Skilled Nursing Facilities
Patient-Driven Payment Model
Technical Report

April 2018

EXECUTIVE SUMMARY

This report introduces a comprehensive alternative to the current resident classification model (case-mix adjustment) within the skilled nursing facility (SNF) prospective payment system (PPS). The current payment model for residents of SNFs in Medicare Part A-covered stays classifies residents into clinically relevant groups for the purpose of determining how much Medicare will reimburse SNFs for the costs of providing care. Acumen developed an alternative classification for SNF residents in Medicare Part A-covered stays pursuant to a contract with the Centers for Medicare & Medicaid Services (CMS). CMS originally contracted with Acumen on 9/20/2012 to identify and evaluate possible alternatives to the existing SNF PPS therapy reimbursement model. Subsequently, the scope of the project was expanded to develop alternatives to the SNF PPS case-mix adjustment methodology in its entirety (Case-mix adjustment adjusts Medicare payments to facilities based on characteristics of the resident for whom care was provided). This executive summary provides background on the current SNF PPS, introduces the Patient-Driven Payment Model (PDPM), and describes the advantages of the recommended reimbursement model.

Current SNF PPS

This section presents an overview of the current SNF PPS and describes refinements that could improve payment accuracy and incentives.

Overview

In the Balanced Budget Act of 1997, Congress amended the Social Security Act to require the Secretary of Health and Human Services to establish a SNF PPS by July 1, 1998. The PPS was designed to include all SNF services covered under Medicare Part A except for approved educational activities. A case-mix-adjusted PPS attempts to predict the cost to treat patients based on their diagnosis, services utilized, and/or other indications of resource use. Based on staff time studies conducted in 1995 and 1997, CMS identified three primary predictors of cost for SNF residents—clinical characteristics, activities of daily living (a measure of functional assistance required by a resident), and skilled services received (e.g., rehabilitation, extensive services, or IV medication)—and based the resident classification system on these characteristics. In the current RUG-IV model, SNF facilities are required to use the Minimum Data Set (MDS) 3.0 assessment tool to assign residents to one of 66 resource utilization groups (RUGs), also known as case-mix groups. While a variety of variables can factor into resident classification under RUG-IV, a large majority of SNF residents receive therapy, and their case-mix group is determined primarily by the number of therapy minutes they receive. CMS assigns a case-mix index (CMI) to each RUG based on the average cost of a SNF resident in that payment group. CMS calculates separate CMIs for nursing and therapy services. The CMI is multiplied by a base rate to determine payment for each day of care. Figure 1 illustrates how

payment is calculated under RUG-IV. Not shown is the adjustment for geographic differences in wages. In addition to case-mix adjustment, the Social Security Act also requires that payment under the SNF PPS be made on a per-diem basis.[1]

Figure 1: Illustration of RUG-IV Payment
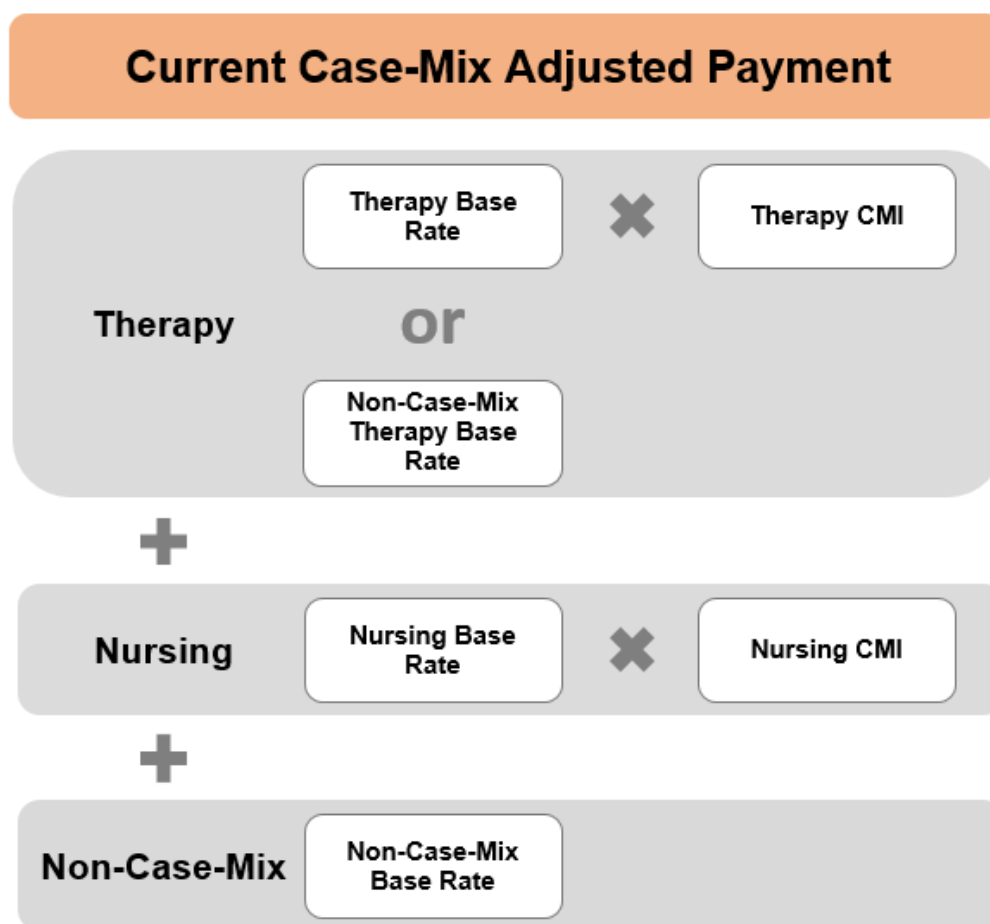
Since the SNF PPS was implemented, CMS has made several revisions to the payment system. In 2001, CMS contracted with the Urban Institute to study and develop refinements to the PPS that would better address medically complex beneficiaries. The Urban Institute's primary finding was that the RUG-III model in use at the time did not adequately account for the high utilization of non-therapy ancillary (NTA) services by residents who receive rehabilitation and extensive services. Based on this finding, CMS in 2006 implemented the RUG-53 classification, which incorporated nine additional case-mix groups in the new Rehabilitation Plus Extensive Services category. In 2006-07, CMS conducted a new staff time study, the Staff Time

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[1] Health Care Financing Administration (HCFA), Department of Health and Human Services (HHS), "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities," *Federal Register* 63 no. 91 (May 12, 1998): 26252-26316, https://www.gpo.gov/fdsys/pkg/FR-1998-05-12/pdf/98-12208.pdf.

and Resource Intensity Verification Project (STRIVE), to develop more comprehensive revisions to the payment system. Notable changes in the resident classification system that were developed using the STRIVE data included the addition of new RUGs, changes in the allocation of therapy minutes administered to multiple patients at once (i.e., concurrent therapy), and modifications to the scale used to measure activities of daily living (ADLs).[2] CMS published the final regulations establishing the revised payment model, RUG-IV, in August 2009. The new resident classification was effective as of fiscal year (FY) 2011.

Refinements to SNF PPS Can Improve Payment Accuracy

As noted above, for a large majority of SNF residents, payment is determined primarily by the number of therapy minutes they receive under RUG-IV. The current payment model does not fully consider the wide range of clinical characteristics that influence the relative resource use of SNF residents. Strengthening the relationship between payment and clinical characteristics promotes payment accuracy by providing SNFs the resources necessary to meet the care needs of a diverse range of patient types. Researchers have recommended two key reforms to improve payment accuracy and strengthen incentives to provide an appropriate level and quality of care:

(i) Remove therapy minutes as a determinant of payment and create a new therapy payment model in which payment is linked to differences in clinical characteristics.[3] [4]

(ii) Create a separate payment component for NTA services, using resident characteristics to predict utilization of these services.[5] [6]

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[2] Eby, Jean, Dane Pelfrey, Kathy Langenberg, Brant Fries, Robert Godbout, David Maltiz, and David Oatway, "Staff Time and Resource Intensity Verification Project Phase II," *Iowa Foundation for Medical Care, University of Michigan, Stepwise Systems, CareTrack Systems*, *Baltimore, MD* (2011), https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/TimeStudy.html.

[3] Carter, Carol, Bowen Garrett, and Doug Wissoker, "Reforming Medicare Payments to Skilled Nursing Facilities to Cut Incentives for Unneeded Care and Avoiding High-Cost Patients," *Health Affairs*, 31 (2012), 1303-1313, content.healthaffairs.org/content/31/6/1303.long.

[4] Carter, Carol, Bowen Garrett, and Doug Wissoker, "The Need to Reform Medicare's Payments to Skilled Nursing Facilities is as Strong as Ever," Urban Institute, Medicare Payment Advisory Commission (2015), http://www.urban.org/sites/default/files/publication/39036/2000072-The-Need-to-Reform-Medicare-Payments-to-SNF.pdf.

[5] Carter, Carol, Bowen Garrett, and Doug Wissoker, "Reforming Medicare Payments to Skilled Nursing Facilities to Cut Incentives for Unneeded Care and Avoiding High-Cost Patients," 1303-1313.

[6] Carter, Carol, Bowen Garrett, and Doug Wissoker, "The Need to Reform Medicare's Payments to Skilled Nursing Facilities is as Strong as Ever."

Patient-Driven Payment Model (PDPM)

This section describes Acumen's recommendations, including an overview of the PDPM reimbursement model, how payment would be calculated under PDPM, and determinants of payment for each recommended payment component.

Overview

Based on extensive investigations of the relationship between resident characteristics and utilization of SNF resources, Acumen developed a new, comprehensive reimbursement model, the Patient-Driven Payment Model (PDPM). PDPM consists of the following five case-mix-adjusted payment components:

- **PT:** covers utilization of physical therapy (PT)

- **OT:** covers utilization of occupational therapy (OT)

- **SLP:** covers utilization of speech-language pathology (SLP) services

- **Nursing:** covers utilization of nursing services and social services

- **NTA:** covers utilization of non-therapy ancillary (NTA) services

Additionally, PDPM would also maintain the existing non-case-mix component to cover utilization of SNF resources that do not vary according to resident characteristics. These six components are shown in Figure 2. For three of the case-mix-adjusted components, PT, OT, and NTA, PDPM includes variable per-diem payment adjustments that modify payment based on changes in utilization of these services over the course of a stay.

Figure 2: Patient-Driven Care Under PDPM
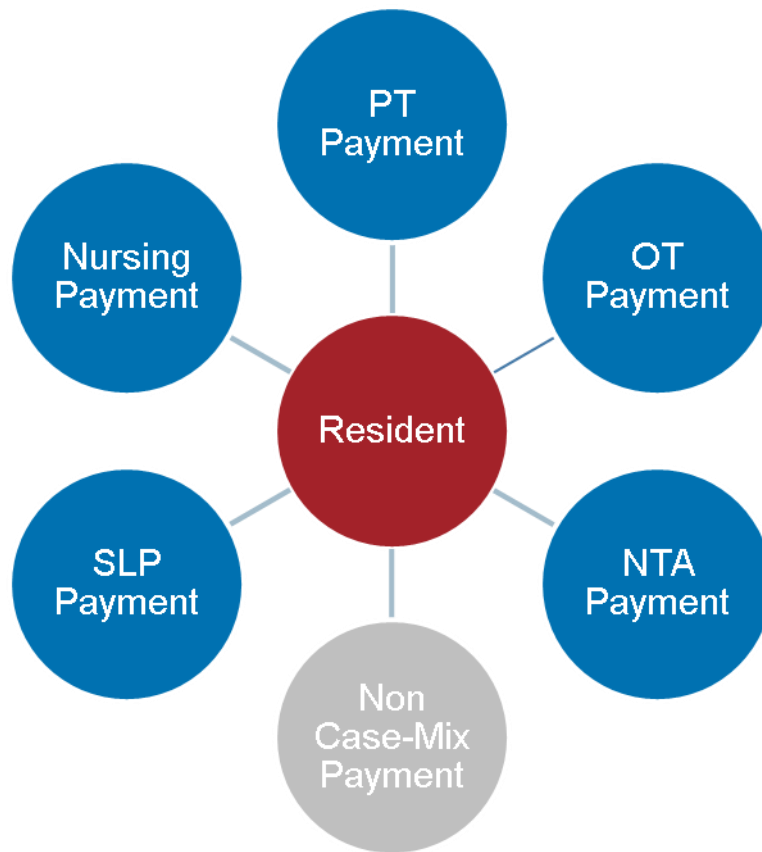
Calculation of Payment Under PDPM

Similar to the current RUG-IV model, per-diem payment under PDPM would be determined by two primary factors: base rates that correspond to each component of payment discussed above and CMIs that correspond to each payment group. Each resident would be classified into a resident group for each of the five case-mix-adjusted components. The base rate for each case-mix-adjusted component would be multiplied by the CMI corresponding to the assigned resident group. Additionally, as noted above, separate adjustments would be applied to each resident's PT, OT, and NTA payments depending on the day of the stay. Figure 3 illustrates how payment for a given day of SNF care would be calculated for a resident. Not shown is the adjustment for geographic differences in labor costs.

Figure 3: Illustration of Payment under PDPM
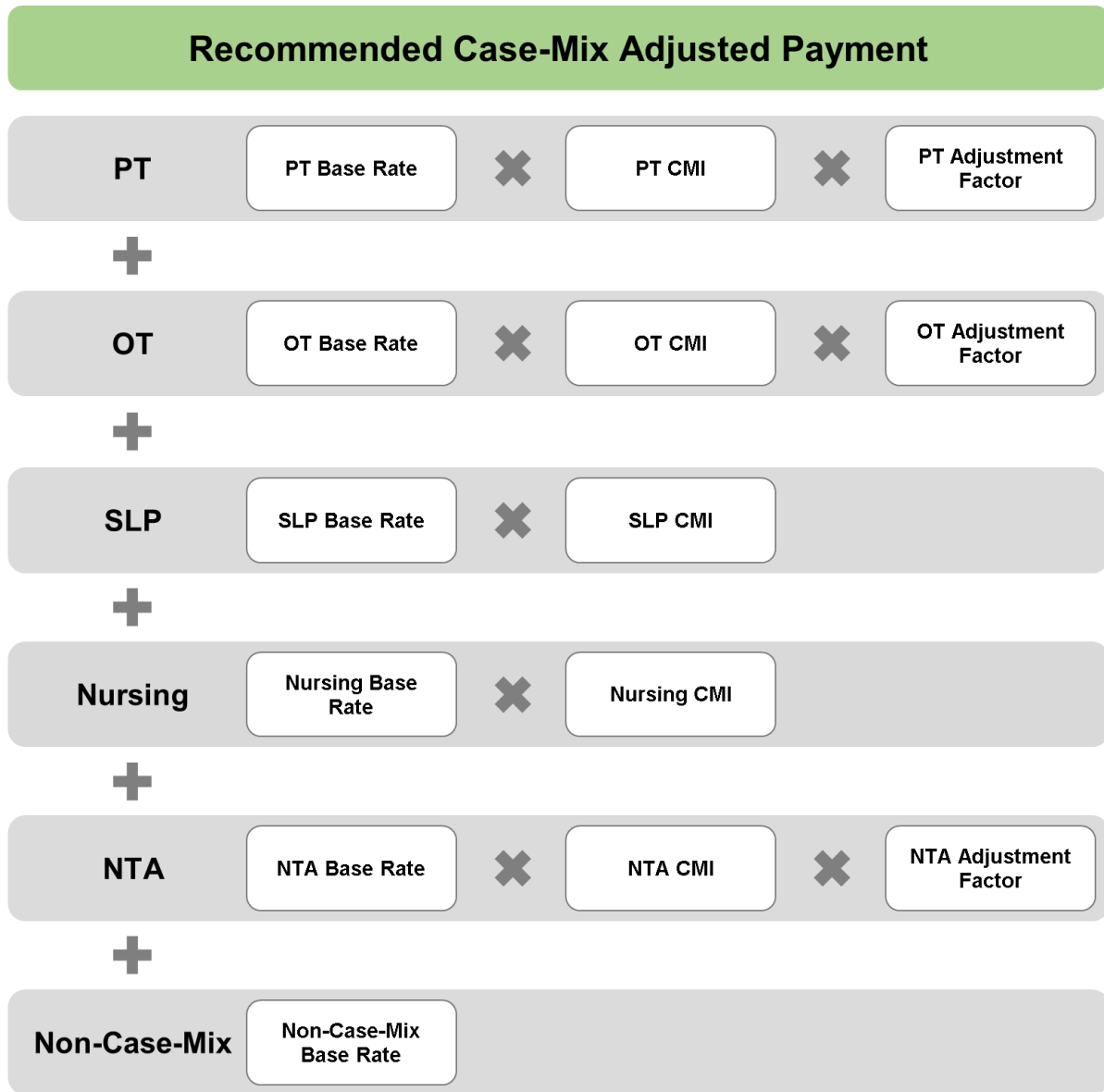
Determinants of Payment Under PDPM

Table 1 shows the determinants of payment for each case-mix-adjusted component in PDPM. The non-case-mix component is not shown, as it is not dependent on resident characteristics. As outlined in Table 1, PT and OT payment would be based on the primary reason for SNF care and functional status at admission. SLP payment would be based on the primary reason for SNF care, cognitive status at admission, SLP-related comorbidities, and the presence of a swallowing disorder or a mechanically altered diet. Nursing payment would be based on clinical information from the SNF stay, functional status, extensive services received,

the presence of depression, and restorative nursing services received. NTA payment would be based on the presence of comorbidities and extensive services received. PT, OT, and NTA payments would also vary based on the point in the stay.

Table 1: Determinants of Payment in PDPM

PT	OT	SLP	Nursing	NTA
• Primary reason for SNF care • Functional status	• Primary reason for SNF care • Functional status	• Primary reason for SNF care • Cognitive status • Presence of swallowing disorder or mechanically altered diet • Other SLP-related comorbidities	• Clinical information from SNF stay • Functional status • Extensive services received • Presence of depression • Restorative nursing services received	• Comorbidities present • Extensive services received
• Point in the stay (variable per diem adjustment)	• Point in the stay (variable per diem adjustment)			• Point in the stay (variable per diem adjustment)

Advantages of PDPM

PDPM incorporates the two major recommendations from the research community and the Medicare Payment Advisory Commission (MedPAC): it removes therapy minutes as the basis for therapy payment and it establishes a separate case-mix-adjusted component for NTA services, thereby mitigating financial incentives to provide excessive therapy and improving allocation of system resources to medically complex beneficiaries. Table 2 summarizes the key advantages of PDPM.

Table 2: Summary of PDPM

Advantages of PDPM
• Removes therapy minutes as the basis for therapy payment
• Establishes separate case-mix-adjusted component for NTA services, thereby improving targeting of resources to medically complex beneficiaries and increasing payment accuracy for these services
• Enhances payment accuracy for nursing services by making nursing payment dependent on a wide range of clinical characteristics (as originally considered for RUG-IV) rather than being primarily a function of therapy minutes and functional status
• Improves targeting of resources to beneficiaries with diverse therapy needs by dividing single therapy component into three separate case-mix-adjusted components: PT, OT, and SLP
• Provides additional resources to facilities for treating potentially vulnerable populations, including beneficiaries with the following characteristics: high NTA utilization, extensive services (ventilator, respirator, or infection isolation), dual enrollment in Medicare and Medicaid, end-stage renal disease (ESRD), longer prior inpatient stays, diabetes, wound infections, IV medication, bleeding disorders, behavioral issues, chronic neurological conditions, and bariatric care
• Enhances payment accuracy for all SNF services by: (1) basing payment for each component on predicted resource utilization associated with clinically-relevant resident characteristics and (2) introducing variable per-diem payment adjustments to track changes in resource use over a stay
• Promotes consistency with other Medicare and post-acute payment settings by basing resident classification on objective clinical information while minimizing the role of service provision in determination of payment

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LIST OF ACRONYMS

ADL	Activities of daily living
AIDS	Acquired Immune Deficiency Syndrome
ARD	Assessment reference date
ASHA	American Speech-Language-Hearing Association
BBA	Balanced Budget Act of 1997, Pub. L. 105-33
BBRA	Medicare, Medicaid, and SCHIP Balanced Budget Refinement Act of 1999, Pub. L. 106-113
BIMS	Brief interview for mental status
BIPA	Medicare, Medicaid, and SCHIP Benefits Improvement and Protection Act of 2000, Pub. L. 106-554
BLS	Bureau of Labor Statistics
CAH	Critical access hospital
CARE	Continuity Assessment Record and Evaluation
CART	Classification and regression trees
CASPER	Certification and Survey Provider Enhanced Reporting
CBSA	Core-based statistical area
CC	Condition category
CCN	CMS Certification Number
CCR	Cost-to-charge ratio
CFR	Code of Federal Regulations
CFS	Cognitive Function Scale
CMI	Case-mix index
CMS	Centers for Medicare & Medicaid Services
COT	Change of Therapy
CPS	Cognitive Performance Scale
CWF	Common Working File
ESRD	End-stage renal disease

FFS	Fee-for-service
FR	Federal Register
FY	Fiscal year
GAO	U.S. Government Accountability Office
HCFA	Health Care Financing Administration
HCPCS	Healthcare Common Procedure Coding System
HHS	U.S. Department of Health and Human Services
HIPPS	Health Insurance Prospective Payment System
HIV	Human Immunodeficiency Virus
ICD-9	International Classification of Diseases, 9th Revision
ICD-10	International Classification of Diseases, 10th Revision
ICU	Intensive care unit
IMPACT	Improving Medicare Post-Acute Care Transformation Act of 2014, Pub. L. 113-185
IPPS	Inpatient prospective payment system
IRF	Inpatient Rehabilitation Facility
IRF-PAI	Inpatient Rehabilitation Facility Patient Assessment Instrument
IV	Intravenous
LASSO	Least Absolute Shrinkage and Selection Operator
LPN	Licensed practical nurse
LTC	Long-term care
LTCH	Long-term care hospital
MACRA	Medicare Access and CHIP Reauthorization Act of 2015, Pub. L. 114-10
MAP	Measures Application Partnership
MBI	Market Basket Index
MDS	Minimum data set
MedPAC	Medicare Payment Advisory Commission

MMA	Medicare Prescription Drug, Improvement, and Modernization Act of 2003, Pub. L. 108-173
MSA	Metropolitan statistical area
MS-DRG	Medical Severity-Diagnosis Related Group
NAICS	North American Industry Classification System
NECMA	New England County Metropolitan Area
NF	Nursing facility
NQF	National Quality Forum
NRST	Non-Resident Specific Time
NST	Non-Study Time
NTA	Non-therapy ancillary
OASIS	Outcome and Assessment Information Set
OES	Occupation and Employment Survey
OIG	The Office of the Inspector General, U.S. Department of Health and Human Services
OLS	Ordinary least squares
OMB	Office of Management and Budget
OMRA	Other Medicare Required Assessment
ONTA	Other Non-therapy ancillary
OT	Occupational therapy
PAC	Post-acute care
PAMA	Protecting Access to Medicare Act of 2014, Pub. L. 113-93
PDPM	Patient-Driven Payment Model
POS	Provider of Services
PPS	Prospective Payment System
PT	Physical therapy
RAI	Resident assessment instrument
RCS-I	Resident Classification System, Version I

RIC   Rehabilitation Impairment Category

RN   Registered nurse

RST   Resident Specific Time

RUG   Resource utilization group

RUG-III   Resource Utilization Groups, Version 3

RUG-IV   Resource Utilization Groups, Version 4

RUG-53   Refined 53-Group RUG-III Case-Mix Classification System

RUGAI   Resource utilization group assessment indicator

SE   Standard error

SLP   Speech-language pathology

SNF   Skilled nursing facility

SNF PMR   Skilled Nursing Facility Payment Models Research

SSA   Social Security Act

STM   Staff time measurement

STRIVE   Staff time and resource intensity verification project

TEP   Technical expert panel

TOB   Type of Bill

WWST   Wage-weighted staff time

1 INTRODUCTION

This report introduces a comprehensive alternative to the current resident classification model (case-mix adjustment) within the skilled nursing facility (SNF) prospective payment system (PPS). The current payment model for residents of SNFs in Medicare Part A-covered stays classifies residents into clinically relevant groups for the purpose of determining how much Medicare will reimburse SNFs for the costs of providing care. Acumen developed an alternative classification for SNF residents in Medicare Part A-covered stays pursuant to a contract with the Centers for Medicare & Medicaid Services (CMS). CMS originally contracted with Acumen on 9/20/2012 to identify and evaluate possible alternatives to the existing SNF PPS therapy reimbursement model. Subsequently, the scope of the project was expanded to develop alternatives to the SNF PPS case-mix adjustment methodology in its entirety (Case-mix adjustment adjusts Medicare payments to facilities based on characteristics of the resident for whom care was provided).

