categories, IRF patients experienced 642.7 emergency visits per 1,000 patients per year (Exhibit 4.7). That is, about 64 percent of IRF patients visited the ER each year during the two years following their initial rehabilitation stay. SNF patients averaged 688.2 ER visits per 1,000 patients per year – or about 69 percent of SNF patients visiting an ER each year during the study window. These results indicate that, on average, patients treated in an IRF experienced 4.5 percent fewer ER visits per year (or avoided 45.5 visits per 1,000 patients per year) than SNF patients ($p<0.0001$).

We note that ER visits captured in this analysis do not result in hospital admissions. Therefore, these are outpatient visits for acute issues or trauma. The presence of ER visits is not unexpected among rehabilitation patients, as ER visits due to falls or injury may be an indicator of greater patient ambulation.

Exhibit 4.7: Number of ER Visits per 1,000 Patients per Year: Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	861.3	1016.7	-155.4	0.0473
Brain Injury	782.0	825.9	-43.9	0.0024
Cardiac Disorder	753.6	807.0	-53.3	0.1268
Hip Fracture	576.5	613.3	-36.8	0.1247
Hip/Knee Replacement	413.1	432.3	-19.3	0.3124
Major Medical Complexity	796.2	872.3	-76.1	0.1094
Major Multiple Trauma	680.4	643.6	36.8	0.6101
Neurological Disorders	772.0	868.9	-96.9	0.8629
Other Orthopedic	609.3	645.8	-36.6	0.8490
Pain Syndromes	745.0	836.6	-91.6	0.0687
Pulmonary Disorders	881.7	966.3	-84.6	0.1255
Spinal Cord Injuries	621.3	701.6	-80.3	0.0051
Stroke	785.9	823.0	-37.1	<.0001
Overall Average	**642.7**	**688.2**	**-45.5**	**<.0001**

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

While the overall difference in the number of ER visits per 1,000 patients per year is statistically significant, indicating that IRF patient experience fewer ER visits per year, the results and statistical significance by clinical condition category is varied (Exhibit 4.8). IRF patients have statistically lower ER rates for four conditions – amputation, brain injury,

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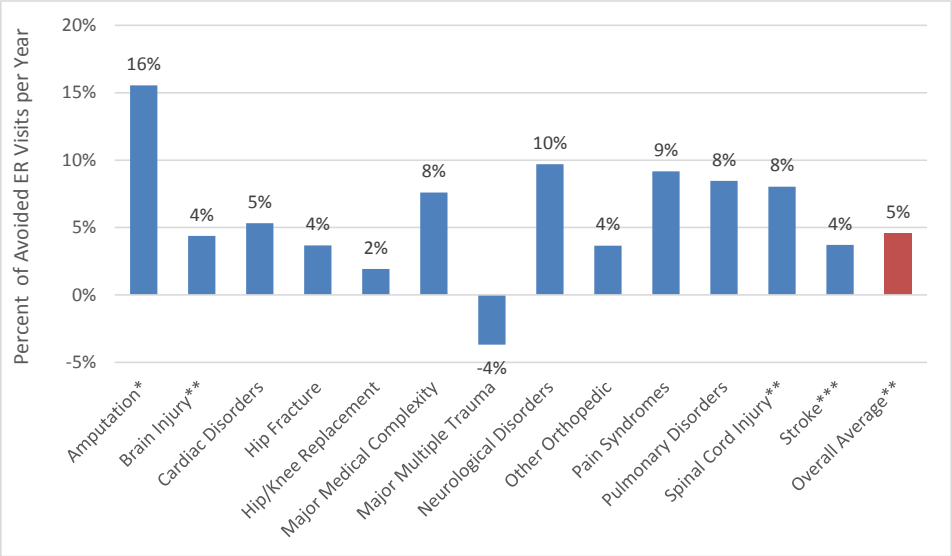
spinal cord injury, and stroke ($p<0.05$). IRF patients treated for major multiple trauma appear to have higher rates of ER visits, but the difference is not statistically significant.

Exhibit 4.8: Average Percent Difference in Number of ER Visits per Year: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.
* = Differences are statistically significant at p-value < 0.05; ** = Differences are statistically significant at p-value < 0.01; *** = Differences are statistically significant at p-value < 0.0001

A hospital readmission indicates a severe or sudden change in a patient's medical stability. While there is no significant difference in the overall hospital readmission rate of patients treated in IRFs compared to SNFs across all conditions (957.7 readmissions per 1,000 patients per year for IRF patients compared to 1,008.1 readmissions per 1,000 patients per year for SNF patients), there are several clinical condition categories that have a significant difference in the hospital readmission rate (Exhibit 4.9).

For five of the 13 conditions, IRF patients experienced significantly fewer hospital readmissions per year than SNF patients – amputation, brain injury, hip fracture, major medical complexity, and pain syndrome (Exhibit 4.10). Patients treated for amputations had the largest difference in hospital readmission rates with IRF patients experiencing 428.3 (or about 43 percent) fewer readmissions per 1,000 patients per year than patients treated in SNFs ($p<0.0001$). Patients treated for pain syndrome in IRFs also had a 10.6 percent lower rate of readmissions per 1,000 patients per year than patients treated in SNFs (a difference of 106.9 readmissions per 1,000 patients per year; $p<0.01$).

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Patients treated for neurological disorders and pulmonary disorders in IRFs experienced significantly higher hospital readmissions than patients treated in the SNFs ($p<0.01$).