Since 1998, Medicare has paid for services provided by SNFs under the Medicare Part A benefit on a per-diem basis through the SNF PPS. Various experts and researchers have recommended fundamental changes to the reimbursement model. These organizations include the Medicare Payment Advisory Commission (MedPAC),[7] the Office of the Inspector General (OIG) within the U.S. Department of Health and Human Services,[8] and the Urban Institute, which was commissioned by CMS to study the SNF reimbursement model and present options to improve the model.[9] These organizations all recommend a new payment model that links payment to clinical characteristics. They attribute the increasing volume of therapy services billed to Medicare by SNFs to the current therapy reimbursement model, which strongly incentivizes therapy provision.[10] Additionally, their research indicates that the current nursing reimbursement model does not appropriately account for variation in the utilization of non-therapy ancillary (NTA) services. Building on these findings in the Medicare payment literature, Acumen conducted extensive quantitative and qualitative analyses to develop a comprehensive alternative payment model that addresses concerns with the current therapy reimbursement

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[7] Medicare Payment Advisory Commission, "Report to the Congress: Reforming the Delivery System," Washington, DC: 2008, http://www.medpac.gov/documents/jun08_entirereport.pdf.
[8] Office of the Inspector General, U.S. Department of Health and Human Services, "Inappropriate Payments to Skilled Nursing Facilities Cost Medicare More Than a Billion Dollars in 2009," Washington, DC: 2012, https://oig.hhs.gov/oei/reports/oei-02-09-00200.pdf.
[9] Liu, Korbin, Bowen Garrett, Sharon Long, Stephanie Maxwell, Yu-Chu Shen, Douglas Wissoker, Brant Fries, et al, "Final Report to CMS: Options for Improving Medicare Payment for Skilled Nursing Facilities," *Urban Institute, University of Michigan, University of Colorado Health Sciences Center, and Harvard University*, *Baltimore, MD* (2007), http://www.urban.org/sites/default/files/alfresco/publication-pdfs/411526-Options-for-Improving-Medicare-Payment-for-Skilled-Nursing-Facilities.pdf.
[10] Medicare Payment Advisory Commission, "Report to the Congress: Reforming the Delivery System."

model, improves targeting of resources to medically complex beneficiaries (i.e., those with high NTA utilization), and enhances payment accuracy system-wide.

This report begins by summarizing Acumen's activities during the base year of the contract and during the subsequent option period. It then describes the steps Acumen followed to develop the comprehensive alternative payment model, including: identifying a study population, creating dependent variables to measure resident resource utilization, selecting clinical characteristics predictive of resource use, and conducting regression analyses to build payment groups. Lastly, the report presents the recommended payment groups, estimated payment weights, and an analysis of the estimated impact of the recommended payment model on selected resident and provider subpopulations.

1.1   Base Year Activities

As discussed above, CMS initially contracted with Acumen to identify and evaluate possible alternatives to the existing therapy reimbursement model for the SNF PPS. Although the scope of the project was later expanded to develop a comprehensive alternative reimbursement model, the first year of the contract focused exclusively on the therapy component.

In the base year, which ran from September 2012 to September 2013, Acumen followed a four step process to begin exploring changes to therapy reimbursement. First, Acumen conducted an environmental scan and stakeholder outreach to gather information about the existing therapy reimbursement model and possible alternative payment approaches. The environmental scan drew on evaluations of the SNF PPS therapy reimbursement model in the academic literature, unpublished government documents, and reports from government-affiliated and non-governmental organizations such as MedPAC and the Urban Institute. Stakeholder outreach consisted of a listening session and the solicitation of public comments through a CMS email inbox. Acumen used these outreach strategies to identify strengths and areas for improvement in the existing payment system. The environmental scan and stakeholder outreach informed future research into alternatives to the existing therapy reimbursement model.

Second, Acumen identified areas for future research to support the development of an alternative therapy payment model. Acumen identified gaps in the existing literature, as well as data limitations that could potentially hinder efforts to develop and implement an alternative therapy payment model. To address these gaps in the literature and data limitations, Acumen proposed two groups of potential analyses. The first group would support the development of a resident classification model for SNF therapy payment based on clinical characteristics. The second group would support changes to the payment unit for SNF therapy services (e.g., per-minute, per-diem, per-stay, per-episode).

Third, Acumen drew on information obtained through the prior steps to evaluate a broad range of considerations for the development of an alternative therapy payment model including:

- payment unit choices,

- therapy case-mix adjustment options,

- data sources, and

- pricing adjustments.

Within each of these broad categories, Acumen evaluated alternatives based on their impact within the SNF setting, impact across other post-acute care settings, and feasibility of implementation.

Finally, based on these analyses, Acumen determined that four broad therapy payment concepts could be explored. Acumen selected concepts that represent fundamentally different approaches to paying for SNF therapy services. The four evaluated alternatives included: a resident characteristics model, a resident characteristics model blended with a resource-based pricing adjustment (the hybrid model), a fee schedule, and a competitive bidding model. Examples of a resource-based adjustment include an outlier payment for residents whose costs of care exceed the costs predicted by the resident characteristics model and a variable per diem pricing adjustment that may increase or decrease payments over a resident's stay based on evidence of how costs vary across a stay. Acumen evaluated each payment concept according to six criteria:

    (i)   Improves payment accuracy for SNF services

    (ii) Improves incentives to provide the appropriate level of care for individuals

    (iii) Feasible to implement in the short-to-medium term

    (iv) Minimizes start-up and ongoing implementation costs for CMS

    (v) Minimizes burden on stakeholders

    (vi) Improves consistency with other settings and payers

After analyzing each of the concepts in relation to the criteria, Acumen decided to further investigate the resident characteristics model and the hybrid model in the next stage of the project. A report that summarizes Acumen's activities and recommendations during the base year of the contract may be found online here: Base Year Summary Report.

1.2   Option Period Activities

In Option Periods 1 and 2 of this project, which began September 2013 and ended September 2017, the project scope was expanded to investigate improvements to all case-mix-adjusted components of the SNF PPS and develop a fully implementable alternative payment

model based on the payment approaches selected for further exploration during the base year. Additionally, Acumen facilitated multiple opportunities for experts and stakeholders to provide feedback on the alternative payment model and used this feedback to make further improvements to the alternative payment model.

First, Acumen converted the payment approaches selected for further investigation during the base year into a fully implementable payment model. This process included creating dependent variables, selecting independent variables, and testing the relationship between the independent and dependent variables via regression modeling. Acumen followed these steps for each component in the alternative resident classification.[11] Determinants of payment were selected based on clinical input, literature reviews, statistical evidence, and expert and stakeholder input. Acumen then created payment groups using selected resident characteristics that were strong predictors of resource utilization, aligned with clinical logic and input, and maintained the simplicity necessary for an operational payment system.

Second, to take advantage of the expertise of researchers in Medicare payment policy as well as clinicians and health care providers in the SNF setting, Acumen facilitated a series of opportunities for these individuals to provide feedback on improvements to the SNF PPS. The first of these opportunities was a technical expert panel (TEP) held in February 2015 that focused on alternative therapy payment models. The second opportunity was a November 2015 TEP focused on alternative models for nursing payment. A third TEP focusing on overall improvements to the payment model was held in June 2016. A fourth TEP presenting a preliminary version of Acumen's alternative resident classification took place in October 2016. In addition to convening this series of TEPs, Acumen solicited feedback via a project inbox and obtained expert and stakeholder input on specific areas of research following the TEPs and during the analytical process. Acumen compiled the recommendations received in these forums and used the feedback to generate new analyses and make further refinements to the recommended payment model. Summaries of the content, discussion, and recommendations from the four TEPs can be found at the following links:

Alternative Therapy Payment Models TEP Summary Report

Alternative Nursing Payment Models TEP Summary Report

Overall SNF Payment TEP Summary Report

Alternative Payment Model TEP Summary Report

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[11] The process to develop the nursing component was somewhat different, as described in Section 3.6.

1.3 Revisions

The final phase of the project, which began in October 2017, was focused on refinements to the payment model developed during Option Periods 1 and 2. CMS received a large number of comments in response to the Advance Notice of Proposed Rulemaking (ANPRM) introducing the alternative payment model, then referred to as the Resident Classification System, Version I (RCS-I). During the revision phase, we conducted additional analyses based on the comments received and made a number of modifications to the payment model. Activities during this period fell under three broad categories: improvements to the payment model, updates to related analyses following model revisions, and activities supporting model implementation and rulemaking. Activities completed during this period are shown under the appropriate heading below:

Improvements to the Payment Model in Response to ANPRM Comments

- Updated the study population from FY 2014 to FY 2017.

- Separated the PT+OT component into two separate components for PT and OT in response to ANPRM comments.

- Reduced the number of payment groups for the PT and OT components (30 to 16 groups), the SLP component (18 to 12 groups), and the nursing component (43 to 25 groups).

- Simplified the variable per diem payment schedule for the PT and OT components. Instead of a 1% reduction in payment every 3 days after day 14 as proposed under RCS-I, the revised payment model reduces payment 2% every 7 days after day 20.

- Replaced the functional measures used for the PT, OT, and nursing components with new measures based on IMPACT Act-compliant Section GG items.

- Revised the list of comorbidities used for payment in the NTA component using multiple years of data. This responds to stakeholder concerns about the robustness of our model.

- Performed robustness checks to confirm the payment model performed well using multiple years of data.

- Investigated the possible inclusion of comorbidities related to PT and OT utilization. We determined that few conditions have a notable impact on PT or OT costs per day, therefore we did not include comorbidities in these components.

- Changed scoring of the proposed cognitive measure based on empirical results, clinical feedback, and ANPRM comments. The revised scoring considers a Cognitive Performance Scale (CPS) score of 0 as cognitively intact. The modified scoring aligns

with comments questioning the original scoring, which considered a CPS score of 0 as mildly impaired.

<u>Updates to Related Analyses Based on Payment Model Revisions</u>

- Updated the HIV/AIDS analysis to determine the payment add-on for the nursing component for members of this subpopulation. Based on this analysis, we updated the recommended add-on from 19% to 18%. We also confirmed that the four other case-mix components (PT, OT, SLP, and NTA) combined adequately reimburse ancillary costs for this subpopulation with no need for further adjustment.

- Updated the calculation of component base rates based on separation of the PT+OT component into separate components for PT and OT, as well as to reflect the base rates published in the FY 2017 final rule.

- Updated estimates of case-mix indexes (CMIs) based on the simplified case-mix classifications and updated study population.

- Updated the impact analysis for resident and provider subpopulations to add subpopulations identified by commenters, as well as to reflect the updated study population and the revisions to the payment model implemented post-ANPRM. The revised payment model performs well with respect to these subpopulations (i.e., addictions, bleeding disorders, behavioral issues, chronic neurological conditions, and bariatric care).

<u>Activities Supporting Implementation and Rulemaking</u>

- Mapped ICD-10 codes to the clinical categories that represent the primary reason for SNF care and are used for resident classification across three components in the recommended payment model (PT, OT, and SLP).

- Documented how the recommended payment model interacts with and complements various other policy initiatives and trends, such as the IMPACT Act, value-based purchasing, the revised Requirements of Participation (ROPs) for long-term care facilities, and bundled payment and care coordination initiatives.

- Documented comments received in response to the ANPRM from both organizations and individual commenters.

- Drafted the technical report documenting the revised payment model.

- Created a provider-level impact file.

- Finalized the mapping of ICD-10-CM codes to NTA and SLP-related comorbidities.

2   BACKGROUND ON SNF PPS

This section provides background on the SNF PPS, including a description of the cost-based payment system that preceded the SNF PPS, the development and key features of the PPS, the 2006-07 staff time study which developed refinements to the PPS, and areas for improvement within the payment system.

2.1   Cost-Based Payment System

Prior to implementation of the SNF PPS, Medicare payment for SNFs was based on retrospective cost reimbursement. Facilities received payment for three major categories of costs: routine, ancillary, and capital. Routine costs were associated with services included by the provider in a daily service charge. These included nursing, minor medical supplies, social services, and the use of certain facilities and equipment which did not entail separate charges. Ancillary costs covered specialized services, including therapy, drugs, and laboratory services, that were associated with individual patients. Capital costs encompassed land, facilities, equipment, and interest associated with financing these purchases.[12] Under the pre-PPS payment system, Medicare reimbursed SNFs for routine costs including room and board and nursing up to specified limits. Reimbursement for ancillary costs was not limited, resulting in weak incentives for facilities to mitigate these costs.[13] Despite limitations on routine costs, Medicare spending on SNFs rose faster than spending in many other areas of Medicare in the 1990s, leading to calls for adoption of a PPS.[14]

2.2   SNF Prospective Payment System

This section describes the initial development and key elements of the SNF PPS.

2.2.1   Establishment of the SNF PPS

In the Balanced Budget Act of 1997, Congress amended the Social Security Act to require the Secretary of Health and Human Services to establish a SNF PPS by July 1, 1998. The PPS was designed to include all SNF services covered under Medicare Part A except for approved educational activities. The revisions to the Social Security Act set the formula for determining Medicare payment rates to SNFs and required the rates to be adjusted for geographic cost differences as well as case mix (i.e., differences in each facility's patient population). A case-mix-adjusted PPS attempts to predict the cost to treat patients based on their clinical

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[12] Health Care Financing Administration (HCFA), Department of Health and Human Services (HHS), "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities," 26252-26316.
[13] U.S. Government Accountability Office, 2002a, "Skilled Nursing Facilities: Medicare Payments Exceed Costs for Most but Not All Facilities," GAO-03-183, Washington, DC, 2002, http://www.gao.gov/assets/240/236797.pdf.
[14] Medicare Payment Advisory Commission (MedPAC), "Report to the Congress: Medicare Payment Policy," Washington, DC: 2002, http://www.medpac.gov/docs/default-source/reports/Mar02_Entire_report.pdf.

characteristics, services utilized, or other factors indicative of resource use. For example, a resident who is more dependent on assistance to perform activities of daily living would be expected to require greater nursing resources than a more independent resident, resulting in a higher nursing payment to the facility treating the beneficiary. Prior to the adoption of the Medicare SNF PPS, states had developed more than 25 case-mix models for Medicaid patients treated in nursing facilities. The Health Care Financing Administration (renamed the Center for Medicare & Medicaid Services in 2001), also funded a multi-state demonstration beginning in 1989 to test a Medicare PPS and quality monitoring system for nursing homes across several states.[15] In addition to case-mix adjustment, the Social Security Act also requires that payment under the SNF PPS be made on a per-diem basis.

2.2.2   SNF Base Rates

For the two case-mix adjusted components of payment (therapy and nursing), payment is calculated by multiplying the base rate for each component by the case-mix index for a resident's case-mix group. SNF base payment rates are based on mean SNF costs for a base year, FY 1995, updated for inflation to the initial period of the SNF PPS (July 1, 1998 to September 30, 1999), and adjusted for facility-level differences in case mix and geographic variation in wages. The original base rates were based on cost report data from hospital-based and freestanding SNFs. Allowable costs that were used to calculate base rates included routine, ancillary, and capital-related costs for SNF services provided under Part A, as well as an estimate of amounts payable under Part B for covered SNF services provided in FY 1995 to SNF residents receiving Part A services.

CMS publishes updated per-diem federal rates in the Federal Register every year in August preceding the fiscal year in which the rates will be implemented. Rates are updated for inflation each year after the initial period using the SNF Market Basket Index (MBI). Rates are published for four separate components of SNF payments, with both urban and rural rates issued for each component:

(i)   nursing case-mix, which includes costs for nursing, social services, and non-therapy ancillary costs (e.g., drugs);

(ii)   therapy case-mix, which includes physical therapy, occupational therapy, and speech-language pathology;

(iii)   non-case-mix therapy, which includes therapy-related costs for patients not placed in a therapy classification group (e.g., evaluation for therapy);

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[15] Health Care Financing Administration (HCFA), Department of Health and Human Services (HHS), "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities," 26253-26254.

(iv)   a separate non-case-mix component, which includes all other costs (e.g., room and board).

The nursing case-mix and therapy case-mix components are adjusted for resident characteristics, as described in the next section. The non-case-mix therapy and non-case-mix components do not vary with resident characteristics.

2.2.3 Case-Mix Adjustments

As noted above, the Social Security Act requires SNF payments to be case-mix adjusted for expected differences in resident resource use based on residents' clinical characteristics, services utilized, or other factors indicative of resource use. To achieve this, CMS constructed a classification model that grouped residents with similar expected resource utilization and calculated case-mix indexes, or payment weights, for each group. CMS conducted studies in 1995 and 1997 to measure nursing and therapy minutes provided per resident. These studies included 12 states, 154 SNFs, and 2,900 SNF residents. Researchers identified three primary predictors of cost for SNF residents—clinical characteristics, the level of assistance required to perform activities of daily living, and skilled services received (e.g., rehabilitation, extensive services, or IV medication)—and based the resident classification model on these characteristics. At the time of the SNF PPS implementation, SNFs were required to use the Minimum Data Set (MDS) assessment tool to assign residents to one of 44 resource utilization groups (RUGs) in the RUG-III classification model. CMS assigned a case-mix index (CMI) to each RUG based on the average cost of a SNF resident in that payment group. For example, a resident with a CMI of 1.5 would be expected to be 1.5 times as costly as the average resident. The facility treating that resident would receive a per diem payment 1.5 times the base rate for that fiscal year. CMS calculates separate CMIs for nursing and therapy services.[16]

2.3   Refinements to the SNF PPS

As discussed in the FY 2006 proposed rule,[17] following implementation of the SNF PPS, concerns arose that the transition to a prospective payment system could limit access for medically complex beneficiaries. In the Medicare, Medicaid, and SCHIP Balanced Budget Refinement Act of 1999 (BBRA), Congress enacted various temporary payment adjustments in response to these concerns, including a 20% increase in per diem rates for 12 complex medical groups in the RUG-III classification. These payment adjustments were to be in place only until CMS refined the resident classification model to better account for medically complex

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[16] Ibid., 26256-26268.
[17] Centers for Medicare & Medicaid Services (CMS), Department of Health and Human Services (HHS), 2005b, "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities for FY 2006," *Federal Register* 70 no. 96 (May 19, 2005): 29070-29162, https://www.gpo.gov/fdsys/pkg/FR-2005-05-19/pdf/05-9934.pdf.

beneficiaries. In 2001, CMS contracted with the Urban Institute to study and develop such refinements. The Urban Institute's primary finding was that the RUG-III model in use at the time did not adequately account for the high NTA utilization of residents who receive both rehabilitation and extensive services. Based on this finding, CMS in 2006 implemented the RUG-53 classification, which incorporated nine additional case-mix groups in the new Rehabilitation Plus Extensive Services category. The temporary 20% increase in per diem rates for 12 complex medical groups ended upon implementation of RUG-53 on Jan. 1, 2006.[18]

2.4   The STRIVE Study

CMS stated in the FY 2006 proposed rule that the changes to the resident classification implemented that year were not intended to represent comprehensive changes to the case-mix model. Efforts to make larger changes to the system began with a new staff time measurement study conducted in 2006-07. A team of researchers measured staff time provided to residents at 205 SNFs in 15 participating states. Researchers documented clinical characteristics and the minutes of nursing and therapy staff time received by each resident in the study population. The staff time minutes were weighted to account for differences in wages for various SNF staff. The Staff Time and Resource Intensity Verification Project (STRIVE) determined that the RUG-III model then in place predicted resident costs reasonably well. Therefore, STRIVE researchers decided to refine the existing classification model, rather than developing an entirely new one.

Using the data derived from the time measurement study, researchers built on the RUG-III model to develop RUG-IV, which incorporated notable changes to resident classification in SNFs. Changes included the addition of new RUGs, modifications in the allocation of therapy minutes administered to multiple patients at once (i.e., concurrent therapy), and updates to the scale used to measure activities of daily living (ADL). These changes also required updates to the MDS assessment tool. See Figure 8 in the appendix for a summary of the resident classification process under RUG-IV, which has been in place until now. Researchers compared RUG-IV to the original classification model and determined that RUG-IV better explained variation in costs across SNF residents, created more homogenous resident groups, and displayed wider variation in case-mix weights, suggesting it provided better incentives to serve high-cost residents. However, the STRIVE study also suffered from notable shortcomings, including methodological flaws in the collection of therapy minutes, small sample sizes for certain resident groups used to generate CMIs, and the retention of various measures of service provision as determinants of payment in the recommended model refinements. The STRIVE researchers adjusted for counterintuitive results produced by small sample sizes by smoothing staff time

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[18] Centers for Medicare & Medicaid Services (CMS), Department of Health and Human Services (HHS), 2005c, "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities for FY 2006," *Federal Register* 70 no. 149 (August 4, 2005): 45026-45127.

estimates to produce CMIs consistent with clinical expectations. CMS published the final regulations establishing RUG-IV in August 2009.[19] The new resident classification was effective as of FY 2011.

2.5 Areas for Improvement in the SNF PPS

Under RUG-IV, a majority of residents receive therapy, and the number of therapy minutes received is the primary determinant of both therapy and nursing payment. Table 73 in the appendix shows the frequency of stays for each RUG in RUG-IV. This payment model overlooks the wide range of clinical characteristics that influence the relative resource use of SNF residents. Strengthening the relationship between payment and clinical characteristics promotes payment accuracy by providing the resources necessary to meet the care needs of a diverse range of resident types. Researchers including MedPAC and the Urban Institute have recommended two key reforms to improve payment accuracy and strengthen incentives to provide an appropriate level and quality of care:

(i) Remove therapy minutes as a determinant of payment and create a new therapy payment model in which payment is linked to differences in clinical characteristics.[20] [21]

(ii) Create a separate payment component for NTA services, using resident characteristics to predict utilization of these services.[22] [23]

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[19] Eby, Jean, Dane Pelfrey, Kathy Langenberg, Brant Fries, Robert Godbout, David Maltiz, and David Oatway, "Staff Time and Resource Intensity Verification Project Phase II," *Iowa Foundation for Medical Care, University of Michigan, Stepwise Systems, CareTrack Systems*, *Baltimore, MD* (2011), https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/TimeStudy.html.

[20] Carter, Carol, Bowen Garrett, and Doug Wissoker, "Reforming Medicare Payments to Skilled Nursing Facilities to Cut Incentives for Unneeded Care and Avoiding High-Cost Patients," *Health Affairs*, 31 (2012), 1303-1313, content.healthaffairs.org/content/31/6/1303.long.

[21] Carter, Carol, Bowen Garrett, and Doug Wissoker, "The Need to Reform Medicare's Payments to Skilled Nursing Facilities is as Strong as Ever," Urban Institute, Medicare Payment Advisory Commission (2015), http://www.urban.org/sites/default/files/publication/39036/2000072-The-Need-to-Reform-Medicare-Payments-to-SNF.pdf.

[22] Carter, Carol, Bowen Garrett, and Doug Wissoker, "Reforming Medicare Payments to Skilled Nursing Facilities to Cut Incentives for Unneeded Care and Avoiding High-Cost Patients," 1306.

[23] Carter, Carol, Bowen Garrett, and Doug Wissoker, "The Need to Reform Medicare's Payments to Skilled Nursing Facilities is as Strong as Ever."

3   PATIENT-DRIVEN PAYMENT MODEL (PDPM)

This section describes the methodology used to develop PDPM and the results of Acumen's analyses.

3.1   Data and Methods

The analysis of SNF payment alternatives began with the identification of a study population. The first step in this process was to select a study window, described in Section 3.1.1. After defining the study window, Acumen constructed stays from SNF claims, described in Section 3.1.2. Acumen then applied a series of restrictions to ensure: 1) stays could be matched to other sources of resident and provider information (Section 3.1.3), and 2) inaccurate, invalid, or irrelevant data (e.g., not pertaining to a SNF resident in a Medicare Part A stay) was excluded (Section 3.1.4).

3.1.1   Year of Data Used for Analyses

The study window uses data corresponding to stays with admissions in fiscal year (FY) 2017. This data reflects the most recent complete year of data available to Acumen as of this report. Foundational analyses used to make decisions regarding elements of the payment model that are not revisited in this report generally use data corresponding to stays with admissions in FY 2014, as FY 2014 was the most recent complete year of data available when those analyses were completed. These analyses are shown in the SNF Payment Models Research (PMR) technical report available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html.

3.1.2   Constructing SNF Stays

This section describes the data sources and methods Acumen used to construct SNF stays from claims. Acumen used Medicare Parts A and B claims from the CMS Common Working File (CWF). CWF data was downloaded weekly from CMS mainframes and then processed according to CMS final action rules. Acumen worked with this final-action data, which describes final payments to providers transacted up to the date of the download. The primary claims data used for the analyses are SNF claims. SNF claims are identified with Type of Bill (TOB) 21X, while hospital swing bed providers use TOB 18X.[24] The Claim Related Condition Code on SNF claims was used to identify Medicare Part A stays paid under the SNF PPS. Acumen constructed Part A stays by linking claims that share the same beneficiary identifier,

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[24] Centers for Medicare & Medicaid Services (CMS), Department of Health and Human Services (HHS), 2016a, "Chapter 6: SNF Inpatient Part A Billing and SNF Consolidated Billing," *Medicare Claims Processing Manual,* http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/clm104c06.pdf.

facility CMS Certification Number (CCN), and admission date. Stays created from SNF claims were then linked to other Medicare claims data and assessment data using beneficiary identifiers.

Acumen applied a series of restrictions to the study population to ensure that all stays included in the study population are associated with Medicare beneficiaries receiving Part A benefits in a SNF. It is essential to restrict the study population to Medicare Part A stays because the model described in this report would govern payment for SNF residents in Medicare Part A-covered stays only. Table 3 lists the Medicare Part A payment restrictions. The first three restrictions (1.1 to 1.3) ensure that all stays are enrolled exclusively in Medicare Part A throughout the stay. Restrictions 1.4 through 1.6 restrict the population to stays that occurred within a SNF and are associated with a Medicare payment.

Table 3: Medicare Part A Payment Restrictions

Medicare Part A Payment Restrictions
1.1   Stay does not have any Part C encounter claims
1.2   Beneficiary is continuously enrolled in Part A throughout stay
1.3   Beneficiary did not transfer from Part C to Part A during stay
1.4   Stay only has PPS claims
1.5   Stay has positive utilization days
1.6   Stay has positive Medicare payment

3.1.3   Matching Stays to Other Sources of Information

The next step in building our study population was matching the SNF stays to various sources of resident and provider information. Matching stays to the prior inpatient claim and overlapping MDS assessments was necessary to conduct analyses linking cost information to resident characteristics. Matching to provider information was necessary to access cost report and wage index data to accurately estimate beneficiary costs. In later stages of the analysis, provider information was used to assess the impact of PDPM on various types of providers. To enable matching, Acumen applied a series of restrictions to the study population.

Table 4 lists the restrictions used for matching. Items 2.1 to 2.6 enable matching of stay-level cost data to sources of resident and provider information. Item 2.1 requires the SNF stays in the population to have a qualifying inpatient stay. Acumen used the first non-missing pair of QLFYFROM and QLFYTHRU dates on the beneficiary's claims to form the SNF stay's qualifying inpatient window. The beneficiary's inpatient stay can be matched to the SNF stay if the inpatient stay overlaps with the qualifying window or if the inpatient stay through date falls within 60 days prior to the SNF admission date. Item 2.2 restricts the population to stays with

provider information by matching the stay to the Certification and Survey Provider Enhanced Reports (CASPER) data using the provider's CCN or, if a provider cannot be found in CASPER, by matching the stay to a provider in the Provider of Services (POS) database. If a swing bed facility cannot be found in CASPER or the POS database using the swing bed CCN, we use the corresponding hospital CCN to locate the facility in CASPER or the POS database and match the provider information associated with that hospital to the stay. Item 2.3 ensures that only stays with a matching MDS 5-day assessment are included. Acumen matched MDS assessments to their corresponding SNF claims using the specific Health Insurance Prospective Payment System (HIPPS) code that appears on both documents. Item 2.4 requires that every non-default assessment indicator in the HIPPS code on claims can be matched to an MDS assessment. Acumen then ordered the assessments by reference date and imposed restrictions 2.5 and 2.6 to ensure that each stay had a complete and correctly ordered series of matched assessments.

Items 2.7 and 2.8 enable estimation of resident costs. Calculating standardized costs requires four elements: charges reported on SNF claims, cost-to-charge ratios (CCRs) from cost reports, each region's wage index, and the annual labor share. Charges for each stay and the annual labor share are always available in the claims and the SNF PPS final rule, respectively. However, if any of the other two elements is missing, stay costs cannot be calculated. Items 2.7 and 2.8 are two additional matching restrictions used to ensure that the stay's costs can be converted from charges on claims using the CCR on the cost report and that the calculated costs can be standardized by removing geographic differences using the wage index and labor share.

Table 4: Matching Restrictions

Matching Restrictions	
2.1	Stay can be matched to a qualifying inpatient stay
2.2	Provider of stay can be found in CASPER or POS
2.3	One 5-day MDS assessment is matched to the stay
2.4	All non-default RUGAIs can be matched to their MDS assessment
2.5	Stay does not begin with unscheduled PPS assessment
2.6	Stay does not have any expected scheduled PPS assessment missing
2.7	A cost report can be found for the provider
2.8	The county in which the facility is located has a wage index

3.1.4 Data Validity Restrictions

After constructing SNF Part A stays and ensuring stays could be matched to other sources of resident and provider information, Acumen created the final study population by applying data

validity restrictions. Table 5 lists the restrictions in this category. Restrictions 3.1 to 3.7 exclude stays that contain invalid information (for example, both zero total therapy charges and positive therapy minutes). Because of the importance of estimating costs in our analysis of payment alternatives, Acumen imposed additional restrictions (3.8 to 3.13) to ensure the quality of estimated costs in our analyses. Items 3.9 and 3.10 are requirements for the validity of CCRs from the cost report. Items 3.11 and 3.12 exclude a stay if any one of the six types of therapy and NTA charges are unrealistically high. Finally, items 3.13 and 3.14 require stays in the population to have costs of all three therapy disciplines present to ensure that the calculated total therapy costs are complete and do not have any component missing, as well as all three types of NTA costs.

Table 5: Data Validity Restrictions

Validity Restrictions	
3.1	Stay is not associated with a duplicate beneficiary record
3.2	Provider of stay is in the 50 states or DC
3.3	Stay has a valid first claim
3.4	Stay does not have a gap between SNF claims
3.5	Stay does not have any overlap with the previous or the next stay of the same beneficiary
3.6	Stay's total utilization days equals the sum of revenue units for all RUGAIs in the claim
3.7	Total utilization days does not exceed 100
3.8	Stay does not have zero total therapy charges and positive therapy minutes at the same time
3.9	Each of the stay's three therapy CCRs (PT, OT, and SLP) falls within the P1-P99 range for the stay provider
3.10	Each of the stay's three NTA CCRs (Drug, Respiratory, and Other) falls within the P1-P99 range for the stay provider
3.11	Each of the stay's three therapy charges does not fall in top 0.01% of charges for all stays
3.12	Respiratory and Other NTA charges do not fall in top 0.05% and Drug charges do not fall in top 0.01% of charges for all stays
3.13	All three nominal therapy costs, calculated by charges*CCR, are not missing
3.14	All three nominal NTA costs, calculated by charges*CCR, are not missing

3.1.5 Summary of Study Population Restrictions

As shown in Table 6, the final study population contains 84.6% of total SNF Part A stays. Acumen compared resident characteristics of the final study population to those of the base Medicare Part A SNF population in terms of gender, age, ethnicity, Medicaid enrollment, location, ownership, and institution type. The two populations are similar in most respects, although the study population contains a higher proportion of stays from for-profit and

freestanding facilities and a lower proportion of stays from non-profit, government, hospital-based, and swing bed facilities, as shown in Table 7.

Table 6: All Study Population Restrictions

Restrictions	Frequency		Cumulative Frequency	
	# of Stays	% of Stays	# of Stays	% of Stays
All Part A SNF Stays	**2,244,031**	**100%**	**2,244,031**	**100%**
Matching Restrictions				
Stay can be matched to the most recent IP stay	2,221,912	99.0%	2,221,912	99.0%
Stay can be matched to qualifying IP stay	2,194,847	97.8%	2,194,847	97.8%
Provider of stay can be found in CASPER or POS	2,243,836	100.0%	2,194,653	97.8%
One 5-day MDS assessment is matched to the stay	2,211,462	98.5%	2,163,219	96.4%
All non-default RUGAIs can be matched to their MDS assessment	2,121,896	94.6%	2,064,669	92.0%
Stay does not begin with unscheduled PPS assessment	2,218,760	98.9%	2,064,066	92.0%
Stay does not have any expected scheduled PPS assessment missing	2,205,364	98.3%	2,036,634	90.8%
A cost report can be found for the provider	2,220,054	98.9%	2,015,265	89.8%
The county in which the facility is located has a wage index	2,244,006	100.0%	2,015,265	89.8%
Validity Restrictions				
Stay is not associated with a duplicate beneficiary record	2,243,481	100.0%	2,014,774	89.8%
Provider of stay is in the 50 states or DC	2,243,813	100.0%	2,014,688	89.8%
Stay has a valid first claim	2,243,309	100.0%	2,014,295	89.8%
Stay does not have a gap between claims	2,243,350	100.0%	2,014,029	89.8%
Stay does not have any overlap with the previous or the next stay of the same beneficiary	2,243,875	100.0%	2,013,938	89.7%
Stay's total utilization days equals the sum of revenue units for all RUGAIs in the claim	2,238,545	99.8%	2,011,139	89.6%
Total utilization days does not exceed 100	2,243,983	100.0%	2,011,139	89.6%
Stay does not have zero total therapy charges and positive therapy minutes at the same time	2,239,406	99.8%	2,007,049	89.4%
The stay's provider has each of the three therapy CCRs falls within its P1-P99 range	2,216,697	98.8%	1,982,731	88.4%
The stay's provider has each of the three NTA CCRs falls within its P1-P99 range	2,209,169	98.4%	1,957,118	87.2%
Each of the stay's three therapy charges does not fall in top 0.01%	2,243,535	100.0%	1,956,811	87.2%
Each of the stay's three NTA charges does not fall in top 0.01%	2,226,054	99.2%	1,946,515	86.7%
All three nominal therapy costs, calculated by charges*CCR, are not missing	2,151,261	95.9%	1,936,388	86.3%
All three nominal NTA costs, calculated by charges*CCR, are not missing	2,118,303	94.4%	1,899,086	84.6%
Study Population Stays out of Part A Stays	-	-	**1,899,086**	**84.6%**

Table 7: Resident and Provider Characteristics in the Study Population

Resident Characteristics	Part A		Study Population	
	#	%	#	%
All Stays	**2,244,031**	**100.0%**	**1,899,086**	**84.6%**
Sex				
Female	1,334,406	59.5%	1,140,568	60.1%
Male	909,625	40.5%	758,518	39.9%
Age				
Under 65	233,640	10.4%	196,450	10.3%
65-69	247,808	11.0%	206,865	10.9%
70-74	300,198	13.4%	252,209	13.3%
75-79	342,477	15.3%	290,856	15.3%
80-84	384,050	17.1%	326,460	17.2%
85-high	735,858	32.8%	626,246	33.0%
Race / ethnicity				
White	1,874,778	83.6%	1,590,510	83.8%
Black	256,628	11.4%	214,155	11.3%
Hispanic	37,192	1.7%	31,159	1.6%
Asian	29,406	1.3%	24,916	1.3%
North American Native	11,442	0.5%	9,485	0.5%
Other	23,481	1.1%	19,522	1.0%
Unknown	11,104	0.5%	9,339	0.5%
Medicaid enrollment				
Not Dually Enrolled	1,470,420	65.5%	1,247,393	65.7%
Dually Enrolled	773,611	34.5%	651,693	34.3%
Location				
Urban	1,861,819	83.0%	1,584,765	83.5%
Rural	382,212	17.0%	314,321	16.6%
Census Division				
New England	153,867	6.9%	132,628	7.0%
Middle Atlantic	331,623	14.8%	271,259	14.3%
East North Central	410,415	18.3%	363,308	19.1%
West North Central	151,894	6.8%	127,015	6.7%
South Atlantic	466,939	20.8%	402,938	21.2%
East South Central	156,911	7.0%	130,383	6.9%
West South Central	224,382	10.0%	178,582	9.4%
Mountain	105,204	4.7%	84,610	4.5%
Pacific	242,578	10.8%	208,363	11.0%

Resident Characteristics	Part A		Study Population	
	#	%	#	%
Other	218	0.0%	-	-
Ownership type				
For profit	1,613,538	71.9%	1,397,432	73.6%
Non-profit	532,370	23.7%	428,401	22.6%
Government	95,929	4.3%	72,421	3.8%
Unknown	1,999	0.1%	832	0.0%
Institution type				
Freestanding	2,116,056	94.3%	1,838,907	96.8%
Hospital-Based	111,560	5.0%	53,868	2.8%
Swing Bed	16,272	0.7%	6,311	0.3%
Unknown	143	0.0%	-	-

3.2 Defining the Dependent Variable

This section describes the development of measures of resource use, quality checks of the data used to develop these measures, and the selection of an appropriate unit of time for the analysis.

3.2.1 Measures of Resource Use

This section describes how we developed resource use measures for PT, OT, SLP, and NTA services.

PT, OT, SLP, and NTA Utilization

There are three measures of resource use documented in the current SNF PPS: charges, costs, and minutes. Therapy minutes provided to each resident are recorded on the MDS assessments and used to determine classification under RUG-IV. However, minutes are only recorded for therapy services received, not for other types of services. Therefore, it is not possible to use minutes to measure resource use across all types of SNF services. Moreover, therapy minutes are only recorded for days that fall during the 7-day look-back window preceding each MDS assessment, so the current data does not document the exact number of therapy minutes provided each day of a SNF stay. Because using minutes as a measure of resource use presents these methodological challenges, Acumen focused on charges and costs.

Charges indicate the amount facilities charge payers for a service and are reported on claims that SNF providers submit to Medicare. Charges are documented in the claim's revenue centers, so each charge is associated with a specific type of service. Costs are reported on annual cost reports, which facilities are required to submit to allow final settlement of payment between

CMS and the provider. While charges are recorded on claims and therefore provide resident-level information, cost reports provide information at the facility level. Cost reports contain cost-to-charge ratios (CCRs) that allow conversion of charges billed on Medicare claims to costs. Similar to charges, different CCRs in the cost reports refer to different types of services. Acumen derived costs from the charges on claims using CCRs on facility cost reports. Costs derived from charges were utilized to develop an alternative reimbursement model. Costs from charges, as opposed to raw charges, were considered to better reflect differences in relative resource use across residents because costs are less reflective of differences in the coding of charges across providers.

Acumen calculated costs separately for the three therapy disciplines and NTA services. SNF claims report charges for each of three therapy disciplines: physical therapy (PT), occupational therapy (OT), and speech-language pathology (SLP). Additionally, cost reports contain CCRs for each therapy discipline. To calculate therapy costs, Acumen multiplied the charges from the SNF claims by the CCR from the facility cost report. This procedure was followed for each discipline to calculate total, PT, OT, and SLP costs for each stay in the study population. NTA charges are recorded in 132 separate revenue centers on SNF claims.[25] Acumen multiplied charges recorded in each of these revenue centers by the corresponding CCRs from the facility-level costs reports to calculate costs for each NTA revenue center. Acumen then summed derived costs across all NTA-related revenue centers to calculate total NTA costs for a stay.

The final step of calculating costs per day is standardizing costs for geographic wage differences. To do this, Acumen used the inverse of the formula used in the SNF PPS to adjust payments to reflect geographic wage differences. Each facility was mapped to its corresponding core-based statistical area (CBSA), which in turn was mapped to the FY 2017 wage index for that CBSA. In FY 2017, CMS estimated that 68.8% of SNF costs corresponded to labor and therefore adjusted that percentage of SNF PPS payments to reflect geographic differences in wages. Acumen removed the geographic adjustment applied to the labor portion of costs using the following formula:

$$Standardized\ Cost = Cost\ from\ Charges\ /[(Wage\ Index * Labor\ Share) + (1 - Labor\ Share)]$$

Nursing Utilization

This section describes the challenges encountered in developing a dependent variable to measure nursing utilization and the decision to use staff-time measurement data from the Staff

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[25] Acumen determined which revenue centers are associated with NTA services using a mapping provided by CMS (see Table 74 in the appendix).

Time and Resource Intensity Verification Project (STRIVE) as a measure of nursing resource use.