Exhibit 4.9: Number of Hospital Readmissions per 1,000 Patients per Year: Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	1538.3	1966.6	-428.3	<.0001
Brain Injury	1094.4	1094.7	-0.3	0.0009
Cardiac Disorder	1351.5	1431.6	-80.1	0.5519
Hip Fracture	838.1	891.1	-53.1	<.0001
Hip/Knee Replacement	499.9	505.2	-5.4	0.0775
Major Medical Complexity	1587.4	1643.1	-55.7	0.0017
Major Multiple Trauma	778.9	815.5	-36.6	0.3360
Neurological Disorders	1234.8	1187.0	47.8	0.0041
Other Orthopedic	866.0	886.4	-20.5	0.9868
Pain Syndromes	1034.8	1141.7	-106.9	0.0053
Pulmonary Disorders	1798.8	1797.6	1.2	0.0058
Spinal Cord Injuries	904.5	933.6	-29.1	0.8471
Stroke	1123.1	1227.1	-104.1	0.9040
Overall Average	**957.7**	**1008.1**	**-50.4**	**0.8931**

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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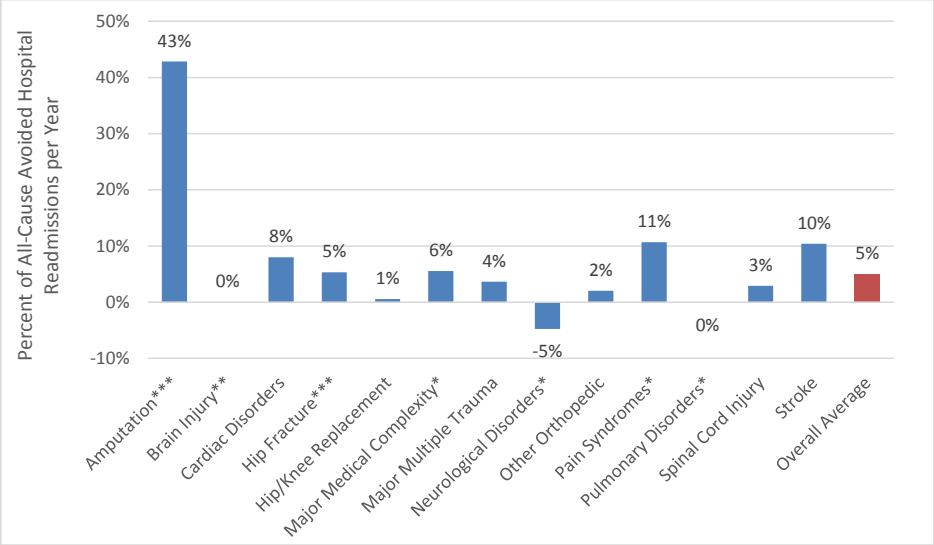
Exhibit 4.10: Average Percent Difference in Number of Hospital Readmissions per Year: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.
* = Differences are statistically significant at p-value < 0.01; ** = Differences are statistically significant at p-value < 0.001; *** = Differences are statistically significant at p-value < 0.0001

Differences in Medicare Payment during the Initial Rehabilitation Stay

In addition to comparing the clinical outcomes of patients treated in an IRF to those treated in a SNF, we compared the Medicare payments on a PMPM basis for the initial rehabilitation stay and the two-year post-rehabilitation period. The care settings included in the PMPM Medicare payments are: inpatient hospital; outpatient hospital; IRF; SNF; HHA; and LTCH.

Despite the shorter length of stay for the initial rehabilitation stay in an IRF compared to a SNF, the Medicare payments are significantly different. Across all clinical condition categories, Medicare payment for patients treated in an IRF is, on average, about $5,975 higher than the payment for patients treated in a SNF ($p<0.0001$) (Exhibit 4.11). This difference in payment could be due to differences in treatment protocols, clinician staffing, and intensity of rehabilitation services. However, it is possible that the intensity of services provided during the rehabilitation stay leads to the significantly better patient outcomes observed in this study.

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Exhibit 4.11: Average Medicare Payment for Initial Rehabilitation Stay: Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	$17,387	$9,051	$8,335	<.0001
Brain Injury	$17,390	$9,012	$8,378	<.0001
Cardiac Disorder	$13,627	$7,568	$6,059	<.0001
Hip Fracture	$15,183	$11,019	$4,164	<.0001
Hip/Knee Replacement	$10,716	$6,056	$4,660	<.0001
Major Medical Complexity	$14,951	$7,802	$7,150	<.0001
Major Multiple Trauma	$16,805	$12,279	$4,527	<.0001
Neurological Disorders	$15,423	$9,707	$5,716	<.0001
Other Orthopedic	$13,619	$9,034	$4,585	<.0001
Pain Syndromes	$12,522	$8,047	$4,475	<.0001
Pulmonary Disorders	$14,763	$7,400	$7,363	<.0001
Spinal Cord Injuries	$16,802	$7,660	$9,142	<.0001
Stroke	$19,149	$10,482	$8,667	<.0001
Overall Average	$14,836	$8,861	$5,975	<.0001

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Differences in Medicare Payment during the Post-Rehabilitation Period

Exhibit 4.12 shows the average PMPM Medicare payment for patients treated in both settings by clinical condition category. While patients treated in an IRF generally have higher PMPM Medicare payments than patients treated in a SNF, the magnitude of the difference and its statistical significance varies by clinical condition category. For example, patients treated for hip/knee replacements have very similar PMPM Medicare payments, with a difference of $43 per month, which is not statistically significant. This suggests that hip/knee replacement patients treated in an IRF have comparable Medicare payments for the two years following the initial rehabilitation stay, and are still able to achieve better clinical outcomes, as described above. However, the difference in PMPM Medicare payment for patients treated for brain injury is greater ($234 PMPM) and is statistically significant. It should be noted that we did find that patients treated for brain injury in an IRF had better outcomes on all measures analyzed than patients treated in SNFs, including lower risk of mortality, more days at home, and fewer ER visits and hospital readmissions.