Lack of Resident-Specific Nursing Charges

Estimating nursing costs presented unique challenges. Unlike therapy and NTA charges, nursing charges are reported on SNF claims as part of routine revenue centers, which does not permit researchers to isolate nursing charges from routine services. The relevant literature and data confirm that nursing charges are included in routine cost centers. The Provider Reimbursement Manual states that routine cost centers include "all general nursing services, including administration of oxygen and related medications, handfeeding, incontinency care, tray service, enemas, etc." [26] Claims data support this finding, as the bulk of non-therapy, non-NTA charges fall in the routine cost centers.

Additionally, Acumen discovered that there was very little variation in routine charges per day across residents in a given facility, indicating that facilities did not record resident-specific nursing charges. For example, for each provider, Acumen subtracted the 10th percentile of charges per day from the 90th percentile of charges per day for three types of charges: nursing and non-case-mix, therapy, and NTA. As shown in Table 8, for most providers, the difference across residents between the 90th percentile and 10th percentile of nursing and non-case-mix charges per day was small, particularly compared to the difference for therapy and NTA charges per day. We also divided the 90th percentile by the 10th percentile for each category of charges. These ratios, shown in Table 9, indicate that for most providers, there is very little difference between residents with the highest and lowest nursing and non-case-mix charges. These findings are consistent with prior research such as the Urban Institute's 2007 final report to CMS.[27] As described in more detail in the following sections, because it was not possible to create a dependent variable for nursing using current data, Acumen used staff-time measurement data from the STRIVE study to develop the recommended resident classification for nursing payment and estimate relative differences in nursing utilization across the recommended PDPM nursing groups.

Table 8: Provider Variation in Per Day Charges – Difference between P90 and P10

Per Day Charges	Provider Count	Within-Provider Difference of Charges per Day: 90th Percentile Minus 10th Percentile						
		P1	P10	P25	P50	P75	P90	P99
Nursing+Non-case-mix	13,209	$0	$0	$0	$16	$51	$167	$381
Therapy	13,209	$59	$105	$141	$198	$279	$387	$716
NTA	13,209	$0	$66	$104	$152	$233	$339	$882

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[26] Centers for Medicare & Medicaid Services (CMS), Department of Health and Human Services (HHS), *The Provider Reimbursement Manual – Part 1*, https://www.cms.gov/regulations-and-guidance/guidance/manuals/paper-based-manuals-items/cms021929.html.

[27] Liu, Korbin, Bowen Garrett, Sharon Long, Stephanie Maxwell, Yu-Chu Shen, Douglas Wissoker, Brant Fries, et al, "Final Report to CMS: Options for Improving Medicare Payment for Skilled Nursing Facilities."

Table 9: Provider Variation in Per Day Charges – Ratio of P90 divided by P10

Per Day Charges	Provider Count*	Within-Provider Ratio of Charges per Day: 90th Percentile Divided by 10th Percentile						
		P1	**P10**	**P25**	**P50**	**P75**	**P90**	**P99**
Nursing+Non-case-mix	13,209	1.0	1.0	1.0	1.1	1.2	1.5	2.7
Therapy	12,308	1.3	1.6	1.8	2.2	3.1	5.0	36.2
NTA	11,744	1.1	5.7	9.0	13.7	22.7	40.2	218.8

This table excludes providers with 0 10th percentile costs because 0 cannot be a denominator.

STRIVE Data Collection

In 2006-2007, CMS conducted a new staff time study, the Staff Time and Resource Intensity Verification Project (STRIVE), to develop more comprehensive revisions to the payment system. Staff time was collected for all nursing, therapy, and other ancillary staff providing care in participating facilities. Non-therapy time was collected over 48 hours, while therapy time was collected over seven days. Three types of staff time were collected: Resident Specific Time (RST), Non-Resident Specific Time (NRST), and Non-Study Time (NST). RST was time a staff member spent providing direct care to a resident. NRST included time spent supporting care for all residents in a study unit but also included tasks unrelated to the study, such as meals and breaks. NST included time spent completing tasks supporting the facility but unrelated to the study. Only RST was used to calculate case-mix indexes. Additionally, researchers collected the job titles associated with minutes of care provided.

STRIVE Construction of Resource Use Measure

This section describes how STRIVE researchers constructed the resource use measure used to set nursing weights. First, residents with zero nursing time (N=95) or observation windows shorter than 48 hours (N=415) were dropped from the study population. For the remaining residents, researchers divided the nursing minutes collected over the 48-hour period in half to arrive at per-diem amounts for each resident. Next, the researchers constructed wage weights based on the median hourly wage for a given job title relative to the median hourly wage for "nursing aides, orderlies and attendants" (Bureau of Labor Statistics [BLS] occupation code 31-1012). Researchers used national wage data from the 2006 BLS Occupation and Employment Survey (OES). For job titles that were not available in this dataset, researchers estimated median wages based on the wage distribution for "nursing aides, orderlies and attendants." For example, they assigned the wage corresponding to the 75th percentile for "nursing aides, orderlies and attendants" ($12.80) to restorative aides, which are not recorded as a separate job title in the 2006 BLS data.[28] The researchers multiplied the minutes associated with each job title by the wage weight for that job title. They then summed the weighted minutes

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[28] See Table 10 for the median wages and wage weights for nursing job titles used in the STRIVE study.

across job titles to arrive at a per-diem wage-weighted staff time (WWST) estimate for a given resident.

To remove high outliers, the STRIVE team truncated the WWST estimates by assigning the 99th percentile of WWST for a given job category to any value above the 99th percentile within that job category. To remove low outliers, the STRIVE team assigned the wage-weighted equivalent of 10 raw minutes of total nursing staff time (14 WWST) to any resident with fewer than 14 total nursing WWST. Staff time estimates were first upper truncated within each job category (RN, LPN, and aides), then lower truncated after summing across all job categories.

Methodology to Update Resource Use Estimates

This section describes how Acumen updated the STRIVE resource use estimates. First, Acumen re-estimated the population WWST using 2006 national BLS OES wages. This was done to verify the STRIVE methodology and data quality. Acumen's estimates of WWST by job title and for all nursing personnel were close, although not identical, to the estimates published in the STRIVE report. Next, Acumen re-estimated WWST for each resident in the population using 2016 wage data, with the following specifications:

• As in the STRIVE study, all residents with zero nursing time (N=95) or observation windows shorter than 48 hours (N=415) were dropped from the study population.

• 2016 BLS OES wage data from facilities with NAICS code 623100: "Nursing Care Facilities (Skilled Nursing Facilities)" was used to update median wages for all titles.[29]

• Occupation code 31-1012 ("nursing aides, orderlies, and attendants") does not exist in 2016 data. Instead, Acumen used the closest substitute, occupation code 31-1014 ("nursing assistants").

• For other job titles unavailable in the 2016 BLS data, Acumen mirrored the STRIVE methodology and estimated median wages using the wage distribution for nursing assistants in nursing care facilities. For example, if STRIVE assigned the wage corresponding to the 75th percentile for "nursing aides, orderlies, and attendants" to a job title, Acumen assigned the 75th percentile of wages for nursing assistants to the job title.

• For each staff type (RN, LPN, and aides) Acumen upper-truncated WWST by adjusting for outliers above the 99th percentile as in the STRIVE study. When calculating total nursing WWST, Acumen lower-truncated WWST by assigning the wage-weighted equivalent of 10 raw

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[29] Bureau of Labor Statistics, U.S. Department of Labor, "May 2016 National Industry-Specific Occupational Employment and Wage Estimates: NAICS 623100 – Nursing Care Facilities (Skilled Nursing Facilities)," *Occupational Employment Statistics,* Last modified March 31, 2017, https://www.bls.gov/oes/2016/may/naics4_623100.htm.

nursing minutes (14 WWST) to residents with fewer than 14 total nursing WWST, as in the STRIVE study.

See Table 10 for the updated median wages and wage weights used to re-estimate WWST.

Table 10: Original and Updated Median Wages and Wage Weights for Nursing Job Titles in the STRIVE Study

Job Title (From STRIVE Table 4-11)	BLS Title	BLS Occupation Code	STRIVE (National)		2016 (Industry 623100)	
			Median Hourly Wage 2006	Wage Weight	Median Hourly Wage	Wage Weight
Registered Nurse (RN)	Registered Nurses	29-1111 (2006), 29-1141 (2016)	$27.54	2.58	$29.41	2.38
Respiratory Therapist	Respiratory Therapists	29-1126	$22.80	2.14	$28.78	2.33
Licensed Practical Nurse (LPN)	Licensed Practical and Licensed Vocational Nurses	29-2061	$17.57	1.65	$21.85	1.77
Certified Nurse Assistant (CNA) Geriatric Nurse Assistant (GNA) Resident Care Technician (RCT)	Nursing aides, orderlies, and attendants (2006) or nursing assistants (2016)	31-1012 (2006), 31-1014 (2016)	$10.67	1.00	$12.34	1.00
Certified Medication Aide (CMA)	Nursing aides, orderlies, and attendants (2006) or nursing assistants (2016)	31-1012 (2006), 31-1014 (2016)	$10.67	1.00	$12.34	1.00
Restorative Aide	75th percentile of national hourly 31-1012 wage (2006) or hourly 31-1014 wage (2016)	Does not exist	$12.80	1.20	$14.54	1.18
Bath Aide	25th percentile of national hourly 31-1012 wage (2006) or hourly 31-1014 wage (2016)	Does not exist	$9.09	0.85	$10.64	0.86
Feeding Aide	25th percentile of national hourly 31-1012 wage (2006) or hourly 31-1014 wage (2016)	Does not exist	$9.09	0.85	$10.64	0.86
Psych Aide	Psychiatric Aides	31-1013	$11.49	1.08	$12.78	1.04
Non Certified Care Technician	25th percentile of national hourly 31-1012 wage (2006) or hourly 31-1014 wage (2016)	Does not exist	$9.09	0.85	$10.64	0.86
Clinical Associate	Median of national hourly 31-1012 wage (2006) or hourly 31-1014 wage (2016)	Does not exist	$10.67	1.00	$12.34	1.00
Transportation	25th percentile of national hourly 31-1012 wage (2006) or hourly 31-1014 wage (2016)	Does not exist	$9.09	0.85	$10.64	0.86
Respiratory Therapy Assistant	Respiratory Therapy Technicians	29-2054	$18.81	1.76	$22.36	1.81

3.2.2 Data Quality Checks

For each of the dependent variables described above, Acumen conducted investigations to verify the quality of the data used to construct the dependent variable. To verify the quality of nursing data, Acumen replicated the methodology followed in the STRIVE study to generate estimates of nursing resource use for the STRIVE study population. These estimates were very close to those reported by STRIVE researchers, as shown in Table 93 in the appendix of the SNF PMR technical report available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html.

For the dependent variables used to develop the four other recommended case-mix components described in Section 3.3, Acumen explored the validity of costs derived from charges using two approaches. First, Acumen checked the consistency of reported charges on the claims and reported charges on the cost report. Providers are required to report Part A SNF total charges for each cost center on the cost reports. Ideally, the total charges reported for each cost center on the cost report would match the total charges reported in the related revenue centers on the claims associated with the cost reporting period. Table 11 below shows that for PT, OT, SLP, and NTA charges, charges from cost reports and charges from claims are close in most cases. These results suggest that the data on charges Acumen used to derive costs is reliable, as cost reports and claims data are generally consistent.

Second, Acumen calculated the correlation between therapy costs per stay derived from charges and estimated therapy minutes per stay for the three therapy disciplines derived from MDS assessments. To estimate therapy minutes during the stay, Acumen used two methods: For utilization days that fell within an MDS assessment look-back window, the actual number of minutes provided was used. For utilization days that did not fall within an assessment lookback window, Acumen assumed that the amount of therapy minutes per day was the same as in the most recent prior assessment. The basis for this assumption is that a change of therapy (COT) assessment would be required if there was a substantive change in the amount of therapy provided to the resident. Table 12 shows that therapy costs were highly correlated with therapy minutes, indicating that therapy costs from charges are reflective of actual therapy utilization during a stay.

Table 11: Consistency in Charges from Cost Reports and Claims

Payment Component	% of Cost Reports for which Charges on Claims are within +/-10% of Charges on Cost Report	% of Cost Reports for which Charges on Claims are within +/-20% of Charges on Cost Report
PT	78.5%	86.9%
OT	77.7%	85.6%
SLP	76.5%	84.0%
NTA	71.2%	83.4%

Table 12: Correlation between Therapy Minutes per Stay and Therapy Costs per Stay

Therapy Discipline	Correlation
PT	0.85
OT	0.86
SLP	0.85

3.2.3 Units of Time

Acumen considered three units of time for the analysis: per day, per stay, and per benefit period/episode. It is important that the unit of time used for the analysis matches the unit of time used for payment. This is because resident characteristics found to be highly predictive of costs per unit of time may vary depending on the unit of time used for the analysis. For example, residents entering a SNF after an inpatient stay of one type may tend to have short stays with very high costs per day, while residents entering a SNF after an inpatient stay of another type may tend to have longer stays with low costs per day. In this case, the two types of residents may exhibit similar average costs per stay, but different average costs per day. Clinical conditions related to the inpatient stay would therefore predict costs more effectively – and hence be incorporated into the recommended resident classification – if a per day unit of analysis were used. For this reason, if CMS uses a per day unit for payment, then using a per day unit for analysis can better ensure that payments in the recommended payment model closely track costs.

As current statute requires per day payment, Acumen decided to also use a per day unit for research purposes. Additionally, using a per day unit for analysis was consistent with feedback received from technical expert panels. To derive costs per day, Acumen summed total costs across the stay and divided by total utilization days for the stay.

3.3　Definition of Payment Components

RUG-IV includes two case-mix-adjusted components: nursing (includes nursing, NTA, and social services) and therapy. There is also a therapy non-case-mix component, which only applies to residents who do not receive therapy and is intended to cover the costs of therapy evaluation(s). Finally, there is a non-case-mix component that does not vary with resident characteristics. PDPM includes six components: five case-mix adjusted components (PT, OT, SLP, nursing, and NTA) and one non-case-mix component. This section describes how Acumen selected the components in PDPM.

3.3.1　Splitting Current Therapy Component

The current therapy component covers the costs of three therapy disciplines: PT, OT, and SLP. However, Acumen found almost no relationship between a resident's PT/OT costs per day and SLP costs per day (correlation of 0.03, as shown in Table 13). Additionally, investigation of independent variables revealed that certain key resident characteristics have opposite effects on PT/OT and SLP costs per day. For example, residents with cognitive impairments receive less physical and occupational therapy but receive more speech-language pathology. Based on these investigations, clinical input, and feedback from technical expert panels, Acumen concluded that SLP costs per day are predicted by a different set of independent variables than those that predict PT and OT costs per day; therefore, SLP services should be case-mix adjusted with a separate payment component from PT and OT.

Acumen then conducted a series of investigations to determine whether PT and OT should form a single payment component. These investigations were prompted by discussion at the Third TEP in June 2016. TEP members were generally supportive of the creation of a separate SLP component, and some members recommended exploring whether there should also be two separate components for PT and OT. As shown in Table 13, Acumen found a strong correlation between PT and OT costs per day of 0.67. Acumen looked at trends in PT and OT costs per day across a wide range of resident characteristics and found that they follow similar trends. For example, both PT and OT costs per day decline as a resident's cognitive and communicative function declines. Acumen then regressed a range of resident characteristics on PT and OT costs per day separately and found that the coefficients in both models followed similar patterns (90% of coefficients had the same sign across the two models, as shown in Table 94 in the appendix of the SNF PMR technical report, available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html). Acumen also used a broader model containing 1,016 recorded values from the MDS assessment, prior inpatient stay claim, and SNF claim to predict PT and OT costs per day separately. Out of the 271 values that were significant in both models, 98% of them had the same sign, indicating that they have a similar effect on PT and OT costs.

Given the results of these investigations, our original RCS-I model addressed PT and OT services through a single component. However, during technical expert panels (TEPs) and in response to the ANPRM, various professional organizations and other stakeholders stated that PT and OT services should be addressed via separate components given the different aims of the two therapy disciplines and differences in the characteristics of the resident subpopulations for which PT or OT services are warranted. Moreover, current data on service utilization partly reflects incentives created by the existing RUG-IV payment model. Without these incentives in place, it is possible that somewhat different sets of resident characteristics would predict PT and OT utilization. For the foregoing reasons, we decided to separate the combined PT/OT component from the RCS-I model into two separate case-mix adjusted components in the proposed PDPM. Because of the strong correlation between the dependent variables used for both components and the similarity in predictors, we maintain the same case-mix classification model for both components. In practice, this means that the same resident characteristics will determine a resident's classification for PT and OT payment. However, each resident will be assigned separate case-mix groups for PT and OT payment, which correspond to separate case-mix indexes and payment rates.

Table 13: Correlation between Costs per Day across Therapy Disciplines

Therapy Discipline	Correlation		
	PT	OT	SLP
PT	1.00	0.67	0.03
OT	0.67	1.00	0.09
SLP	0.03	0.09	1.00

3.3.2 Splitting Current Nursing Component

As noted above, NTA services are currently reimbursed by the nursing component of the SNF PPS. However, nursing case-mix indexes are solely based on variation in nursing staff time and therefore do not reflect variation in NTA resource use and costs. Figure 4 shows that average NTA costs per day do not track closely with nursing indexes. For example, stays in the CA1 RUG have the third-highest NTA costs per day ($216) but one of the lowest nursing component CMIs (0.78). Conversely, RUX receives very high nursing component payments (CMI of 2.67) despite having lower NTA costs ($96 per day). Table 77 in the appendix provides more detail on each individual RUG.

Figure 4: Nursing Index and Average NTA Costs per Day by RUG
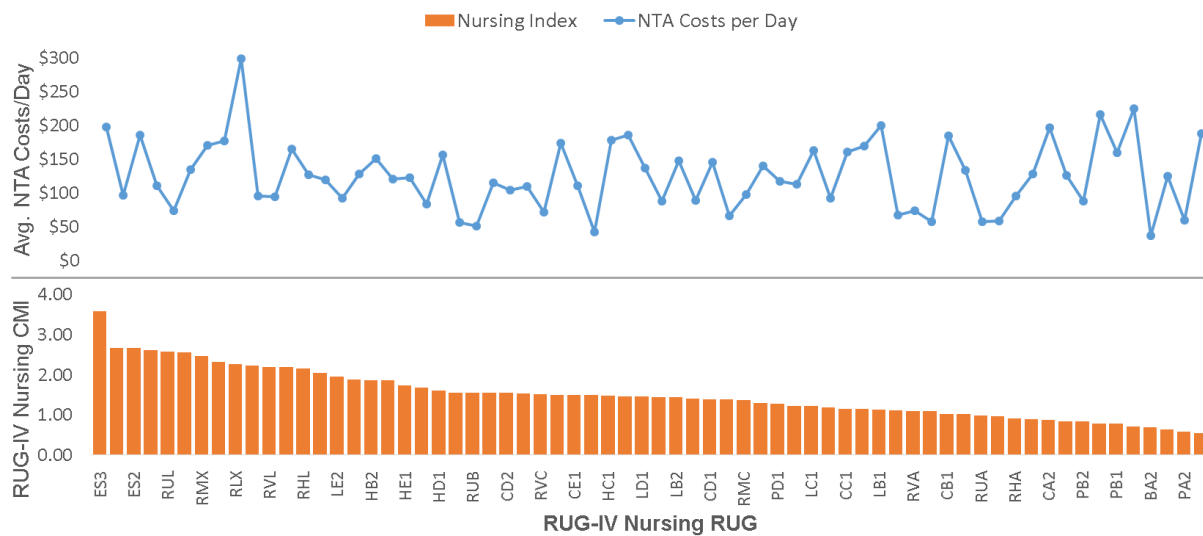
These findings are consistent with other studies. MedPAC stated in a 2015 report that "under current (2014) policies, there is essentially no correlation between nursing payments and NTA costs, with (nursing) payments explaining 0.1% of variability in (NTA) costs."[30] This means that facilities may be underpaid for residents with high NTA costs and overpaid for residents with low NTA costs, which could create an incentive for facilities to avoid residents with substantial NTA service needs. To address this, MedPAC recommended removing NTA services from the nursing component and creating a separate NTA component. In separate research, the Urban Institute concluded that alignment of SNF payments with NTA costs could be improved while imposing a minimal administrative burden on SNFs by creating a separate NTA component.[31] Additionally, members of the Nursing TEP in November 2015, the Third TEP in June 2016, and the Fourth TEP in October 2016 agreed with the recommendation to create a new NTA component separate from nursing. Based on the findings described above and the consensus on the issue, Acumen modeled NTA costs as a separate component.

3.4 Resident Classification for Physical and Occupational Therapy Components

This section describes the selection of independent variables for the PT and OT components, variable grouping methods, and results.

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[30] Carter, Carol, Bowen Garrett, and Doug Wissoker, "The Need to Reform Medicare's Payments to Skilled Nursing Facilities is as Strong as Ever."

[31] Liu, Korbin, Bowen Garrett, Sharon Long, Stephanie Maxwell, Yu-Chu Shen, Douglas Wissoker, Brant Fries, et al, "Final Report to CMS: Options for Improving Medicare Payment for Skilled Nursing Facilities."

3.4.1 Selection of Independent Variables

Selection of independent variables consisted of two primary phases: (1) initial selection of resident characteristics likely to be good predictors of PT and OT utilization and (2) final selection of the variables that were most predictive of resource use. Acumen used relevant literature, clinical input, regression evidence, and feedback from technical expert panels to identify resident characteristics that were potentially predictive of PT and OT utilization. In the initial selection phase, Acumen first narrowed the full list of MDS variables to likely predictors of PT and OT use based on evidence from the literature and input from clinicians. Next, Acumen used the LASSO regression technique[32] to determine which of the initial set of variables were most predictive of costs. Input from technical expert panels was also incorporated into the exploratory phase of independent variable selection. Acumen then developed a final list of potential predictors by removing items with a minimal impact on costs.

The final list of potential predictors selected for further exploration included: clinical reasons for the prior inpatient stay and SNF stay, functional status, cognitive impairment, age, prior utilization of services (emergency, acute inpatient, and post-acute), comorbidities recorded during the SNF stay and during the year prior to the stay, and services received during the SNF stay. Acumen then used regression analysis to examine the relationship between these characteristics and PT and OT costs per day. Three types of resident information were found to be strong predictors of PT and OT costs per day: clinical reasons for the prior inpatient stay, functional status, and cognitive impairment. Clinical reasons for the prior inpatient stay were defined using the clinical categories described in the first sub-section below. Cognitive impairment was identified using the cognitive indicator described in the second sub-section. Functional status was incorporated using a function score described in the third sub-section.

Subsequent to these investigations, commenters responding to the ANPRM noted that comorbidities were included as determinants of payment in the SLP and NTA components of the recommended payment model, therefore comorbidities should also be considered for inclusion in the PT and OT components. In response to these comments, we conducted further investigations to determine if it was appropriate to include PT and OT comorbidities in the recommended payment model. The results of these investigations are described in the fourth sub-section below.

Clinical Categories

In the SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) we describe the methodology for constructing clinically relevant classifications to group residents for payment purposes. As

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[32] Tibshirani, Robert, "Regression Shrinkage and Selection via the Lasso," *Journal of the Royal Statistical Society: Series B (Statistical Methodology)* 58 (1996): 267-288, https://statweb.stanford.edu/~tibs/lasso/lasso.pdf.

described in that report, Acumen sought to create broad groupings that would allow the incorporation of additional criteria relevant to SNF resource use. To achieve this, Acumen worked with clinicians to create broad clinical categories that group residents based on their primary reason for SNF care. Based on the analyses, ten clinical categories were created: Acute Infections, Acute Neurologic, Cancer, Cardiovascular and Coagulations, Major Joint Replacement or Spinal Surgery, Medical Management, Non-Surgical Orthopedic/Musculoskeletal, Pulmonary, Non-Orthopedic Surgery, and Orthopedic Surgery (Except Major Joint Replacement or Spinal Surgery). The ten clinical categories and average costs per day by component are shown in Table 14 below.[33]

At the time the clinical categories were developed, we determined that SNF diagnostic information was of lower quality than diagnostic information from the prior inpatient stay. For example, the MDS assessment does not indicate the primary reason for a SNF stay. We also found that 47% of SNF claims assigned generic ICD-9-CM codes as the principal diagnosis, limiting the usefulness of diagnoses from SNF claims in classifying residents. As a result, we used the Medical Severity – Diagnostic Related Group (MS-DRG) from the prior inpatient stay to define the primary reason for SNF care and assign residents to clinical categories. A full mapping between MS-DRGs and the 10 categories is shown in Table 78 in the appendix. For residents whose prior inpatient stay took place in an inpatient rehabilitation facility (IRF), we used the Rehabilitation Impairment Category (RIC) from the IRF stay to assign residents to clinical categories, as IRFs do not use MS-DRGs to determine payment. A mapping of the RICs to the clinical categories is shown in Table 79 in the appendix. More details on these decisions are provided in the SNF PMR technical report.

Table 14: 10 Clinical Categories and Average Costs per Day by Component

Clinical Category	# of Stays	% of Stays	Avg. Costs per Day			
			PT	OT	SLP	NTA
Acute Infections	124,274	6.5%	$65	$56	$17	$87
Acute Neurologic	121,220	6.4%	$68	$58	$35	$58
Cancer	87,061	4.6%	$64	$55	$20	$63
Cardiovascular and Coagulations	187,395	9.9%	$68	$58	$16	$79
Medical Management	579,044	30.5%	$64	$55	$20	$72
Non-Orthopedic Surgery	205,931	10.8%	$68	$58	$15	$89
Non-Surgical Orthopedic/Musculoskeletal	110,066	5.8%	$73	$61	$14	$56
Major Joint Replacement or Spinal Surgery	163,444	8.6%	$88	$65	$8	$63
Orthopedic Surgery (Except Major Joint Replacement or Spinal Surgery)	165,662	8.7%	$74	$62	$13	$68
Pulmonary	154,989	8.2%	$65	$56	$21	$93

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[33] Nursing costs per day are not shown because, as discussed in Section 3.2.1, resident-specific data on nursing costs is not available.

As described in the SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html), in developing RCS-I we included the 10 clinical categories as a categorical variable when using the Classification and Regression Trees (CART) algorithm to develop resident groups for PT and OT payment. As described in Section 3.4.2, CART is a decision tree learning technique that produces classification groups based on the relationship between a dependent variable and at least one independent variable. Allowing CART to group the clinical categories resulted in fewer resident groups but a higher R-squared value. Therefore, Acumen used the results of this simpler model to collapse clinical categories that were often grouped together by CART. Table 15 shows the five collapsed categories for the PT and OT components. Table 16 shows the collapsed clinical categories, the number of stays, and PT and OT costs per day.

Table 15: Collapsed Clinical Categories for PT and OT Components

Original Categories	Collapsed Categories
Major Joint Replacement or Spinal Surgery	Major Joint Replacement or Spinal Surgery
Non-Surgical Orthopedic/Musculoskeletal	Other Orthopedic
Orthopedic Surgery (Except Major Joint Replacement or Spinal Surgery)	Other Orthopedic
Acute Infections	Medical Management
Medical Management	Medical Management
Cancer	Medical Management
Pulmonary	Medical Management
Cardiovascular and Coagulations	Medical Management
Acute Neurologic	Acute Neurologic
Non-Orthopedic Surgery	Non-Orthopedic Surgery

Table 16: Collapsed Clinical Categories and Average PT and OT Costs per Day

Clinical Category	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
Major Joint Replacement or Spinal Surgery	163,444	8.6%	$88	$65
Other Orthopedic	275,728	14.5%	$73	$61
Medical Management	1,132,763	59.6%	$65	$56
Non-Orthopedic Surgery	205,931	10.8%	$68	$58
Acute Neurologic	121,220	6.4%	$68	$58

Cognitive Measure

The SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) describes the investigations that led us to select

a cognitive measure based on the Cognitive Function Scale (CFS) to assess cognition for the therapy components of the recommended payment model. As described in that report, this measure was selected because there is currently no single measure of cognitive status that allows comparability across residents. RUG-IV, the current payment model, primarily uses the Brief Interview for Mental Status (BIMS) to measure residents' cognitive function. However, about 15% of residents do not complete the BIMS: in 12% of cases, the interview is not attempted, and for 3% of stays, the interview is attempted but cannot be completed. In these cases, the MDS requires assessors to complete the Staff Assessment for Mental Status (items C0700-C1000), and the Cognitive Performance Scale (CPS) derived from those items, originally developed for the MDS 2.0, can be used to assess cognitive function.

To address the lack of a common measure of cognitive status, Thomas et al. proposed in a 2015 paper the use of a new cognitive measure, the Cognitive Function Scale (CFS), which combines scores from the BIMS and CPS into one scale that can be used to compare cognitive function across all residents.[34] The CFS places residents into one of four cognitive performance categories based on their score on either the BIMS or CPS. In response to the ANPRM, commenters questioned this scoring methodology, specifically the classification of a CPS score of 0 as "mildly impaired." Based on a subsequent analysis showing that residents with a CPS score of 0 had similar therapy costs as residents with a BIMS score of 13-15 indicating "cognitively intact" (see Table 17), as well as clinical feedback, we determined that it was appropriate to reclassify residents with a CPS score of 0 as cognitively intact, consistent with ANPRM feedback. The final scoring methodology for the proposed PDPM cognitive measure is shown in Table 18. The SNF PMR technical report provides more details on our decision to select a cognitive measure based on the CFS as an indicator of cognitive status for the therapy components. As noted in that report, the CFS-based cognitive measure is not used to determine payment in the recommended nursing and NTA components.

Table 17: Therapy Costs per Day by CPS Score and BIMS Score

Cost Component	CPS Score = 0	CPS Score = 1	CPS Score = 2	BIMS Score = 13-15	BIMS Score = 8-12
Total Therapy	$145	$148	$156	$146	$148
PT	$72	$68	$69	$73	$67
OT	$61	$58	$58	$61	$58
SLP	$12	$22	$29	$12	$23

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[34] Thomas, Kali S., David Dosa, Andrea Wysocki, and Vincent Mor, "The Minimum Data Set 3.0 Cognitive Function Scale," Medical Care (2015), https://doi.org/10.1097/MLR.000000000000334.

Table 18: Revised Mapping between BIMS/CPS Scores and PDPM Function Scale

PDPM Cognitive Level	BIMS Score	CPS Score
1 - Cognitively Intact	13-15	0
2 - Mildly Impaired	8-12	1-2
3 - Moderately Impaired	0-7	3-4
4 - Severely Impaired	-	5-6

Construction of Function Score

In developing RCS-I, Acumen constructed a function score to measure therapy utilization based in part on the current ADL score. In contrast to the current ADL score, the RCS-I function score to measure therapy utilization excluded bed mobility items and relied exclusively on three late-loss self-performance items (toileting, transferring, and eating) to assess function. Bed mobility items and support provided items were excluded from the RCS-I function score because these items were considered to be based on the level of service provided and therefore not consistent with a payment model based on resident characteristics. Additionally, the RCS-I function score assigned points on the basis of therapy utilization rather than functional dependence. The SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) provides more details on the construction of the function score to measure therapy utilization.

Comments submitted in response to the ANPRM suggested replacing older MDS items used to determine payment in RCS-I with newer, IMPACT Act-compliant items. Additionally, some commenters recommended also using early loss ADLs to measure function. In light of this feedback, we constructed a new function score based on functional items found on Section GG, a relatively new section of the MDS 3.0 that offers standardized and more comprehensive measures of functional status and therapy needs. Section GG measures three self-care activities (eating, oral hygiene, and toileting hygiene) and various activities relating to mobility. Section GG is assessed once at admission and once at discharge. At admission, the assessor completes both the admission performance and the discharge goal for the resident. At discharge, only the discharge performance is assessed. SNFs have been collecting Section GG data since October 2016 as part of the requirements for the Improving Medicare Post-Acute Care Transformation Act of 2014 (IMPACT Act).

To select Section GG items for inclusion in the functional measure for the PT and OT components, we ran individual regressions using each of the 12 Section GG functional abilities assessed at admission to separately predict PT and OT costs per day. The R-squared values of these individual regressions are shown in Table 19. Because of the lower predictive ability of the wheeling items GG0170R1 (wheel 50 feet with two turns) and GG0170S1 (wheel 150 feet),

we excluded these from construction of the functional measure. We retained the 10 remaining items shown in Table 19.

Table 19: Predictive Ability of Section GG Items

MDS Item	Name	ADL Type	Description	PT	OT
GG0130A1	Self-care: Eating	Late loss	The ability to use suitable utensils to bring food to the mouth and swallow food once the meal is presented on a table/tray. Includes modified food consistency.	0.034	0.027
GG0130B1	Self-care: Oral hygiene	Early loss	The ability to use suitable items to clean teeth. Dentures: The ability to remove and replace dentures from and to the mouth, and manage equipment for soaking and rinsing them.	0.038	0.030
GG0130C1	Self-care: Toileting Hygiene	Late loss	The ability to maintain perineal hygiene, adjust clothes before and after using the toilet, commode, bedpan, or urinal.	0.025	0.020
GG0170B1	Mobility: Sit to lying	Late loss	The ability to move from sitting on side of bed to lying flat on the bed.	0.034	0.025
GG0170C1	Mobility: Lying to sitting on side of bed	Late loss	The ability to safely move from lying on the back to sitting on the side of the bed with feet flat on the floor, and with no back support.	0.036	0.027
GG0170D1	Mobility: Sit to stand	Late loss	The ability to safely come to a standing position from sitting in a chair or on the side of the bed.	0.043	0.032
GG0170E1	Mobility: Chair/bed-to-chair transfer	Late loss	The ability to safely transfer to and from a bed to a chair (or wheelchair).	0.035	0.027
GG0170F1	Mobility: Toilet transfer	Late loss	The ability to safely get on and off a toilet or commode.	0.029	0.023
GG0170J1	Mobility: Walk 50 feet with 2 turns	Early loss	Once standing, the ability to walk at least 150 feet in a corridor and make 2 turns.	0.055	0.038
GG0170K1	Mobility: Walk 150 feet	Early loss	Once standing, the ability to walk at least 150 feet in a corridor or similar space.	0.054	0.037
GG0170R1	Mobility: Wheel 50 feet with 2 turns	Early loss	Once seated in wheelchair/scooter, can wheel at least 50 feet and make 2 turns.	0.004	0.004
GG0170S1	Mobility: Wheel 150 feet	Early loss	Once seated in wheelchair/scooter, can wheel at least 150 feet in a corridor or similar space.	0.003	0.003

After selecting the Section GG items that comprise the functional measure for the PT and OT components, we assigned points to each response based on functional independence, with higher points assigned to higher independence levels. This approach is consistent with point assignment for the PDPM nursing functional measure and functional measures in other care settings. Further, under the RUG-IV model, if the SNF codes that the "activity did not occur" or

"occurred only once," these items are assigned the same point value as "independent." However, we observed that residents who were unable to complete an activity had similar PT and OT costs as dependent residents. Therefore, when the activity cannot be completed, the equivalent Section GG responses ("resident refused," "not applicable," "not attempted due to medical condition or safety concerns") are grouped with "dependent" for the purpose of point assignment. For the two walking items, there is an additional response level to reflect residents who skip the walking assessment due to their inability to walk. Residents who are coded as unable to walk receive the same score as dependent residents to match with clinical expectations.

Table 20 and Table 21 show the points assigned to each response using this methodology. The point assignment is nearly identical across the two tables, except that for the walking items, residents who cannot walk (based on item GG0170H1) are assigned 0 points. To calculate a total function score, we calculated average scores for bed mobility, transfer, and walking based on the multiple items that describe these activities, then summed the three average scores with the scores for eating, oral hygiene, and toileting hygiene, resulting in equal weighting of the six activities. This procedure avoids overweighting activities that are measured using multiple items. The final score is rounded to the nearest integer, resulting in a total theoretical function score that ranges from 0 to 24.

Table 20: Points Assigned to Section GG Responses (Except Walking)

Response	Score
05 Set-up assistance, 06 Independent	4
04 Supervision or touching assistance	3
03 Partial/moderate assistance	2
02 Substantial/maximal assistance	1
01 Dependent, 07 Refused, 09 N/A, 88 Not Attempted	0

Table 21: Points Assigned to Section GG Responses (Walking Items)

Response	Score
05 Set-up assistance, 06 Independent	4
04 Supervision or touching assistance	3
03 Partial/moderate assistance	2
02 Substantial/maximal assistance	1
01 Dependent, 07 Refused, 09 N/A, 88 Not Attempted, Resident Cannot Walk*	0

Coded based on response to GG0170H1 (Does the resident walk?).

Figure 5 shows PT and OT costs per day and the percentage of stays by Section GG-based function score value. The graph shows an inverse U-shaped relationship between function

score and costs per day. PT and OT costs are lowest for residents with the highest and lowest function scores.

Figure 5: PT and OT Costs per Day and % of Stays by Section GG-based Score Value
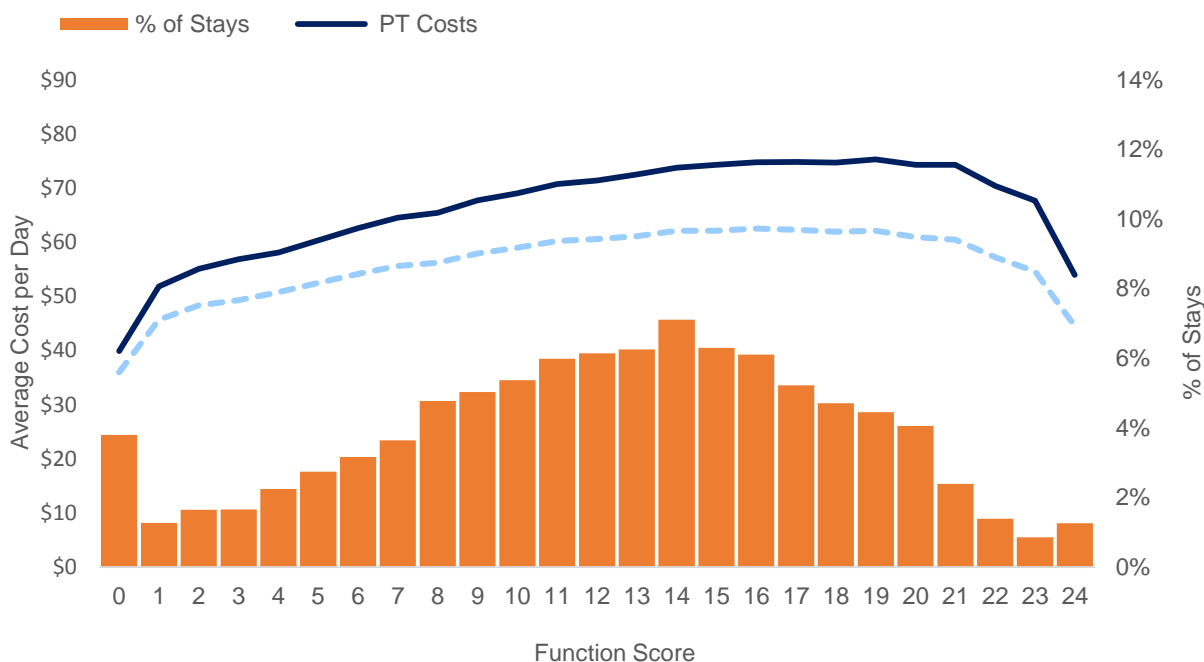
Comorbidities Related to PT and OT Utilization

As noted above, we revisited the decision to exclude PT and OT related comorbidities from the recommended payment model based on feedback received in response to the ANPRM. We first investigated the impact of a broad list of selected conditions on PT and OT utilization. These conditions were identified based on ANPRM comments, clinical input, and a literature search. Table 22 shows the impact of each condition on PT and OT costs per day. Conditions were defined using the PPS-required MDS item indicated in the table or ICD-10 diagnosis codes, when no PPS-required MDS item is indicated. A list of ICD-10-CM codes used to define conditions that were not defined using MDS items can be found in Table 80 in the appendix. All conditions that had a positive impact on PT or OT costs per day of $2 or more were selected for further investigation.[35] These are: J1700A Fall within month prior to admission, J1700C Fall-related fracture within 6 months prior to admission, arthritis, rheumatoid arthritis, musculoskeletal pain, and vertigo with specific cause. As noted in the SNF PMR technical report (available at available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html), including items that impact payment negatively can

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[35] The impact of a given condition is defined as the average costs for stays with the condition minus the average costs for stays without the condition.

result in access barriers for beneficiaries with these conditions and incentivize providers to miscode these items or stint on care provided to residents with these conditions.