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Exhibit 4.12: Average Medicare Payment PMPM for Post-Rehabilitation Period: Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	$3,313	$3,693	-$380	0.0114
Brain Injury	$2,199	$1,965	$234	<.0001
Cardiac Disorder	$2,162	$2,186	-$24	0.1889
Hip Fracture	$1,679	$1,598	$80	<.0001
Hip/Knee Replacement	$887	$844	$43	0.3236
Major Medical Complexity	$2,847	$2,696	$151	<.0001
Major Multiple Trauma	$1,609	$1,509	$101	0.0484
Neurological Disorders	$2,401	$2,102	$299	<.0001
Other Orthopedic	$1,639	$1,578	$61	0.0072
Pain Syndromes	$1,794	$1,868	-$74	0.0247
Pulmonary Disorders	$2,918	$2,649	$269	<.0001
Spinal Cord Injuries	$1,848	$1,644	$204	0.0037
Stroke	$2,227	$2,162	$65	<.0001
Overall Average	$1,815	$1,736	$79	N/A*

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.
* Calculated as weighted average across all conditions based on volume (number of matched pairs). Therefore, significance of the difference is not available.

Two additional analyses were conducted to better explain the difference in the PMPM Medicare payments between the two patient cohorts. First, we compared the distribution of PMPM Medicare payments by site of service to determine if the differences in total PMPM payments could be attributed to different utilization patterns (using more or fewer services) or different treatment protocols (using different services). Second, we compared the PMPM Medicare payments over time to see if there are systematic changes in care during the post-rehabilitation period.

The results of the first analysis suggested that patients treated in IRFs consistently used more home health care than the clinically and demographically similar matched patients treated in SNFs. The difference in HHA PMPM payments ranged from $12 more PMPM for hip/knee replacement patients treated in IRFs to $127 more PMPM for neurological disorder patients treated in IRFs ($p<0.0001$). It is interesting to note that patients treated in a SNF consistently had higher use of hospice services, ranging from $4 more PMPM payments for hip/knee replacement patients ($p<0.001$) to $99 more PMPM payments for brain injury patients ($p<0.0001$). Trends in utilization of care across the other settings varied by clinical condition.

Results of the second analysis indicated that after the first month following discharge from the initial rehabilitation stay, the average PMPM payment by month for each patient cohort

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(within each clinical condition category) was comparable. That is, in the month following discharge from the IRF or SNF, the average Medicare payment per month is consistent across patient groups. The driver of the difference in overall PMPM Medicare payments is due to the increased services IRF patients receive immediately (within one month) upon discharge from the initial rehabilitation stay.

Average Medicare Payment per Day

With differences in the average length of stay during the initial rehabilitation stay and the average days alive during the post-rehabilitation period between IRF and SNF patients, we calculated the average difference in Medicare payment per day for the entire episode of care (initial rehabilitation stay plus the post-rehabilitation period). Across all clinical condition categories, patients treated in an IRF experience their significantly improved patient outcomes at an additional cost to Medicare of $12.59 per day while patients are alive over the two-year study window. That is, IRF patients have an average Medicare payment per day of $82.65, compared to $70.06 for patients treated in SNFs (Exhibit 4.13). The average Medicare payment per day is calculated for each individual patient, then averaged across all patients within a clinical condition category. The overall average is calculated as the weighted average payment across all clinical condition categories.

Exhibit 4.13: Average Medicare Payment per Day for Initial Rehabilitation Stay and Post-Rehabilitation Period: Matched IRF and SNF Patients

Clinical Condition Category	IRF	SNF	Difference (IRF minus SNF)	P value
Amputation	$137.27	$133.53	$3.74	0.1732
Brain Injury	$101.36	$79.50	$21.86	<.0001
Cardiac Disorder	$93.75	$83.92	$9.83	0.0683
Hip Fracture	$78.17	$68.40	$9.77	<.0001
Hip/Knee Replacement	$43.64	$35.55	$8.09	<.0001
Major Medical Complexity	$120.27	$101.52	$18.75	<.0001
Major Multiple Trauma	$77.26	$65.78	$11.48	<.0001
Neurological Disorders	$103.51	$82.74	$20.77	<.0001
Other Orthopedic	$73.57	$63.88	$9.69	<.0001
Pain Syndromes	$77.26	$72.22	$5.04	0.4849
Pulmonary Disorders	$123.05	$98.82	$24.23	<.0001
Spinal Cord Injuries	$85.49	$64.83	$20.66	<.0001
Stroke	$104.41	$88.08	$16.33	0.0008
Overall Average	**$82.65**	**$70.06**	**$12.59**	**<.0001**

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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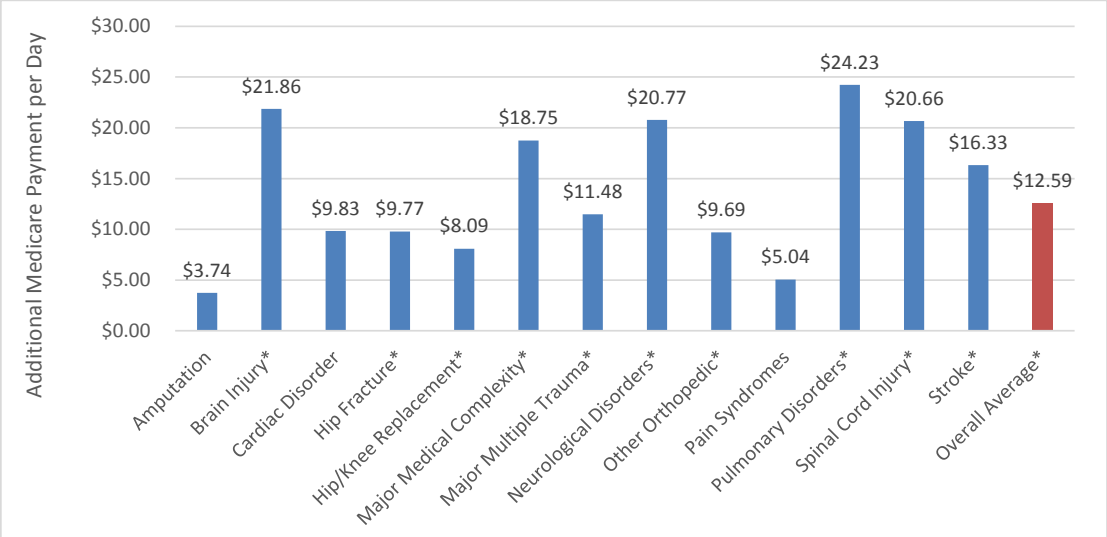
The difference in the average Medicare payment per day varies greatly across conditions. Patients treated for an amputation or pain syndromes in an IRF have an additional cost to Medicare of $3.74 and $5.04 per day, respectively, which are not statistically significant. However, patients treated in IRFs for pulmonary disorders have an average additional Medicare payment of $24.23 per day, which is significant (p<0.0001) (Exhibit 4.14).