<p style="text-align:center">Table 22: Conditions Selected for Investigation as PT and OT Comorbidities</p>

Condition	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
B1000 Vision				
Missing	26,985	1.4%	$53.7	$46.4
Adequate	1,547,758	81.5%	$69.8	$58.7
Impaired	214,843	11.3%	$66.3	$56.8
Moderately Impaired	53,428	2.8%	$63.4	$54.3
Highly Impaired	39,736	2.1%	$54.1	$46.5
Severely Impaired	16,336	0.9%	$58.8	$51.2
J1700A Fall within month prior to admission				
Missing	62,982	3.3%	$57.4	$48.0
No	1,120,965	59.0%	$67.7	$56.9
Yes	640,809	33.7%	$71.6	$60.5
Unable to Determine	74,330	3.9%	$65.7	$57.2
J1700B Fall within 2-6 months prior to admission				
Missing	70,801	3.7%	$58.8	$49.1
No	1,290,902	68.0%	$69.2	$58.1
Yes	377,500	19.9%	$68.8	$58.2
Unable to Determine	159,883	8.4%	$67.8	$58.5
J1700C Fall-related fracture within 6 months prior to admission				
Missing	65,990	3.5%	$57.8	$48.4
No	1,444,716	76.1%	$68.2	$57.5
Yes	297,507	15.7%	$73.6	$61.5
Unable to Determine	90,873	4.8%	$66.6	$57.5
K0100Z No signs or symptoms of possible swallowing disorder				
Missing	12,834	0.7%	$85.7	$60.4
No	84,129	4.4%	$61.1	$52.5
Yes	1,802,123	94.9%	$68.8	$58.1
K0510C2 Mechanically altered diet while a resident				
Missing	5,326	0.3%	$57.5	$50.7
No	1,450,938	76.4%	$71.0	$59.5
Yes	442,822	23.3%	$60.9	$52.6
I0200 Anemia				
Missing	288	0.0%	$70.9	$61.2
No	1,317,028	69.4%	$69.3	$58.4
Yes	581,770	30.6%	$67.0	$56.7
I0600 Heart Failure				

Condition	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
Missing	207	0.0%	$72.2	$59.3
No	1,400,419	73.7%	$69.2	$58.0
Yes	498,460	26.2%	$67.0	$57.3
I0700 Hypertension				
Missing	321	0.0%	$69.0	$61.9
No	422,775	22.3%	$68.3	$57.2
Yes	1,475,990	77.7%	$68.7	$58.0
I2900 Diabetes Mellitus (DM)				
Missing	179	0.0%	$60.5	$56.3
No	1,215,901	64.0%	$69.3	$58.1
Yes	683,006	36.0%	$67.3	$57.4
I4500 CVA, TIA, or Stroke				
Missing	160	0.0%	$62.3	$52.8
No	1,726,601	90.9%	$69.0	$58.1
Yes	172,325	9.1%	$64.1	$55.4
I4800 Non-Alzheimer's Dementia				
Missing	157	0.0%	$63.3	$55.9
No	1,516,050	79.8%	$70.5	$59.2
Yes	382,879	20.2%	$61.1	$52.6
I4900 Hemiplegia or Hemiparesis				
Missing	112	0.0%	$57.3	$52.0
No	1,806,257	95.1%	$69.0	$58.1
Yes	92,717	4.9%	$61.4	$53.4
I5000 Paraplegia				
Missing	85	0.0%	$61.5	$55.0
No	1,888,791	99.5%	$68.7	$57.9
Yes	10,210	0.5%	$45.4	$43.5
I5100 Quadriplegia				
Missing	83	0.0%	$62.5	$56.7
No	1,893,606	99.7%	$68.7	$57.9
Yes	5,397	0.3%	$40.3	$38.1
I5200 Multiple Sclerosis				
Missing	82	0.0%	$59.9	$53.7
No	1,884,932	99.3%	$68.7	$57.9
Yes	14,072	0.7%	$58.5	$51.3
I5300 Parkinson's Disease				
Missing	93	0.0%	$62.2	$56.2
No	1,819,996	95.8%	$68.7	$57.9
Yes	78,997	4.2%	$65.5	$55.8

Condition	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
I5700 Anxiety Disorder				
Missing	175	0.0%	$61.9	$52.4
No	1,482,818	78.1%	$69.4	$58.3
Yes	416,093	21.9%	$65.7	$56.0
I5800 Depression				
Missing	230	0.0%	$63.4	$55.5
No	1,261,551	66.4%	$69.8	$58.5
Yes	637,305	33.6%	$66.2	$56.4
I5900 Manic Depression				
Missing	113	0.0%	$58.6	$51.8
No	1,842,514	97.0%	$68.8	$58.0
Yes	56,459	3.0%	$62.2	$53.9
I5950 Psychotic Disorder				
Missing	115	0.0%	$64.1	$54.8
No	1,842,973	97.0%	$68.9	$58.1
Yes	55,998	2.9%	$57.3	$49.9
I6000 Schizophrenia				
Missing	96	0.0%	$62.4	$49.2
No	1,842,987	97.0%	$68.9	$58.0
Yes	56,003	2.9%	$58.2	$51.4
I6100 Post Traumatic Stress Disorder (PTSD)				
Missing	87	0.0%	$60.2	$52.8
No	1,891,191	99.6%	$68.6	$57.8
Yes	7,808	0.4%	$65.9	$56.1
Peripheral Neuropathy (ICD-10-CM)				
No	1,756,604	92.5%	$68.5	$57.8
Yes	142,482	7.5%	$69.7	$58.7
Substance Abuse (ICD-10-CM)				
No	1,799,063	94.7%	$68.7	$57.9
Yes	100,023	5.3%	$67.3	$57.4
Osteoporosis (ICD-10-CM)				
No	1,685,885	88.8%	$68.4	$57.7
Yes	213,201	11.2%	$69.7	$58.6
Arthritis (ICD-10-CM)				
No	1,346,603	70.9%	$67.0	$57.2
Yes	552,483	29.1%	$72.5	$59.5
Rheumatoid Arthritis (ICD-10-CM)				
No	1,828,421	96.3%	$68.5	$57.8
Yes	70,665	3.7%	$70.7	$59.4

Condition	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
Hyperglycemia or Hypoglycemia (ICD-10-CM)				
No	1,843,981	97.1%	$68.6	$57.9
Yes	55,105	2.9%	$67.7	$57.1
Musculoskeletal Pain (ICD-10-CM)				
No	370,965	19.5%	$66.7	$54.9
Yes	1,528,121	80.5%	$69.1	$58.5
Vertigo with Specific Cause (ICD-10-CM)				
No	1,896,138	99.8%	$68.6	$57.8
Yes	2,948	0.2%	$71.5	$61.1
Spinal Cord Injury (ICD-10-CM)				
No	1,893,706	99.7%	$68.6	$57.8
Yes	5,380	0.3%	$61.9	$54.6
Amputation (ICD-10-CM)				
No	1,851,044	97.5%	$68.8	$58.0
Yes	48,042	2.5%	$61.3	$53.2
Anemia (ICD-10-CM)				
No	1,000,059	52.7%	$68.9	$58.2
Yes	899,027	47.3%	$68.2	$57.5
Cancer (ICD-10-CM)				
No	1,714,587	90.3%	$68.8	$58.0
Yes	184,499	9.7%	$66.3	$56.2

The next step in our analysis was to use the subset of conditions selected based on the results shown in Table 22 to predict PT and OT costs per day. We also included the collapsed clinical categories in Table 16, PDPM cognitive measure, and the Section GG-based function score as covariates to control for case mix. Table 23 shows the results of this investigation. The table shows that only one condition is associated with a statistically significant increase in both PT and OT costs of at least $2: J1700A Fall within month prior to admission. However, the impact of this item on costs is small: $2.52 for PT costs per day and $2.33 for OT costs per day.

Table 23: OLS Estimates of Impact of Selected Conditions on PT and OT Costs per Day

Variable	PT Costs per Day		OT Costs per Day	
	Coeff.	P-Value	Coeff.	P-Value
J1700A: Fall in the Last Month Prior to Admission				
Yes	2.52	<.0001	2.33	<.0001
No	Ref.	-	Ref.	-
Unable to Determine	1.02	<.0001	2.19	<.0001
J1700C: Fracture Related to A Fall within 6 Months Prior to Admission				

Variable	PT Costs per Day		OT Costs per Day	
	Coeff.	P-Value	Coeff.	P-Value
Yes	0.50	<.0001	0.75	<.0001
No	Ref.	-	Ref.	-
Unable to Determine	0.72	0.001	0.63	<.0001
Arthritis (ICD-10-CM)				
Yes	1.24	<.0001	0.34	<.0001
No	Ref.	-	Ref.	-
Rheumatoid Arthritis (ICD-10-CM)				
Yes	0.06	0.378	0.25	0.013
No	Ref.	-	Ref.	-
Musculoskeletal Pain (ICD-10-CM)				
Yes	1.46	<.0001	2.43	<.0001
No	Ref.	-	Ref.	-
Vertigo with Specific Cause (ICD-10-CM)				
Yes	0.98	0.141	1.75	0.002
No	Ref.	-	Ref.	-

The last step of our analysis was to test the impact of adding the comorbidities shown in Table 23 on the predictive ability of the payment model. Table 24 compares the predictive ability of two models. The first model, shown in the first row, includes the five collapsed PT and OT clinical categories shown in Table 16, the Section GG-based function score, and cognitive status. The second model, shown in the second row, additionally includes all of the comorbidities shown in Table 23. The table shows that including the comorbidities shown in Table 23 has a negligible impact on predictive ability.

Table 24: Predictive Ability of Potential PT and OT Comorbidities

Model	R-squared	
	PT Costs per Day	OT Costs per Day
Clinical Categories + Function + Cognition	0.076	0.049
Clinical Categories + Function + Cognition + Comorbidities	0.077	0.051

The results discussed above show that 1) even the most promising conditions investigated as potential PT and OT comorbidities are associated with only a small (no more than $2.52) increase in PT or OT costs per day and 2) including the most promising conditions as predictors has a marginal impact on predictive ability. Because including PT and OT comorbidities would increase model complexity with little gain in payment accuracy, Acumen decided to not include PT and OT comorbidities in the payment model.

3.4.2 Variable Grouping Methods

After selecting independent variables related to PT and OT utilization, Acumen used the predictors to construct payment groups. Construction of payment groups consisted of the following steps:

1) During development of the RCS-I model, we used the Classification and Regression Trees (CART) algorithm to explore possible payment groups for the PT/OT component.

2) Based on the preliminary groupings created by CART, we created a PT/OT classification that used consistent criteria to group residents into 30 payment groups across the five clinical categories determined to be relevant to PT/OT utilization. In other words, the classification uses the same function score bins and cognitive levels to classify residents within each of the five PT/OT clinical categories: Major Joint Replacement or Spinal Surgery, Other Orthopedic, Non-Orthopedic Surgery, Acute Neurologic, and Medical Management.

3) In response to ANPRM comments stating the RCS-I was overly complex, we explored options to reduce the number of PT and OT payment groups.[36] Because we observed that resource utilization was similar for residents in the clinical categories Non-Orthopedic Surgery and Acute Neurologic (see Table 16), we determined that we could combine these two categories with a minimal loss in predictive accuracy. This decision reduced the number of PT and OT payment groups to 24.

4) After replacing the RCS-I function score with the revised function score for PT and OT classification based on Section GG items, we used CART to again explore potential groupings within the four PT and OT clinical categories (Major Joint Replacement or Spinal Surgery, Other Orthopedic, Non-Orthopedic Surgery/Acute Neurologic, and Medical Management).

5) The CART results from Step 4 revealed that after the inclusion of the Section GG-based function score, cognitive status played a minimal role in classification. Based on this finding, we determined that we could remove cognition as a determinant of PT and OT payment with a minimal loss in predictive accuracy. This decision reduced the number of PT and OT groups to 16.

The SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) provides more details on Steps 1 and 2. The following sub-sections provide further details on the CART algorithm and Steps 3-5. Specifically, the first sub-section describes the CART algorithm, the second sub-section shows the independent variables included in the final stage of CART, the third sub-section shows the

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[36] As noted in Section 3.3.1, we split the RCS-I PT+OT component into two separate components for PT and OT based on feedback from ANPRM commenters and technical expert panels.

CART results, and the fourth sub-section describes how we determined the final PT and OT case-mix groups based on the initial CART results.

CART Algorithm

CART is a non-parametric decision tree learning technique that produces either classification or regression trees, depending on whether the dependent variable is categorical or numeric, respectively. CART selects splits in independent variables to obtain the highest gain in the predictive ability (measured by the R-squared value) of a classification/regression tree. CART is a recursive procedure. Once a rule is selected and splits a node into two, the same process is applied to each "child" node until CART detects no further gain can be made, or some pre-set stopping rules are met. Each branch of the tree ends in a terminal node, each observation falls into one and exactly one terminal node, and each terminal node is uniquely defined by a set of rules.

Acumen required that each split in the tree must increase the overall R-squared by at least 0.0001. Acumen then pruned the tree generated by CART to find the smallest number of splits with an associated cross-validated error less than the minimum cross-validated error plus one standard error of that minimum error (a "One Standard Error (SE)" rule). In other words, we take the simplest tree whose error is within one standard error of the minimum error.[37]

Using the CART technique to identify potential payment groups is advantageous because the model is easy to interpret and resistant to outliers. Additionally, CART only selects the variables that result in the largest gains in the predictive ability of the classification/regression tree, which enhances generalization by reducing the chances of overfitting, which is likely in a complex index model. CART was used to create payment groups in other Medicare settings. For example, it determined the age, function, and cognitive splits within rehabilitation impairment groups (RICs) when the IRF PPS was developed. The Urban Institute has also used CART in its research on SNF payment alternatives: researchers from the Urban Institute used CART to explore alternatives to traditional regression models[38] and create classification groups for NTA payment.[39] However, a limitation of CART is that each subsequent split depends on the previous one, so that an error in the higher split is propagated down. Additionally, a small change in the dataset can cause a large change in the tree. For these reasons, Acumen examined

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[37] For more detail on why these parameters were chosen, see: Therneau, Terry M., and Elizabeth J. Atkinson, "An Introduction to Recursive Partitioning Using the RPART Routines," *Mayo Foundation, Rochester, MN* (2015), https://cran.r-project.org/web/packages/rpart/vignettes/longintro.pdf.

[38] Liu, Korbin, Bowen Garrett, Sharon Long, Stephanie Maxwell, Yu-Chu Shen, Douglas Wissoker, Brant Fries, et al., "Final Report to CMS: Options for Improving Medicare Payment for Skilled Nursing Facilities."

[39] Wissoker, Doug, and A. Bowen Garrett, "Development of Updated Models of Non-Therapy Ancillary Costs," *Urban Institute, Medicare Payment Advisory Commission. Washington, DC* (2010), http://www.urban.org/sites/default/files/alfresco/publication-pdfs/412249-Development-of-Updated-Models-of-Non-Therapy-Ancillary-Costs.PDF.

the robustness of conclusions by running CART on multiple populations and used clinical review of the final results to ensure clinical validity.

Variables Included in the CART Models

To create the final PT and OT case-mix groups in the PDPM, we ran separate CART models for PT and OT, given the separation of the RCS-I PT+OT component into two separate case-mix components in the PDPM. As discussed in the SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html), the CART algorithm requires a dependent variable and at least one independent variable. The dependent variable for the PT model was PT costs per day, while the OT model used OT costs per day. The CART models used function score and cognitive status as independent variables to create splits within each of the four PT and OT clinical categories (Major Joint Replacement or Spinal Surgery, Other Orthopedic, Non-Orthopedic Surgery/Acute Neurologic, and Medical Management). Comorbidities were not used to create PT and OT payment groups because they were not determined to be strong predictors of PT or OT utilization, as discussed in Section 3.4.1.

Table 25 shows the Section GG-based function score included in CART. The functional variable is a discrete numeric variable that can contain any integer value between 0 and 24. Table 26 shows the cognitive status variable used in the CART analysis. The cognitive status variable is categorical, however it follows an implied order as shown in Table 26.

Table 25: Function Score Included in CART

Score	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
0	72,151	3.8%	$40	$36
1	24,084	1.3%	$52	$46
2	31,268	1.6%	$55	$48
3	31,376	1.7%	$57	$49
4	42,694	2.2%	$58	$51
5	52,086	2.7%	$60	$52
6	60,115	3.2%	$63	$54
7	69,151	3.6%	$65	$56
8	90,639	4.8%	$65	$56
9	95,492	5.0%	$68	$58
10	101,913	5.4%	$69	$59
11	113,752	6.0%	$71	$60
12	116,603	6.1%	$71	$61
13	118,711	6.3%	$73	$61
14	134,994	7.1%	$74	$62

Score	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
15	119,572	6.3%	$74	$62
16	115,925	6.1%	$75	$63
17	99,217	5.2%	$75	$62
18	89,419	4.7%	$75	$62
19	84,593	4.5%	$75	$62
20	77,047	4.1%	$74	$61
21	45,372	2.4%	$74	$60
22	26,407	1.4%	$70	$57
23	16,160	0.9%	$68	$55
24	23,926	1.3%	$54	$44
Missing*	46,419	2.4%	$65	$51

Stays with missing values were not included in the CART analysis

Table 26: Cognitive Status Variable Included in CART

PDPM Cognitive Level	BIMS Score	CPS Score	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
1. Cognitively Intact	13-15	0	1,078,460	56.8%	$73	$61
2. Mildly Impaired	8-12	1-2	380,382	20.0%	$68	$58
3. Moderately Impaired	0-7	3-4	309,039	16.3%	$61	$53
4. Severely Impaired	-	5-6	72,975	3.8%	$46	$40
Missing*	-	-	58,230	3.1%	$62	$53

Stays with missing values were not included in the CART analysis

CART Results

Acumen ran a CART analysis within each of the 4 collapsed categories (Major Joint Replacement or Spinal Surgery, Other Orthopedic, Non-Orthopedic Surgery/Acute Neurologic, and Medical Management), resulting in 14 groups for PT and 14 groups for OT. All observations with missing values were dropped before running the CART analysis. Table 27 shows the PT payment groups generated by CART and their associated costs. Table 28 shows the same information for the OT component.

Table 27: PT Groups Created by CART within Collapsed Clinical Categories

Clinical Category	Function Score	Cognitive Level	# of Stays	% of Stays	Avg. PT Costs per Day
Major Joint Replacement or Spinal Surgery	0-12	-*	50,106	2.8%	$78
Major Joint Replacement or Spinal Surgery	13-24	-	106,159	5.9%	$92
Other Orthopedic Surgery	0-6	-	36,399	2.0%	$64
Other Orthopedic Surgery	7-24	-	227,590	12.6%	$75
Medical Management	0	-	46,198	2.6%	$37
Medical Management	1-5	-	109,956	6.1%	$54
Medical Management	6-9	-	178,248	9.9%	$62
Medical Management	24	-	13,952	0.8%	$48
Medical Management	10-23	3,4	102,367	5.7%	$64
Medical Management	10-23	1,2	620,866	34.5%	$71
Non-Orthopedic Surgery and Acute Neurologic	0	-	14,594	0.8%	$46
Non-Orthopedic Surgery and Acute Neurologic	1-4	-	22,925	1.3%	$59
Non-Orthopedic Surgery and Acute Neurologic	5-10		76,160	4.2%	$66
Non-Orthopedic Surgery and Acute Neurologic	11-24	-	195,104	10.8%	$72

A dash indicates that any value is included.

Table 28: OT Groups Created by CART within Collapsed Clinical Categories

Clinical Category	Function Score	Cognitive Level	# of Stays	% of Stays	Avg. OT Costs per Day
Major Joint Replacement or Spinal Surgery	0-7	-*	15,065	0.8%	$59
Major Joint Replacement or Spinal Surgery	8-24	-	141,200	7.8%	$66
Other Orthopedic Surgery	0-5	-	26,206	1.5%	$53
Other Orthopedic Surgery	6-24	-	237,783	13.2%	$63
Medical Management	0	-	46,198	2.6%	$34
Medical Management	1-5	-	109,956	6.1%	$48
Medical Management	24	-	13,635	0.8%	$41
Medical Management	6-9	-	178,248	9.9%	$54
Medical Management	10-23	3,4	102,391	5.7%	$55
Medical Management	10-23	1,2	621,159	34.5%	$60
Non-Orthopedic Surgery and Acute Neurologic	0-3	-	30,310	1.7%	$46
Non-Orthopedic Surgery and Acute Neurologic	4-9	-	64,657	3.6%	$56
Non-Orthopedic Surgery and Acute Neurologic	24		4,358	0.2%	$46
Non-Orthopedic Surgery and Acute Neurologic	10-23	-	209,458	11.6%	$61

A dash indicates that any value is included.

Consistent Splits Approach

As discussed in the SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html), our approach in creating case-mix groups was to use the CART output as a template, retaining features of the CART splits that are important to classifying residents based on differences in resource use while discarding other features that are less important in order to reduce complexity and create uniformity across clinical categories. Based on these guidelines, we simplified the CART results shown in Table 27 and Table 28 to develop a classification option for the PT and OT components that uses consistent splits across the four clinical categories. As shown in Table 27 and Table 28, after replacing the Section G-based function score with the Section GG-based score and collapsing the Non-Orthopedic Surgery and Acute Neurologic clinical categories, cognitive status plays a less important role in classifying residents. As a result, we decided to exclude cognition as a determinant of PT and OT payment. We believe this decision reduces complexity without a notable sacrifice in predictive accuracy. Table 29 compares the R-squared values for the CART results and the consistent splits. The consistent splits model has only a slightly lower R-squared and is simpler in that it uses consistent criteria to group residents across clinical categories. The consistent splits payment groups and associated costs are shown in Section 3.4.3.

Table 29: PT and OT Group Options R-squared Comparison

Model	# of Groups	R-squared Value	
		PT	OT
Consistent Splits	16	0.067	0.040
CART	14	0.072	0.045

3.4.3 Results

Table 30 shows the recommended resident groups for PT and OT payment, frequency of stays, and average PT and OT costs per day.

Table 30: Recommended Resident Groups for PT and OT Payment

Clinical Categories	PT and OT GG-based Function Score	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
Major Joint Replacement or Spinal Surgery	0-5	8,359	0.4%	$68	$56
Major Joint Replacement or Spinal Surgery	6-9	17,458	0.9%	$77	$62
Major Joint Replacement or Spinal Surgery	10-23	131,888	6.9%	$90	$66
Major Joint Replacement or Spinal Surgery	24	1,777	0.1%	$92	$62
Other Orthopedic	0-5	27,274	1.4%	$62	$53

Clinical Categories	PT and OT GG-based Function Score	# of Stays	% of Stays	Avg. PT Costs per Day	Avg. OT Costs per Day
Other Orthopedic	6-9	59,114	3.1%	$71	$60
Other Orthopedic	10-23	181,702	9.6%	$76	$63
Other Orthopedic	24	1,549	0.1%	$56	$47
Medical Management	0-5	167,800	8.8%	$49	$43
Medical Management	6-9	187,407	9.9%	$62	$54
Medical Management	10-23	733,015	38.6%	$70	$60
Medical Management	24	16,048	0.8%	$49	$42
Non-Orthopedic Surgery and Acute Neurologic	0-5	50,226	2.6%	$56	$49
Non-Orthopedic Surgery and Acute Neurologic	6-9	51,418	2.7%	$66	$57
Non-Orthopedic Surgery and Acute Neurologic	10-23	213,080	11.2%	$72	$61
Non-Orthopedic Surgery and Acute Neurologic	24	4,552	0.2%	$54	$46

3.5   Resident Classification for Speech-Language Pathology Component

This section describes the selection of independent variables for the SLP component, variable grouping methods, and results.

3.5.1 Selection of Independent Variables

Selection of independent variables consisted of two primary phases: (1) initial selection of resident characteristics likely to be good predictors of SLP utilization, and (2) final selection of the variables that were most predictive of resource use. Acumen used relevant literature, clinical input, regression evidence, and feedback from technical expert panels to identify resident characteristics that were potentially predictive of SLP utilization. In the initial selection phase, Acumen first narrowed the full list of MDS variables to likely predictors of SLP utilization based on evidence from the literature and input from clinicians. Input from technical expert panels was also incorporated into the exploratory phase of independent variable selection. The final list of potential predictors selected for further exploration included: clinical reasons for the prior inpatient stay and SNF stay, functional status, cognitive impairment, age, prior utilization of services (emergency, acute inpatient, and post-acute), comorbidities recorded during the SNF stay and during the year prior to the stay, and services received during the SNF stay.

Acumen then used regression analysis to examine the relationship between these characteristics and SLP costs per day. Based on this analysis and additional clinical input, five types of resident information were found to be strong predictors of SLP costs per day: clinical reasons for the prior inpatient stay, cognitive impairment, the presence of a swallowing disorder, nutritional approach, and additional SLP-related conditions and services. The SNF PMR

technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) describes this analysis in further detail. The incorporation of these predictors into the SLP resident classification is described in the following sub-sections.

Clinical Categories

Similar to the process to collapse the 10 Acumen-developed clinical categories for PT and OT classification, we analyzed CART results and determined we could collapse the 10 clinical categories into two categories relevant to SLP utilization while preserving payment accuracy and reducing model complexity. Acute Neurologic was retained as a separate category because of the higher SLP utilization among these residents, while the remaining nine clinical categories were collapsed into the Non-Neurologic category, as shown in Table 31. The SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) provides more details on this decision. Table 32 shows SLP costs per day for the two collapsed clinical categories.

Table 31: SLP Collapsed Clinical Categories

Clinical Category	Collapsed Categories used in CART
Acute Neurologic	Acute Neurologic
Major Joint Replacement or Spinal Surgery	Non-Neurologic
Non-Surgical Orthopedic/Musculoskeletal	Non-Neurologic
Orthopedic Surgery (Except Major Joint Replacement or Spinal Surgery)	Non-Neurologic
Acute Infections	Non-Neurologic
Medical Management	Non-Neurologic
Cancer	Non-Neurologic
Pulmonary	Non-Neurologic
Cardiovascular and Coagulations	Non-Neurologic
Non-Orthopedic Surgery	Non-Neurologic

Table 32: SLP Costs per Day by SLP Collapsed Clinical Category

Clinical Category	# of Stays	% of Stays	Avg. SLP Costs per Day
Acute Neurologic	121,220	6.4%	$35
Non-Neurologic	1,777,866	93.6%	$17

Cognitive Measure

Section 3.4.1 describes the construction of the PDPM cognitive measure. For the SLP component, residents are classified as either cognitively intact or cognitively impaired. Residents are classified as cognitively impaired when they are assessed to be mildly, moderately, or severely impaired using the PDPM cognitive measure. This definition aligns with clinical feedback and is consistent with the definition of cognitive impairment in the PDPM PT and OT components. Table 33 shows that residents with mild, moderate, or severe cognitive impairments have higher SLP costs than cognitively intact residents.

Table 33: SLP Costs per Day by PDPM Cognitive Level

PCPM Cognitive Level	# of Stays	% of Stays	Avg. SLP Costs per Day
1. Cognitively Intact	1,078,460	56.8%	$12
2. Mildly Impaired	380,382	20.0%	$23
3. Moderately Impaired	309,039	16.3%	$29
4. Severely Impaired	72,975	3.8%	$29
Missing	58,230	3.1%	$23

Swallowing Disorder and Nutritional Approach

Based on clinical input, TEP feedback, and empirical findings, we identified two swallowing-related MDS items that had a notable impact on SLP costs per day and model fit: swallowing disorder and mechanically altered diet. These analyses are described in greater detail in the SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html). Table 34 and Table 35 show SLP costs by presence of a swallowing disorder and presence of a mechanically altered diet, respectively.

Table 34: Average SLP Costs per Day by Swallowing Disorder

Swallowing Disorder	# of Stays	% of Stays	Avg. SLP Costs per Day
No	1,802,123	94.9%	$17
Yes	84,129	4.4%	$39
Missing	12,834	0.7%	$16

Table 35: Average SLP Costs per Day by Mechanically Altered Diet

Mechanically Altered Diet	# of Stays	% of Stays	Avg. SLP Costs per Day
No	1,450,938	76.4%	$13
Yes	442,822	23.3%	$33
Missing	5,326	0.3%	$16

SLP-Related Conditions and Services

As described in the SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html), Acumen identified additional conditions and services related to SLP utilization by using an exhaustive list of items from the MDS assessment to predict SLP costs per day. This investigation found that four Section I diagnoses indicating neurological conditions (I4300: Aphasia, I4500: CVA, TIA, or Stroke, I4900: Hemiplegia or Hemiparesis, and I5500: Traumatic Brain Injury) were associated with notably higher SLP costs. Acumen also investigated additional conditions and services related to SLP utilization based on recommendations from clinicians, the American Speech-Language-Hearing Association (ASHA), and panelists at the Third TEP. Acumen used MDS items and diagnosis codes on the most recent inpatient claim and the first SNF claim to identify these conditions/services and found that residents with these conditions/services had much higher SLP costs per day. Based on these investigations, Acumen included the four Section I neurological conditions and the additional conditions and services found to be associated with higher SLP costs per day as SLP-related comorbidities. A mapping of SLP-related services and conditions that were not defined using MDS items is shown in Table 81 in the appendix. Table 36 shows the services and conditions included as SLP comorbidities.

Table 36: Services and Conditions Included as SLP Comorbidities

Condition/Service
I4300: Aphasia
I4500: CVA,TIA, or Stroke
I4900: Hemiplegia or Hemiparesis
I5500: Traumatic Brain Injury
O0100E2: Tracheostomy Care While a Resident
O0100F2: Ventilator or Respirator While a Resident
Laryngeal Cancer
Apraxia
Dysphagia
ALS

Condition/Service
Oral Cancers
Speech and Language Deficits

Rather than accounting for each SLP-related condition and service separately, we incorporated SLP comorbidities as a combined flag. We found that the predictive ability of the combined SLP comorbidity flag is comparable to that of including each individual SLP-related comorbidity as a separate predictor, while greatly improving the simplicity of the payment model. The SNF PMR technical report provides more detail on this analysis. Table 37 shows the stay frequency and SLP costs per day by presence of an SLP-related comorbidity.

Table 37: Average SLP Costs per Day by Presence of SLP-related Comorbidity

SLP-Related Comorbidity	# of Stays	% of Stays	Avg. SLP Costs per Day
No	1,644,735	86.6%	$16
Yes	254,351	13.4%	$30

3.5.2 Variable Grouping Methods

After selecting independent variables related to SLP utilization, Acumen used these predictors to construct payment groups. Construction of SLP payment groups consisted of the following steps:

1) During development of the RCS-I model, we used the CART algorithm, described in Section 3.4.2, to explore possible payment groups. The dependent variable used in this analysis was SLP costs per day. The independent variables used were cognitive impairment, SLP-related conditions and services, the presence of a swallowing disorder, and nutritional approach (the presence of a mechanically altered diet or feeding tube).

2) Based on the preliminary groupings created by CART, we created an SLP classification that used consistent criteria to group residents into 18 payment groups across the two clinical categories determined to be relevant to SLP utilization. In other words, based on the presence of the SLP-related predictors residents are grouped in the same way within both SLP clinical categories: Acute Neurologic and Non-Neurologic. The SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) provides more details on Steps 1 and 2.

3) In response to ANPRM comments stating the RCS-I was overly complex, we explored ways to simplify SLP resident classification. By collapsing clinical category, cognitive impairment, and the presence of an SLP-related comorbidity into a single predictor, we reduced the number of SLP groups to 12. This methodology is explained in more detail below.

To reduce SLP model complexity, we investigated four alternative classification models ranging from more complex to simpler. Table 38 shows the four alternative models as well as the 18-group model shown in the SNF PMR technical report. The four alternative models are based on the 18-group model and the original CART results shown in the SNF PMR technical report. Model 1, the most complex model, treats each of the five independent variables as binary flags and results in 32 groups. Models 2-4 test the effect of combining three independent variables, clinical categories, cognitive impairment, and the presence of an SLP-related comorbidity, because of the clinical relationship between acute neurologic conditions, cognition, and SLP comorbidities. In deciding which model to select, we sought a solution that would balance simplicity and goodness of fit. Model 3 maintains goodness of fit while improving simplicity by collapsing three related independent variables. It reduces the number of resident groups from 18 to 12 and has an R-squared value almost identical to that of the original RCS-I SLP model. Therefore, we selected Model 3.

Table 38: SLP Resident Classification Models

Model	Independent Variables					# Groups	R-Squared
	Acute Neurologic	SLP-Related Comorbidity	Cognitive Impairment	Mechanically Altered Diet	Swallowing Disorder		
RCS-I	Yes / No	Either / Neither / Both		Either / Neither / Both		18	0.140
1	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	32	0.140
2	Either / Neither / Both		Yes / No	Either / Neither / Both		18	0.140
3	None / Any one / Any two / All three			Either / Neither / Both		12	0.140
4	At least one / None			Either / Neither / Both		6	0.127

3.5.3 Results

Table 39 shows the recommended resident groups for SLP payment, frequency of stays, and distribution of SLP costs per day.

Table 39: Recommended Resident Groups for SLP Payment

Presence of Acute Neurologic Condition, SLP-Related Comorbidity, or Cognitive Impairment	Mechanically Altered Diet or Swallowing Disorder	# of Stays	% of Stays	Avg. SLP Costs per Day
None	Neither	817,121	43.0%	$8
None	Either	113,333	6.0%	$24
None	Both	14,454	0.8%	$36
Any one	Neither	453,974	23.9%	$18
Any one	Either	203,188	10.7%	$31
Any one	Both	31,448	1.7%	$40
Any two	Neither	89,980	4.7%	$26
Any two	Either	55,295	2.9%	$38
Any two	Both	10,031	0.5%	$46
All three	Neither	18,109	1.0%	$38
All three	Either	16,910	0.9%	$49
All three	Both	4,002	0.2%	$57

3.6   Resident Classification for Nursing Component

As described in Section 3.2.1, because it was not possible to create a dependent variable for nursing using current data, Acumen used staff-time measurement data from the STRIVE study to develop the recommended resident classification for nursing payment. Specifically, Acumen used the 43 RUG-IV nursing groups as a basis for developing a new nursing classification. Classification into the RUG-IV nursing groups is based on clinical characteristics related to nursing utilization, as measured in the STRIVE study. Figure 8 in the appendix shows the services and clinical conditions necessary to classify a SNF resident into a non-rehabilitation RUG. We believe that in lieu of a suitable measure of nursing utilization in the current SNF population, the current RUG-IV nursing classification, which is based on clinically relevant resident characteristics, represents an appropriate basis for resident classification under the PDPM. The following sub-sections describe our modifications to the current nursing classification methodology, including consolidation of the nursing RUGs to reduce model complexity and construction of a new functional measure based on Section GG.

3.6.1 Consolidation of Nursing RUGs

Because of the lack of resident-specific data on nursing utilization, Acumen was unable to create new nursing payment groups based on the relative resource use associated with various clinical characteristics in developing RCS-I. Instead, Acumen used the existing RUG-IV methodology to classify residents into one of 43 nursing RUGs. As noted earlier in this report,

commenters responding to the ANPRM expressed concern over the large number of possible combinations of case-mix groups under RCS-I. Therefore, as with other payment components, we explored options to simplify the classification for the nursing component.

Acumen explored three options to simplify the RUG-IV nursing classification. One option would remove distinctions based on depression. In other words, two RUGs that are defined by the same set of clinical traits or services, except that one RUG includes residents with depression and one does not, would be collapsed into a single group that included all residents with a given clinical profile regardless of depression. A second option would collapse pairs of RUGs that are defined by the same set of clinical traits or services but correspond to different (contiguous) function score bins. A third option would both remove distinctions based on depression and collapse contiguous function score bins. Acumen estimated that depression was associated with a 20.2% increase in WWST for RUGs in the Special Care High and Special Care Low categories and a 15.1% increase for RUGs in the Clinically Complex category. Based on these results, we decided to retain depression as a determinant of resident classification in the nursing component.

However, we observed that nursing resource use as measured by WWST does not vary markedly between nursing case-mix groups defined by contiguous ADL score bins (for example, 11-14 and 15-16) but otherwise sharing the same clinical traits (for example, classified into Special Care High and depressed), as shown in Table 40. Therefore, we decided to collapse these pairs of RUGs. Specifically, in the Special Care High, Special Care Low, Clinically Complex, and Reduced Physical Function classification groups (RUGs beginning with H, L, C, or P), for nursing groups that were otherwise defined with the same clinical traits (for example, extensive services, medical conditions, depression, restorative nursing services received), we combined the following pairs of second characters due to their contiguous ADL score bins: (E, D) and (C, B). These characters correspond to ADL score bins (15 to 16, 11 to 14) and (6 to 10, 2 to 5), respectively. For example, HE2 and HD2, which are both in the Special Care High group and both indicate the presence of depression, are collapsed into a single nursing case-mix group. Similarly, PC1 and PB1 (Reduced Physical Function and 0 to 1 restorative nursing services) also are combined into a single nursing case-mix group. In the Behavioral and Cognitive Performance classification group (RUGs beginning with B), for RUGs that are otherwise defined by the same number of restorative nursing services (0 to1 or 2 or more), we combined RUGs with the second character B and A, which correspond to contiguous ADL score bins 2 to 5 and 0 to 1, respectively. In other words, BB2 and BA2 are combined into a single nursing group, and BB1 and BA1 are also combined into a single nursing group.

We maintained separate nursing groups for CA1, CA2, PA1, and PA2 because they are associated with distinctly lower nursing utilization compared to RUGs that otherwise have the

same clinical traits (for example, medical conditions, depression, restorative nursing services received) but higher ADL score bins. Additionally, we did not collapse the ES3, ES2, and ES1 because although these RUGs share the same function score bin, they are defined by a different set of clinical characteristics.

Table 40: Stay Distribution and Nursing Utilization by RUG-IV Nursing RUG

Nursing RUG	RUG-IV ADL Score	# of Stays	% of Stays	Avg. WWST
ES3	2-16	5,575	0.3%	420
ES2	2-16	11,287	0.6%	318
ES1	2-16	20,371	1.1%	303
HE2	15-16	3,444	0.2%	264
HD2	11-14	6,463	0.3%	242
HE1	15-16	27,678	1.5%	220
HD1	11-14	79,802	4.2%	201
HC2	6-10	5,544	0.3%	239
HB2	2-5	2,222	0.1%	217
HC1	6-10	95,155	5.0%	199
HB1	2-5	39,770	2.1%	180
LE2	15-16	3,564	0.2%	218
LD2	11-14	6,156	0.3%	214
LE1	15-16	42,318	2.2%	181
LD1	11-14	108,336	5.7%	178
LC2	6-10	4,846	0.3%	180
LB2	2-5	1,371	0.1%	172
LC1	6-10	112,729	5.9%	150
LB1	2-5	34,361	1.8%	143
CE2	15-16	3,085	0.2%	203
CD2	11-14	8,926	0.5%	192
CE1	15-16	36,228	1.9%	176
CD1	11-14	171,965	9.1%	167
CC2	6-10	8,895	0.5%	164
CB2	2-5	3,740	0.2%	150
CA2	0-1	2,478	0.1%	113
CC1	6-10	251,464	13.2%	143
CB1	2-5	122,073	6.4%	131
CA1	0-1	64,933	3.4%	98
BB2	2-5	431	0.0%	114
BA2	0-1	184	0.0%	79
BB1	2-5	27,841	1.5%	107

Nursing RUG	RUG-IV ADL Score	# of Stays	% of Stays	Avg. WWST
BA1	0-1	10,387	0.5%	74
PE2	15-16	505	0.0%	173
PD2	11-14	1,466	0.1%	160
PE1	15-16	31,258	1.6%	163
PD1	11-14	134,833	7.1%	151
PC2	6-10	2,227	0.1%	133
PB2	2-5	789	0.0%	106
PA2	0-1	245	0.0%	73
PC1	6-10	250,815	13.2%	125
PB1	2-5	111,155	5.9%	99
PA1	0-1	42,171	2.2%	69

3.6.2 Construction of Functional Measure

In developing RCS-I, Acumen constructed a function score to measure therapy utilization based in part on the current ADL score. Acumen did not incorporate this functional measure into the nursing component because of the desire to maintain the RUG-IV methodology for nursing classification, which relies on the RUG-IV ADL score. As discussed in Section 3.4.1, comments submitted in response to the ANPRM ask CMS to consider replacing older MDS items used to determine payment in RCS-I with newer, IMPACT Act-compliant items. In response to this feedback, Acumen investigated also replacing the ADL score currently used for nursing classification with Section GG items. To accomplish this, Acumen sought to replicate the current methodology for calculating the ADL score as closely as possible using items from Section GG.

To construct a functional measure for nursing based on Section GG items, we developed a mapping between the Section G items/responses used to construct the current ADL score and Section GG items/responses. This proved challenging because there is not a one-to-one mapping between Section G and Section GG items/responses. For example, Section GG combines "supervision" and "limited assistance" into a single response, "supervision or touching assistance." Section GG does not have a close equivalent to the Section G response "activity occurred only once or twice." Additionally, Section GG has no equivalent for the Section G support provided items that are used to calculate the ADL score. Notwithstanding these difficulties, we mapped the Section GG late-loss items to the self-performance versions of the four Section G late-loss items per the mapping shown in Table 41. We used the response descriptions to map the Section G self-performance responses to the Section GG item responses. The response mapping is shown in Table 42.

Table 41: Section GG Items Included in Nursing Component Functional Measure

Functional Area	MDS Item	Name	Item Description	Mapped To
Bed Mobility	GG0170B1	Mobility: Sit to lying	The ability to move from sitting on side of bed to lying flat on the bed	G0110A1
Bed Mobility	GG0170C1	Mobility: Lying to sitting on side of bed	The ability to safely move from lying on the back to sitting on the side of the bed with feet flat on the floor, and with no back support	G0110A1
Transfer	GG0170D1	Mobility: Sit to stand	The ability to safely comes to a standing position from sitting in a chair or on the side of the bed	G0110B1
Transfer	GG0170E1	Mobility: Chair/bed-to-chair transfer	The ability to safely transfer to and from a bed to a chair (or wheelchair)	G0110B1
Transfer	GG0170F1	Mobility: Toilet transfer	The ability to safely get on and off a toilet or commode	G0110B1
Eating	GG0130A1	Self-care: Eating	The ability to use suitable utensils to bring food to the mouth and swallow food once the meal is presented on a table/tray. Includes modified food consistency.	G0110H1
Toileting	GG0130C1	Self-care: Toileting Hygiene	The ability to maintain perineal hygiene, adjust clothes before and after using the toilet, commode, bedpan, or urinal.	G0110I1

Table 42: Mapping of Section GG Item Responses to Section G Self-Performance Responses

Section GG Response	Section G Response
01 Dependent	4 Total Dependence
02 Substantial/maximal assistance	3 Extensive Assistance
03 Partial/moderate assistance	3 Extensive Assistance
04 Supervision or touching assistance	1 Supervision / 2 Limited Assistance
05 Setup or clean-up assistance	No equivalent response
06 Independent	0 Independent
07 Resident refused	8 Activity Did Not Occur
09 Not applicable	8 Activity Did Not Occur
88 Not attempted due to medical condition or safety concerns	8 Activity Did Not Occur

Next, based on the mapping shown above, we assigned points to each response to track independence. In other words, higher points were assigned to higher levels of independence, consistent with point assignment for the PT and OT functional measure and other care settings. The responses "refused," "N/A," and "not attempted" were grouped with "dependent" responses for the purpose of point assignment based on clinical expectations. Table 43 shows Acumen's recommended scoring methodology for Section GG responses.

Table 43: Recommended Scoring for Section GG Late-Loss Items

Response	Score
05 Set-up assistance, 06 Independent	4
04 Supervision or touching assistance	3
03 Partial/moderate assistance	2
02 Substantial/maximal assistance	1
01 Dependent, 07 Refused, 09 N/A, 88 Not Attempted	0

The final step to construct the Section GG-based function score for nursing was to average the scores for related items. This entails averaging the scores for the two bed mobility items and the three transfer items, as in the PT and OT functional measure. This procedure avoids overweighting activities that are measured using multiple items. The average bed mobility and transfer scores are then summed with the eating and toileting scores to calculate the total function score for nursing. The final score is rounded to the nearest integer, and ranges from 0 to 16.

3.6.3 Updating Resource Use Estimates

To calculate CMIs for the collapsed nursing RUGs as discussed in Section 3.11, we first had to update estimates of resource utilization for each nursing group. This was necessary because of the changes in the nursing classification discussed above and to reflect the relative nursing resource needs of the entire SNF population. As noted in the SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html), under RUG-IV nursing indexes were calculated to capture variation in nursing utilization using only the staff time collected for the non-rehabilitation population. Because all residents would be classified into a nursing group under PDPM, it is appropriate to estimate group-level resource use using the entire SNF population rather than only residents who do not receive rehabilitation.

The first step to updating group-level resource use estimates was to re-estimate average nursing utilization by non-collapsed nursing RUG. To accomplish this, Acumen replicated the methodology described in the FY 2010 SNF PPS rule (74 FR 22236 through 22238) but classified the full STRIVE study population into nursing RUGs using the RUG-IV classification rules. Acumen's methodology for updating resource use estimates for each nursing RUG proceeded according to the following steps:

(1) Calculate average wage-weighted staff time (WWST) for each STRIVE study resident using FY 2016 SNF wages as described in Section 3.2.1.

(2) Apply sample weights to resident-level WWST estimates to allow for unbiased population estimates. The reason for this weighting is that the STRIVE study was not a random sample of residents. Certain key subpopulations, such as residents with HIV/AIDS, were over-sampled to ensure that there were enough residents to draw conclusions on the subpopulations' resource use. As a result, STRIVE researchers also developed sample weights, equal to the inverse of each resident's probability of selection, to permit calculation of unbiased population estimates. Applying the sample weights to a summary statistic results in an estimate that is representative of the actual population. The sample weight method is explained in Phase I of the STRIVE study. A link to the STRIVE study is available at https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/TimeStudy.html.

(3) Assign the full STRIVE population to the appropriate non-rehabilitation RUG. As discussed in the SNF PMR technical report, using the full STRIVE population rather than the STRIVE Part A population to update RUG-level resource use estimates generates estimates that conform to clinical expectations much more frequently and thus would not require major adjustments and assumptions.

(4) Calculate the average WWST for each of the 43 nursing RUGs.