Exhibit 4.14: Average Additional Medicare Payment per Day for IRF Care Compared to SNF Care: Matched IRF and SNF Patients



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.
* = Differences are statistically significant at p-value < 0.001

Longitudinal Analysis Summary and Discussion

The results of this longitudinal study suggest that when patients are matched on demographic and clinical characteristics, rehabilitation in IRFs leads to lower mortality, longer life, fewer ER visits and, in some instances, fewer readmissions than rehabilitation in SNFs for the same condition. However, these improved patient outcomes are often associated with statistically greater PMPM or per-day costs to Medicare. The literature and regulations indicate that the care delivered in an IRF is not the same as care delivered in a SNF. Our results suggest that different PAC settings affect patient outcomes.

Exhibit 4.15 summarizes the differences in outcomes for two key clinical condition categories - stroke and cardiac, as well as all conditions overall. Patients with cardiac conditions were discharged significantly sooner from IRFs than patients treated in SNFs (11.9 days earlier). During the post-rehabilitation period, the IRF patients have significantly lower mortality rates, survive their episode longer, and remain in the home longer. While the Medicare payment for their initial rehabilitation stay is higher than

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comparable patients treated in a SNF, there is no significant difference in the average PMPM payment during the post-rehabilitation period. Furthermore, in considering the total payment for the initial rehabilitation stay and post-rehabilitation period, there is no significant difference in the Medicare payment per day. Together, these results suggest that patients treated in the SNF (as opposed to the IRF) are likely to experience worse clinical outcomes at a comparable cost to Medicare.

Stroke patients treated in IRFs are also discharged significantly sooner than patients treated in SNFs (16.5 days earlier). During the post-rehabilitation period, these patients have lower mortality rates, remain in the home longer, and have significantly fewer ER visits. While the Medicare payment for their initial rehabilitation stay and post-rehabilitation period are higher than comparable patients treated in a SNF, these outcomes can be achieved with an additional cost to Medicare of $16.33 per day (over the two-year study period while alive) ($p<0.001$).

Exhibit 4.15: Difference in Outcomes for Patients Treated in IRFs as Compared to SNFs during Two-Year Study Period – Cardiac Conditions, Stroke, and Overall Average (All Conditions)

Difference in Patient Outcomes (Compared to SNF Patients) IRF Patients had:	Cardiac Conditions	Stroke	Overall Average	
Discharge from Initial Rehabilitation Stay	11.9**	16.5**	13.9**	days earlier discharge
Mortality Rate	10.7%**	14.3%**	7.9%**	lower mortality
Additional Days Alive	66.7**	96.8**	51.9**	additional days alive
Additional Days at Home	72.1**	92.0**	51.5**	additional days at home
ER Visits per 1,000 beneficiaries per Year	5.3%	3.7%**	4.5%**	fewer ER visits
Hospital Readmissions per 1,000 beneficiaries per Year	8.0%	10.4%	5.0%	fewer readmissions
Medicare Payment during Initial Rehabilitation Stay for IRF Care	$6,059**	$8,335**	$5,975**	higher Medicare payment
Medicare PMPM Payment during Post-Rehabilitation Period for IRF Care	-$24	$65**	$79	higher Medicare payment PMPM
Medicare Payment per Day for IRF Care (Initial Rehabilitation Plus Post-Rehabilitation)	$9.83	$16.33*	$12.59**	higher Medicare payment per day

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

* = Differences are statistically significance at $p<0.001$; ** = Differences are statistically significance at $p<0.0001$.

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Discussion

One purpose of this research was to determine how the distribution of clinical condition categories changed within and across PAC settings following the implementation of the 60 Percent Rule. Once these trends had been identified, we examined the long-term impact on patient outcomes for receiving rehabilitative care in SNFs as opposed to IRFs for a variety of clinical condition categories. This study serves as the most comprehensive national analysis to date examining the long-term clinical outcomes of clinically similar patient populations treated in IRFs and SNFs, utilizing a sample size of more than 100,000 matched pairs drawn from Medicare administrative claims.

The implementation of the 60 Percent Rule led to an overall decrease in the number of patients treated in IRFs.[51] This impact is consistent with policymakers' goal of redirecting lower severity patients receiving rehabilitation in IRFs into lower cost setting such as SNFs and HHAs.[52] While the proportion of patients treated in IRFs for hip/knee replacements showed the most significant change (a decrease from 25.4 percent of all IRF patients in 2005 to 14.5 percent in 2009), the distribution of other conditions changed as well.

The long-term impact on Medicare beneficiaries for such policies must be considered. Providing rehabilitation in an IRF is generally associated with higher Medicare payments than providing rehabilitation for a comparable patient in a SNF, likely due to differences in cost structures, staffing arrangements, and treatment protocols. However, policies that may incentivize patients to receive care in SNFs as opposed to IRFs may have unintended consequences.

When patients are matched on demographic and clinical characteristics, rehabilitation in IRFs leads to lower mortality, fewer readmissions and ER visits, and more days at home (not in a hospital, IRF, SNF, or LTCH) than rehabilitation in SNFs for the same condition.

This suggests that the care delivered in an IRF is not the same as care delivered in a SNF.

Our results suggest that different PAC settings affect patient outcomes.

[51] Utilization Trends in Inpatient Rehabilitation: Update Through Q2: 2011. (2011). The Moran Company.

[52] Medicare Payment Advisory Commission (Report to the Congress). Medicare Payment Policy. March 2014.

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Discussion

This study demonstrated that for many clinical condition categories, patients treated in IRFs experienced improved patient outcomes including but not limited to lower risk of mortality, more days at home, and lower ER visits and readmission rates. Furthermore, patients with some of these conditions are able to experience these superior outcomes without a negative impact on Medicare payments (considering the Medicare cost for the initial rehabilitation stay and two-year post-rehabilitation period). Therefore, patients redirected from the IRF to the SNF in an attempt to reduce Medicare payments for the initial rehabilitation stay may suffer diminished patient outcomes that impact their quality of life and, in some cases, with comparable long-term Medicare payments.

Through rigorous propensity score matching techniques, patient demographic and clinical characteristics were controlled in order to isolate the impact of the setting in which the patient received care – an IRF or a SNF. There is a notable difference in medical rehabilitation care practices between the two settings.[53] Treatment provided in IRFs is under the direction of a physician and specialized nursing staff.[54] On the other hand, SNFs exhibit greater diversity in practice patterns and lower intensity rehabilitation.[55]

MedPAC and other policymakers are currently considering payment policies that could greatly impact the site of service in which Medicare beneficiaries receive rehabilitation. For instance, under the site-neutral payment policy, Medicare would reimburse IRFs and SNFs the same payment rate for patients treated for strokes, hip fractures, and hip/knee replacements. In the 2014 IRF-PPS Final Rule, CMS noted that "the 13 medical conditions that are listed in [the 60 Percent Rule] are conditions that ''typically'' require the level of intensive rehabilitation that provide the basis of need to differentiate the services offered in IRFs from those offered in other care settings."[56] Despite the acknowledgement that medical rehabilitative services differ in SNFs and IRFs, stroke is included in the site-neutral payment proposals ***and*** is one of the 13 conditions within the 60 Percent Rule. Therefore, based on the results of our analyses, stroke patients treated in SNFs as opposed to IRFs could be harmed. Furthermore, across other clinical conditions, a "pure" site-neutral payment might not adequately compensate IRF providers for certain cases and may contribute the shifting of patients into SNF. (Some proposals, however, provide higher payments to IRFs based on IRF-SNF cost differences).

While our analysis focuses on the immediate implementation of the 60 Percent Rule (2005 through 2009), MedPAC suggests that these trends have continued through 2013, and literature suggests that the outcomes are different between IRFs and SNFs for select

[53] Keith RA. Treatment strength in rehabilitation. *Arch Phys Med Rehabil*. 1997; 90:1269-83.

[54] Harvey RL. Inpatient rehab facilities benefit post-stroke care. *Manag Care*. 2010; 19(1):39-41.

[55] DeJong G, Hsieh C, Gassaway J, et al. Characterizing rehabilitation services for patients with knee and hip replacement in skilled nursing facilities and inpatient rehabilitation facilities. *Arch Phys Med Rehabil*: 2009; 90:1269-83.

[56] 2014 IRF-PPS Final Rule, Federal Register, Volume 78, pg 47844.

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conditions. Therefore, if our longitudinal results are indicative of the current disparity in clinical outcomes between SNFs and IRFs, payment reforms that lead to shifting sites of services for Medicare beneficiaries could adversely and quite significantly affect Medicare beneficiaries' health outcomes.

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Appendix A: Algorithms to Define Clinical Condition Categories

Exhibit A-1: Algorithms for Identifying Clinical Condition Categories across All PAC Settings

Clinical Condition Category	Criteria	ICD-9
Stroke	Presence of Stroke (ICD-9s)	430, 431, 432.0-432.9, 433.x1, 434.x1, 436
	or Effects of Stroke (ICD-9s)	438.0-438.9 (late effects of cerebrovascular disease)
Congenital Deformities	Presence of Congenital Deformities (ICD-9s)	741.00-741.03, 741.90-741.93, 728.3, 742.0-742.8, 754.1-754.89, 755.0-755.9, 756.0-756.9
Spinal Cord Injury	Presence of Spinal Cord Injury (ICD-9s)	0.150, 170.2, 192.2-192.3, 198.3, 198.4, 225.3, 225.4, 237.5, 237.6, 239.7, 323.9, 324.1, 441.00-441.03, 441.1, 441.3, 441.5, 441.6, 721.1, 721.41, 721.42, 721.91, 722.71-722.73, 723.0, 724.00-724.09, 806.00-806.9, 953.0-953.8, 952.00-952.8
	or Effects of Spinal Cord Injury (ICD-9s)	907.2 (late effect of spinal cord injury)
	or NTSCI/TSCI RIC	04.110-04.130, 04.210-04.230 NTSCI RIC: 05; TSCI: 04
Amputation	Presence of Amputation (ICD-9s)	ICD 9 Procedure code :- 84.00 – 84.19 or DRG codes :- 474, 475, 476
Brain Injury	Presence of Brain Injury (ICD-9s)	036.0, 0.36.1, 049.0-049.9, 191.0-191.9, 192.1, 198.3, 225.0, 225.1, 225.2, 237.5, 237.6, 239.6, 323.0-323.9, 324.0, 331.0, 331.2, 331.3, 348.1, 800.60-800.99, 801.60-801.99, 803.60-803.99, 851.10-851.19, 851.30-851.39, 851.50-851.59, 851.70-851.79, 851.90-851.99, 852.10-852.19, 852.30-852.39, 852.50-852.59, 853.00-853.09, 853.10-853.19, 854.10-854.19, 800.10-800.49, 801.10-801.49, 803.10-803.49, 850.0-850.9, 851.00-851.09, 851.20-851.29, 851.40-851.49, 851.60-851.69, 851.80-851.89, 852.00-852.09, 852.20-852.29, 852.40-852.49, 854.00-854.09
	or Effects of Brain Injury (ICD-9s)	905.0 (late effect of fracture of skull and face bones)907.0 (late effect of intracranial injury without mention of skull fracture)
Knee/Hip Replacement	Hip Replacement(s) or Knee Replacement(s)	696.0, 711.0, 714-714.2, 714.30-714.33, 714.4, 715.x5, 715.x6, 716.x5, 716.x6, 720.0; MS-DRG 469-470; ICD-9 procedure code: 81.51-81.55 Note: if admission is following revision of implant, use: 996.4, 996.66, 996.67, 996.77-996.79

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Appendix A

Clinical Condition Category	Criteria	ICD-9
	Other Orthopedic	170.2-170.8, 198.5, 719.5, 719.00-719.89, 733.11-733.19, 754.2, 823.00-823.91; MS-DRG 466-468
Major Multiple Trauma	2 or More: TBI, TSCI, or Multiple Fractures	2 or more ICD-9-CM codes for traumatic impairment codes 2 or more ICD-9-CM codes for trauma to multiple systems or sites, but not brain or spinal cord 823-828 (all)
Hip Fracture	Presence of Hip Fracture (ICD-9s), femur, pelvis	820.00-820.9, 821.00-821.11, 821.20-821.39, 808
Burns	Presence of Burns (ICD-9s)	941.00-941.59, 942.00-942.59, 943.00-943.59, 944.00-944.58, 945.00-945.59, 946.0-946.5
Neurological Disorders	Presence of Neurological Disorders (ICD-9s)	340, 332.0-332.1, 356.0-356.8, 357.5-357.8, 343.0-343.8, 335.20-335.9, 358.0, 359.0-359.4, 333.0-333.7, 333.80-333.99, 334.0-334.3, 334.8, 337.0, 337.20-337.29, 337.3, 337.9, 341.0-341.8, 357.0
	or Effects of Neurological Disorders (ICD-9s)	(Very low volume)
Rheumatoid and Other Arthritis (likely secondary condition)	Presence of Rheumatoid and Other Arthritis (ICD-9s)	714.0-714.2, 714.30-714.33, 714.4, , 696.0, 710.0, 710.1, 710.3, 710.4, 711.0, 716.00-716.99, 720.0
	and Significant Functional Impairment of ambulation	Reduced performance on ADLs
	and Therapy Preceding IRF Admission	Revenue center: 420, 421, 422, 423, 424, 429, (430-434, 439,) 530, 531, 539
Osteoarthritis	2 or more joints – elbow, hip, knee, shoulder – not with prosthetic	
	Joint deformity	
	Substantial loss of range of motion, atrophy, significant functional impairment	(Very low volume)
	Osteoarthrosis and allied disorders	715.00 – 715.99
Systemic Vasculidities	Presence of Systemic Vasculidities (ICD-9s)	446, 446.0, 446.1, 446.2, 446.20, 446.21, 446.29, 446.3, 446.4, 446.5, 446.6, 446.7
	and Significant Functional Impairment	(Very low volume)
	and Therapy Preceding IRF Admission (Revenue Centers)	0118, 0128, 0138, 0148, 0158 420, 421, 422, 423, 424, 429, (430-434, 439)
Pain Syndromes	Presence of pain (ICD-9s)	721.0-721.91, 722.0-722.93, 723.0-723.8, 724.00-724.9, 729.0-729.5, 846.0-846.9, 847.0-847.4
Cardiac Disorders	Presence of cardiac disorders (ICD-9s)	410.00-410.92, 411.0-411.89, 414.00-414.07, 414.10-414.9, 427.0-427.9, 428.0-428.9
Pulmonary Disorders	Presence of pulmonary disorders (ICD-9s)	491.0-491.8, 492.0-492.8, 493.00-493.92, 494.0-494.1, 496
Other Disabling Impairments	Presence of other disabling impairments "not elsewhere defined"	
Developmental Disability	Presence of developmental disorders (ICD-9s)	317, 318.0-318.2, 319
Debility	Presence of debility (ICD-9s)	728.2, 728.9, 780.71, 780.79 ("code specific medical condition primarily responsible for the patient's debility")

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Appendix A

Clinical Condition Category	Criteria	ICD-9
Medically Complex Conditions	Presence of infections (ICD-9s)	0.13.0-013.9, 0.38.0-038.9, 041.00-041.09, 041.10-041.19, 041.81-041.9, 042
	Presence of neoplasms (ICD-9s)	Two or more of: 140.0-149.9, 150.0-159.9, 160.0-165.9, 170.0-170.9, 171.0-171.9, 172.0-172.9, 173.0-173.9, 174.0-174.9, 175.0-175.9, 176.0-176.9, 179-189.9, 200.00-200.88, 201.00-201.98, 202.00-202.98, 203.00-203.81, 204.00-204.91, 205.00-205.91, 206.00-206.91, 207.00-208.91, V58.0, V58.1
	Presence of nutrition (ICD-9s)	250.00-250.93, 276.0-276.9
	Presence of circulatory disorders (ICD-9s)	403.00-403.91, 404.00-404.93, 414.00-414.07, 428.0-428.9, 443.0-443.9, 453.0-453.9
	Presence of respiratory disorders (ICD-9s)	480.0-480.9, 481.0-486, 507.0-507.8, 518.0-518.89
	Presence of terminal care (ICD-9s)	"End-stage conditions –e.g., cancer, Alzheimer's disease, renal failure, congestive heart failure, stroke, acquired immunodeficiency syndrome (AIDS), Parkinsonism, emphysema"
	Presence of skin disorders (ICD-9s)	681.10-681.11, 682.0-682.8, 707.0, 707.10-707.8, 870.0-879.9, 890.0-894.2
	Presence of medical/surgical complications (ICD-9s)	996.00-996.79, 996.80-996.89, 996.90-996.99, 997.00-997.99, 998.0-998.9
	Presence of other medically complex conditions (ICD-9s)	584.5-584.9, 585.x, 595.0-595.89, 597.0-597.89

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Appendix B: Cross-Sectional Results in Other PAC Settings

Exhibit B.1 presents the distribution of clinical condition categories among SNFs between 2005 and 2009. Across all years, major medical complexities was the largest clinical condition category, representing at least one third of all admissions each year. The proportion of this condition increased from 33.8 percent in 2005 to 37.5 percent in 2009. The proportion of patients treated for hip/knee replacements in SNFs had a modest increase from 2005 to 2009, while hip fractures and cardiac disorders all decreased as a proportion of all patients.

Exhibit B.1: Distribution of Clinical Condition Categories among SNFs (2005-2009)

Clinical Condition Category	2005	2006	2007	2008	2009	Percentage Point Change (2005-2009)
Hip/Knee Replacement	7.4%	7.3%	7.5%	7.6%	8.0%	0.6%
Stroke	7.1%	6.7%	6.5%	6.3%	6.2%	-1.0%
Hip Fracture	10.2%	10.1%	10.1%	9.9%	9.8%	-0.4%
Major Medical Complexity	33.8%	35.3%	36.6%	36.9%	37.5%	3.7%
Cardiac Disorders	18.1%	17.8%	17.2%	17.0%	16.7%	-1.4%
Neurological Disorders	1.9%	2.0%	2.0%	2.0%	1.9%	0.0%
Other Orthopedic	1.9%	2.0%	2.2%	2.3%	2.3%	0.5%
Brain Injury	3.5%	3.5%	3.5%	3.5%	3.3%	-0.2%
Spinal Cord Injury	1.5%	1.5%	1.6%	1.6%	1.6%	0.1%
Amputation	2.1%	1.7%	1.0%	0.9%	0.9%	-1.2%
Pulmonary Disorders	7.5%	7.0%	6.8%	7.0%	6.8%	-0.7%
Pain Syndromes	2.4%	2.5%	2.5%	2.5%	2.5%	0.0%
Major Multiple Trauma	0.5%	0.6%	0.6%	0.6%	0.6%	0.1%
Debility	1.9%	1.8%	1.8%	1.8%	1.7%	-0.2%
All Other	0.3%	0.3%	0.3%	0.2%	0.2%	0.0%

Percentages may not total 100 percent due to rounding.
Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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Appendix B

Exhibit B.2 presents the distribution of clinical condition categories among HHAs between 2005 and 2009. The proportion of major medical complexity and cardiac disorders represented the majority of admissions each year. The proportion of patients treated for major medical complexities increased by 1.4 percentage points, while the proportion for cardiac disorders decreased by 2.7 percentage points over this period. The proportion of hip/knee replacements increased from 10.4 percent in 2005 to 12.8 percent in 2009. This suggest that as the proportion of patients treated for hip/knee replacements decreased significantly among IRFs, the proportion among SNFs and HHAs increased.

Exhibit B.2: Distribution of Clinical Condition Categories among HHAs (2005-2009)

Clinical Condition Category	2005	2006	2007	2008	2009	Percentage Point Change (2005-2095)
Hip/Knee Replacement	10.4%	10.6%	11.4%	11.5%	12.8%	2.4%
Stroke	4.0%	3.9%	3.8%	4.1%	4.0%	0.0%
Hip Fracture	1.5%	1.5%	1.5%	1.4%	1.3%	-0.2%
Major Medical Complexity	34.2%	35.3%	36.1%	35.8%	35.6%	1.4%
Cardiac Disorders	27.3%	26.6%	25.5%	24.9%	24.6%	-2.7%
Neurological Disorders	1.4%	1.4%	1.5%	1.5%	1.4%	0.0%
Other Orthopedic	2.1%	2.2%	2.4%	2.4%	2.5%	0.4%
Brain Injury	1.9%	1.9%	1.9%	1.8%	1.8%	-0.1%
Spinal Cord Injury	1.6%	1.7%	1.7%	1.7%	1.7%	0.1%
Amputation	1.7%	1.4%	0.8%	0.7%	0.7%	-1.0%
Pulmonary Disorders	10.7%	10.1%	10.1%	10.9%	10.6%	-0.1%
Pain Syndromes	2.2%	2.2%	2.2%	2.2%	2.0%	-0.1%
Major Multiple Trauma	0.2%	0.2%	0.2%	0.2%	0.2%	0.0%
Debility	0.6%	0.8%	0.8%	0.6%	0.6%	0.0%
All Other	0.3%	0.3%	0.3%	0.2%	0.2%	0.0%

Percentages may not total 100 percent due to rounding.

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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Exhibit B.3 presents the distribution of clinical condition categories among LTCHs between 2005 and 2009. Major medical complexity represented the largest proportion of LTCH admission each year, with an increasing proportion between 2005 and 2008. This proportion increased markedly from 55.9 percent in 2005 to 67.1 percent in 2009. The increase in major medical complexity proportions appeared to be offset by smaller proportional decreases in amputation, cardiac disorder, stroke, and hip fracture cases.

Exhibit B.3: Distribution of Clinical Condition Categories among LTCHs (2005-2009)

Clinical Condition Category	2005	2006	2007	2008	2009	Percentage Point Change (2005-2009)
Hip/Knee Replacement	1.6%	1.1%	0.9%	0.6%	0.4%	-1.2%
Stroke	6.2%	5.7%	4.9%	4.8%	4.2%	-2.0%
Hip Fracture	3.8%	3.2%	2.9%	2.2%	2.0%	-1.8%
Major Medical Complexity	55.9%	59.9%	64.8%	66.6%	67.1%	11.2%
Cardiac Disorders	11.4%	10.9%	10.0%	9.1%	9.0%	-2.4%
Neurological Disorders	0.8%	0.7%	0.7%	0.6%	0.7%	-0.1%
Other Orthopedic	1.5%	1.5%	1.4%	1.3%	1.6%	0.2%
Brain Injury	1.7%	2.0%	1.8%	1.9%	1.9%	0.1%
Spinal Cord Injury	1.4%	1.4%	1.2%	1.3%	1.2%	-0.2%
Amputation	6.7%	5.7%	2.7%	2.6%	3.0%	-3.7%
Pulmonary Disorders	7.2%	6.5%	7.0%	7.1%	7.3%	0.0%
Pain Syndromes	0.6%	0.5%	0.6%	0.6%	0.5%	-0.1%
Major Multiple Trauma	0.5%	0.5%	0.5%	0.5%	0.5%	0.0%
Debility	0.2%	0.1%	0.1%	0.1%	0.1%	-0.1%
All Other	0.5%	0.5%	0.6%	0.6%	0.7%	0.2%

Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

Exhibit B.4 shows that the relative proportion of IRF patients by clinical condition category across four census regions (i.e., Northeast, South, Midwest, and West) reflect the nationwide distribution for each study year. In each region, hip/knee replacement, stroke, and hip fracture conditions represented the greatest relative proportion of IRF cases. The marked decline in the proportion of hip/knee replacements is also observed across census regions, although this change appears somewhat less pronounced in the Northeast (a reduction in proportion of 6.5 percent) compared to the Midwest, South, and West, with a reduction in proportions of 11.5 percent, 12.6 percent, and 11.6 percent, respectively.

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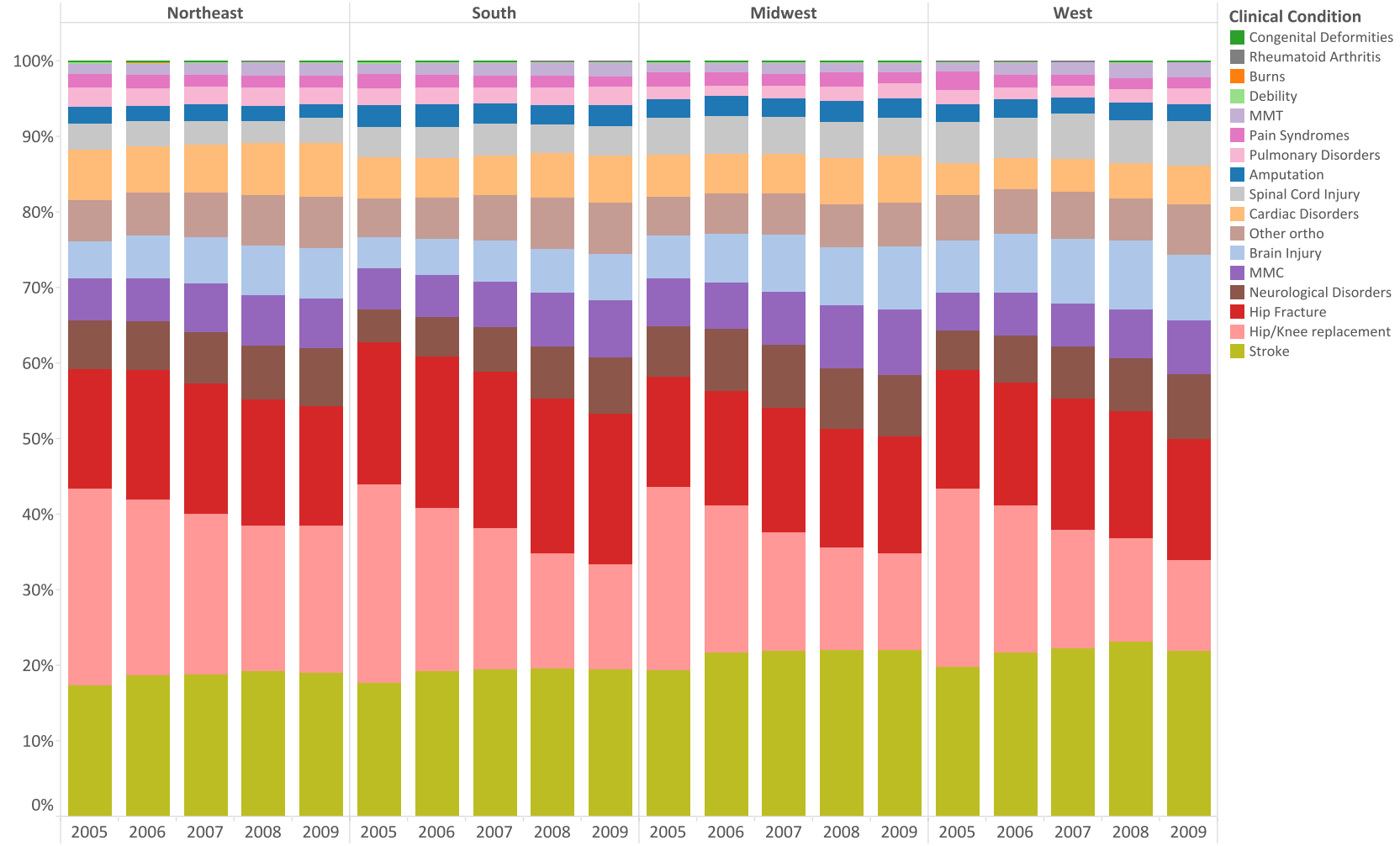
Exhibit B.4: Distribution of Clinical Condition Categories among IRFs by Census Region (2005-2009)



Source: Dobson | DaVanzo analysis of research identifiable 20 percent sample of Medicare beneficiaries (and 100 percent sample of IRF beneficiaries), 2005-2009.

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