(5) Smooth WWST estimates that do not match RUG hierarchy using the same method as the STRIVE study. RUG-IV, from which the nursing RUGs are derived, is a hierarchical classification in which payment should track clinical acuity. It is intended that residents who are more clinically complex or who have other indicators of acuity, including a higher ADL score, depression, or restorative nursing services, would receive higher payment. When STRIVE researchers estimated WWST for each RUG, several inversions occurred because of imprecision in the means. Inversions are defined as WWST estimates that are not in line with clinical expectations.   The methodology used to smooth WWST estimates is explained in Phase II of the STRIVE study. A link to the STRIVE study is available at https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/TimeStudy.html.

Next, we estimated the average WWST for each collapsed nursing RUG. To derive the average WWST of each collapsed RUG, we first estimate the average WWST of the original 43 nursing RUGs based on steps 1-4 above, then calculate a weighted mean of the average WWST of the two RUGs that form the collapsed RUG.

3.6.4 Results

Table 44 shows the recommended resident groups for nursing payment as well as the distribution of stays and average WWST. The groups shown in this table replace the RUG-IV ADL score bins with their corresponding Section GG-based function score bins based on the functional measure for nursing described in Section 3.6.2. Because the Section GG-based

function score tracks functional independence, whereas the RUG-IV ADL score tracks functional dependence, the numbers that correspond to each bin are different, although the level of functional ability described is the same. For example, a Section GG-based function score bin of 15-16, which indicates the highest level of functional independence, corresponds to a RUG-IV ADL score bin of 0-1, while a Section GG-based function score bin of 0-5, which indicates a higher level of functional dependence, corresponds to a RUG-IV ADL score range of 11-16.

Table 44: Recommended Resident Groups for Nursing Payment

Nursing RUG	Nursing GG-based Function Score	# of Stays	% of Stays	Avg. WWST
ES3	0-14	5,465	0.3%	420
ES2	0-14	11,029	0.6%	318
ES1	0-14	20,089	1.1%	303
HDE2	0-5	6,545	0.3%	249
HDE1	0-5	73,030	3.8%	207
HBC2	6-14	10,921	0.6%	231
HBC1	6-14	167,801	8.8%	192
LDE2	0-5	7,204	0.4%	215
LDE1	0-5	109,783	5.8%	179
LBC2	6-14	8,434	0.4%	178
LBC1	6-14	183,343	9.7%	148
CDE2	0-5	7,229	0.4%	194
CDE1	0-5	114,140	6.0%	168
CBC2	6-14	17,239	0.9%	160
CA2	15-16	1,945	0.1%	113
CBC1	6-14	466,468	24.6%	138
CA1	15-16	48,848	2.6%	98
BAB2	11-16	1,009	0.1%	108
BAB1	11-16	61,572	3.2%	102
PDE2	0-5	2,021	0.1%	163
PDE1	0-5	88,186	4.6%	153
PBC2	6-14	5,506	0.3%	125
PA2	15-16	289	0.0%	73
PBC1	6-14	421,387	22.2%	115
PA1	15-16	28,320	1.5%	69

3.7 Resident Classification for Non-Therapy Ancillary Component

This section describes the selection of independent variables for the NTA component, variable grouping methods, and results.

3.7.1 Selection of Independent Variables

Selection of independent variables consisted of two primary phases: (1) initial selection of resident characteristics likely to be good predictors of NTA utilization, and (2) regression analysis to identify the subset of initially explored variables that was most predictive of resource use. Acumen used relevant literature, clinical input, and feedback from technical expert panels to identify resident characteristics that were potentially predictive of NTA utilization. These included: age, clinical reasons for the prior inpatient stay and SNF stay, comorbidities recorded during the SNF stay and during the year prior to the stay, and services provided during the SNF stay. Acumen then used regression analysis to examine the relationship between these characteristics and NTA costs per day. Three types of resident information were found to be strong predictors of NTA costs per day: comorbidities, use of extensive services, and age. While NTA costs are correlated with age, the correlation between NTA costs and resident comorbidities and extensive services is much stronger. Based on this evidence as well as concerns shared by TEP panelists during the June 2016 TEP, we removed age from further consideration as a determinant of NTA classification. Of particular concern, some panelists stated that including age as a determinant of NTA payment could create access issues for older beneficiaries.

Because of the relationship between comorbidities and the provision of extensive services, as well as their similar impact on NTA costs, Acumen decided to treat comorbidities and extensive services similarly for the purpose of NTA classification, investigating their impact on costs in a single investigation that did not differentiate between conditions and services. This is similar to other Medicare payment systems such as the IRF PPS. Conditions and services were defined in three ways. First, clinicians identified MDS items that correspond to conditions/services likely related to NTA utilization. However, since many conditions related to NTA utilization are not included on the MDS assessment, we used the condition categories from the Part C and Part D risk adjustment models to define additional potential comorbidities. To do this, we mapped ICD-10 diagnosis codes from the prior inpatient claim, the first SNF claim, and section I8000 of the 5-day MDS assessment to condition categories from the Part C (CCs) and the Part D (RxCCs) risk adjustment models.[40] The CCs and RxCCs were used to define conditions by aggregating related diagnosis codes into a single condition flag. Because the CCs were developed to predict utilization of Part A and B services, while the RxCCs were developed to predict Part D drug costs, the largest component of NTA costs, using both sources allowed us to define the conditions and services potentially associated with NTA utilization more comprehensively. Lastly, we used ICD-10 diagnosis codes to define additional conditions that

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[40] Mappings of CCs and RxCCs to ICD-10-CM codes can be found at https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Risk-Adjustors-Items/Risk2017.html.

clinicians identified as being potentially associated with increased NTA service utilization but are not fully reflected in either the MDS or the CCs/RxCCs.

In selecting conditions to investigate for possible inclusion as NTA comorbidities, we defined two levels of parenteral/IV feeding based on our investigations into the relationship between the intensity of parenteral/IV feeding and NTA costs per day. The two levels of parenteral/IV feeding were defined by MDS items K0510A2 (parenteral/IV feeding while a resident), K0710A2 (proportion of total calories the resident received through parenteral or tube feeding while a resident), and K0710B2 (average fluid intake per day by IV or tube feeding while a resident). If a beneficiary received parenteral/IV feeding while a resident and the percentage of total calories the beneficiary received through parenteral or tube feeding while a resident was greater than 50%, the resident qualified for Parenteral IV Feeding: Level high. If a beneficiary received parenteral/IV feeding while a resident, the percentage of total calories the beneficiary received through parenteral or tube feeding while a resident was greater than 25%, and average fluid intake per day by IV or tube feeding while a resident was at least 500 cc per day, the resident qualified for Parenteral/IV feeding: Level low. Parenteral/IV feeding cases satisfying neither of the above requirements were not considered for inclusion. Section 3.7.1 of the SNF PRM technical report that accompanied the ANPRM (www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) provides more details on the investigations that led to these definitions.

Two ICD-10-based conditions were included: HIV/AIDS and endocarditis. Acumen defined HIV/AIDS to only include residents with ICD-10 diagnosis code B20 on the first SNF claim. The SNF PPS uses ICD-10 diagnosis code B20 to identify SNF residents eligible for the 128% add-on for HIV/AIDS. Acumen chose this definition after investigations showed that residents with HIV/AIDS coded on the first SNF claim were much more costly than residents who had HIV/AIDS coded on another diagnosis source during a one-year lookback window. Given concerns about appropriately paying for the cost of services associated with this population, Acumen narrowed the definition of residents with HIV/AIDS, which results in a higher estimate of costs for this population and consequently increases the payment associated with this comorbidity. Based on clinical input, we defined endocarditis with the following ICD-10 diagnosis codes: A0102, A1884, A3282, A3951, A5203, A78, B3321, B376, I330, I339, I38, I39, and M3211.

In defining conditions and services as described above, Acumen used different criteria to identify the presence of acute and chronic conditions/services. For acute conditions, Acumen checked if the condition/service was present on the first SNF claim, the prior inpatient claim, or the MDS assessment. For chronic conditions, we also checked if the condition/service was

present on any inpatient, outpatient, or Part B physician claim during one year prior to SNF admission.

Next, Acumen estimated the impact of conditions and services on NTA costs per day using three stages of ordinary least squares (OLS) regressions. The first stage selects the 50 costliest conditions and services from two separate models based on the Part C and Part D risk adjustment models, respectively. The second stage selects the 50 costliest conditions and services from a single model that includes all conditions and services that were among the 50 costliest in the models with either the Part C CCs or Part D RxCCs. The third stage estimates the costliness of the top 50 conditions and services in the combined model.

For each regression, we used four years of data (FY2014-FY2017) in response to ANPRM comments stating that the design of the NTA component should be more robust to changes in the SNF population and care practices over time. Additionally, we excluded stays with fewer than 8 utilization days. To determine the 8-day cutoff, we plotted the standard deviation of NTA costs per day against length of stay. As shown in Figure 6, the standard deviation drops dramatically until length of stay reaches 8 utilization days, then decreases only slightly for longer stays. This indicates there is a large amount of variation in NTA costs per day for short stays, likely obscuring the relationship between comorbidities and NTA costs per day when short stays are included. Based on this evidence, Acumen excluded stays with fewer than 8 utilization days from regressions using conditions/services to predict NTA costs.

Figure 6: Standard Deviation of Average NTA Costs per Day by Length of Stay
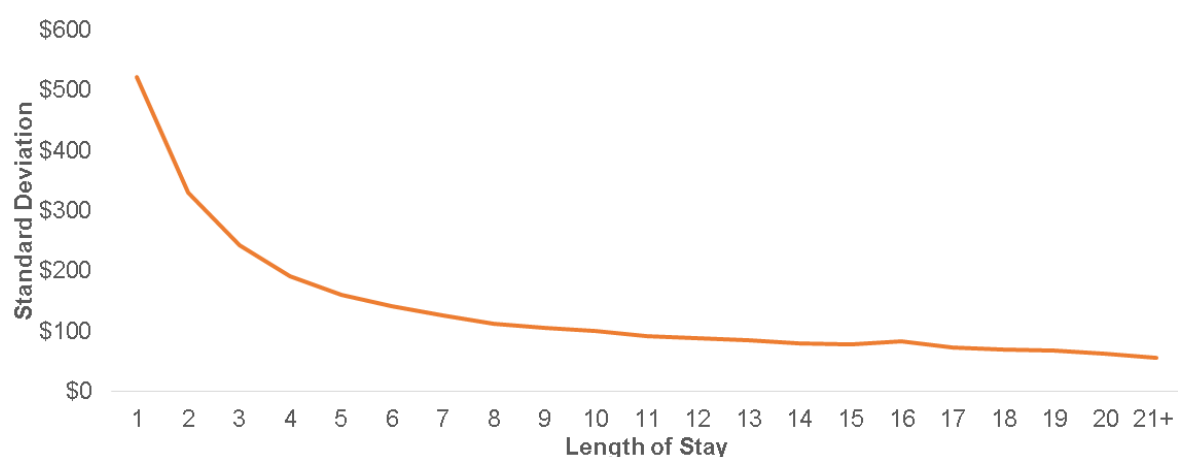
As discussed above, two models were used in the first stage: one that maps conditions to CCs from the Part C risk adjustment model and one that maps conditions to the RxCCs from the Part D risk adjustment model. Each model also includes conditions/services defined using MDS items and ICD-10 diagnosis codes. Because there is some overlap between CC/RxCC definitions and MDS/ICD-10 definitions, Acumen removed duplicate conditions/services from

each model before estimating the costliness of each condition/service. The following changes in definitions were also implemented prior to the first-stage regressions:

- MDS Section M1040 items (Other Foot Skin Problems) were divided into two flags: (1) M1040A: Foot Infection Code only, M1040C: Other Open Lesion only, or M1040A and M1040C only and (2) M1040B: Diabetic Foot Ulcer Code (with or without M1040A or M1040C). In other words, if a resident has M1040B, he or she will only receive points for M1040B, regardless of whether he or she has M1040A, M1040C, or both. This reduces incentives for coding multiple foot skin problems.

- In the model with Part D RxCCs, organ transplants were divided into two categories, lung transplant and all other major organ transplants. We found that residents who received a lung transplant had notably higher costs than residents who received other transplants.

Table 45 shows all the positive and significant conditions/services in the model with Part C CCs. Table 46 shows all the positive and significant conditions/services in the model with Part D RxCCs. Variables with negative coefficients were not considered because conditions with a negative impact on costs (relative to the reference group with none of the conditions included in each model) cannot be feasibly included in a scoring system, as this would create incentives to not report them.

Table 45: Positive, Significant (p<0.05) Coefficients in Model with Part C CCs

Condition/Service	% of Stays*	OLS Estimate
HIV/AIDS	0.3%	$77.12
Parenteral IV feeding: Level high	0.2%	$67.08
O0100H2: Special Treatments/Programs: Intravenous Medication Post-admit Code	8.1%	$49.50
O0100F2: Special Treatments/Programs: Ventilator or Respirator Post-admit Code	0.3%	$37.48
Parenteral IV Feeding: Level Low	0.0%	$33.60
O0100I2: Special Treatments/Programs: Transfusion Post-admit Code	0.3%	$19.03
I5200: Active Diagnoses: Multiple Sclerosis Code	0.7%	$18.60
CC6: Opportunistic Infections	0.4%	$18.32
CC186: Major Organ Transplant or Replacement Status	0.3%	$17.91
I6200: Active Diagnoses: Asthma COPD Chronic Lung Disease Code	26.7%	$16.88
I2900: Active Diagnoses: Diabetes Mellitus (DM) Code	35.4%	$15.53
Endocarditis	0.6%	$14.48
I2500: Wound Infection Code	1.6%	$13.75
CC39: Bone/Joint/Muscle Infections/Necrosis	2.3%	$13.73
CC110: Cystic Fibrosis	0.0%	$13.40
O0100E2: Special Treatments/Programs: Tracheostomy Care Post-admit Code	0.8%	$12.31
CC27: End-Stage Liver Disease	1.5%	$12.25

Condition/Service	% of Stays*	OLS Estimate
I1700: Active Diagnoses: Multi-Drug Resistant Organism (MDRO) Code	2.0%	$11.64
O0100M2: Special Treatments/Programs: Isolation Post-admit Code	1.3%	$11.13
M1040B: Other Foot Skin Problems: Diabetic Foot Ulcer Code	1.1%	$10.90
CC22: Morbid Obesity	8.8%	$8.95
O0100B2: Special Treatments/Programs: Radiation Post-admit Code	0.2%	$7.90
CC34: Chronic Pancreatitis	0.6%	$7.54
CC35: Inflammatory Bowel Disease	1.4%	$7.08
H0100D: Bladder and Bowel Appliances: Intermittent catheterization	0.9%	$6.84
CC84: Cardio-Respiratory Failure and Shock	11.6%	$6.76
O0100D2: Special Treatments/Programs: Suctioning Post-admit Code	0.8%	$6.65
CC47: Disorders of Immunity	3.7%	$6.12
M0300X1: Highest Stage of Unhealed Pressure Ulcer - Stage 4	1.1%	$5.91
CC122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1.0%	$5.73
K0510B2: Nutritional Approaches While a Resident: Feeding Tube	4.0%	$5.69
CC176: Complications of Specified Implanted Device or Graft	2.7%	$5.36
M1040A or M1040C: Other Foot Skin Problems: Foot Infection Code, Other Open Lesion on Foot Code, Except M1040B: Diabetic Foot Ulcer Code	1.4%	$5.14
CC23: Other Significant Endocrine and Metabolic Disorders	9.1%	$4.45
CC40: Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	7.7%	$4.40
I5600: Active Diagnoses: Malnutrition Code	4.2%	$4.33
CC162: Severe Skin Burn or Condition	0.0%	$3.91
M1200E: Skin and Ulcer Treatments: Ulcer Care Code	14.8%	$3.88
H0100C: Bladder and Bowel Appliances: Ostomy	2.5%	$3.87
CC83: Respiratory Arrest	0.0%	$3.84
CC112: Fibrosis of Lung and Other Chronic Lung Disorders	5.5%	$3.53
CC107: Vascular Disease with Complications	7.4%	$3.44
CC115: Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.6%	$3.18
H0100A: Bladder and Bowel Appliances: Indwelling Catheter	11.1%	$3.03
CC46: Severe Hematological Disorders	1.5%	$2.90
CC28: Cirrhosis of Liver	2.3%	$2.83
M1040D: Other Skin Problems: Open Lesions Other Than Ulcers Rashes Cuts Code	1.6%	$2.74
CC75: Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	1.6%	$2.62
M1200I: Skin and Ulcer Treatments: Application Dressings to Foot Code	5.1%	$2.62
M1200G: Skin and Ulcer Treatments: Application Nonsurgical Dressing Code	21.5%	$2.48
CC9: Lung and Other Severe Cancers	3.5%	$2.39
M0300X1: Highest Stage of Unhealed Pressure Ulcer - Stage 3	1.8%	$2.38
CC88: Angina Pectoris	5.5%	$2.37
CC189: Amputation Status, Lower Limb/Amputation Complications	2.8%	$2.30
I0200: Active Diagnoses: Anemia Code	31.2%	$2.23
M1040E: Other Skin Problems: Surgical Wound(s) Code	26.9%	$2.18

Condition/Service	% of Stays*	OLS Estimate
CC137: Chronic Kidney Disease, Severe (Stage 4)	5.8%	$2.17
CC136: Chronic Kidney Disease, Stage 5	5.3%	$2.17
CC79: Seizure Disorders and Convulsions	7.9%	$2.15
CC8: Metastatic Cancer and Acute Leukemia	3.0%	$2.12
CC55: Drug/Alcohol Dependence	5.1%	$2.08
M1200F: Skin and Ulcer Treatments: Surgical Wound Care Code	23.2%	$2.03
H0100B: Bladder and Bowel Appliances: External Catheter	0.3%	$2.02
I5300: Active Diagnoses: Parkinson's Code	4.2%	$1.70
CC29: Chronic Hepatitis	1.2%	$1.63
CC71: Paraplegia	1.1%	$1.45
CC134: Dialysis Status	3.6%	$1.41
CC10: Lymphoma and Other Cancers	3.1%	$1.37
CC58: Major Depressive, Bipolar, and Paranoid Disorders	15.1%	$0.98
CC85: Congestive Heart Failure	34.6%	$0.97
CC72: Spinal Cord Disorders/Injuries	2.5%	$0.74
I3100: Active Diagnoses: Hyponatremia Code	2.9%	$0.73
K0510D2: Nutritional Approaches While a Resident: Therapeutic diet	57.2%	$0.53
CC114: Aspiration and Specified Bacterial Pneumonias	4.0%	$0.39
CC48: Coagulation Defects and Other Specified Hematological Disorders	13.7%	$0.33
CC96: Specified Heart Arrhythmias	30.4%	$0.25

Regression includes stays from FYs 2014-2017 with 8 or more utilization days.

Table 46: Positive, Significant (p<0.05) Coefficients in Model with Part D RxCCs

Condition/Service	% of Stays*	OLS Estimate
HIV/AIDS	0.3%	$76.72
Parenteral IV Feeding: Level High	0.2%	$65.37
O0100H2: Special Treatments/Programs: Intravenous Medication Post-admit Code	8.1%	$50.85
O0100F2: Special Treatments/Programs: Ventilator or Respirator Post-admit Code	0.3%	$38.24
Parenteral IV Feeding: Level Low	0.0%	$32.73
RxCC395: Lung Transplant Status	0.0%	$25.04
O0100I2: Special Treatments/Programs: Transfusion Post-admit Code	0.3%	$18.85
RxCC5: Opportunistic Infections	0.4%	$17.77
RxCC260 RxCC396 RxCC397: Major Organ Transplant Status, Except Lung	0.6%	$17.70
I5200: Active Diagnoses: Multiple Sclerosis Code	0.7%	$17.27
I6200: Active Diagnoses: Asthma COPD Chronic Lung Disease Code	26.7%	$16.80
RxCC15: Chronic Myeloid Leukemia	0.1%	$15.98
I2900: Active Diagnoses: Diabetes Mellitus (DM) Code	35.4%	$15.33
Endocarditis	0.6%	$14.37
I2500: Wound Infection Code	1.6%	$14.10

Condition/Service	% of Stays*	OLS Estimate
O0100E2: Special Treatments/Programs: Tracheostomy Care Post-admit Code	0.8%	$12.28
RxCC355: Narcolepsy and Cataplexy	0.1%	$12.07
RxCC225: Cystic Fibrosis	0.0%	$11.88
M1040B: Other Foot Skin Problems: Diabetic Foot Ulcer Code	1.1%	$11.78
I1700: Active Diagnoses: Multi-Drug Resistant Organism (MDRO) Code	2.0%	$11.62
RxCC40: Specified Hereditary Metabolic/Immune Disorders	0.0%	$11.36
O0100M2: Special Treatments/Programs: Isolation Post-admit Code	1.3%	$10.96
RxCC97: Immune Disorders	0.9%	$10.83
RxCC43: Morbid Obesity	8.8%	$8.86
RxCC166: Migraine Headaches	1.8%	$7.21
M0300X1: Highest Stage of Unhealed Pressure Ulcer - Stage 4	1.1%	$7.19
O0100B2: Special Treatments/Programs: Radiation Post-admit Code	0.2%	$7.03
O0100D2: Special Treatments/Programs: Suctioning Post-admit Code	0.8%	$6.98
RxCC96: Myelodysplastic Syndromes and Myelofibrosis	0.8%	$6.71
RxCC65: Chronic Pancreatitis	0.6%	$6.49
H0100D: Bladder and Bowel Appliances: Intermittent catheterization	0.9%	$6.46
RxCC67: Inflammatory Bowel Disease	1.4%	$6.08
M1040A or M1040C: Other Foot Skin Problems: Foot Infection Code, Other Open Lesion on Foot Code, Except M1040B: Diabetic Foot Ulcer Code	1.4%	$5.98
RxCC82: Psoriatic Arthropathy and Systemic Sclerosis	0.3%	$5.98
RxCC54: Chronic Viral Hepatitis C	0.9%	$5.51
RxCC241: Diabetic Retinopathy	3.5%	$5.19
RxCC163: Intractable Epilepsy	0.7%	$4.87
RxCC68: Esophageal Reflux and Other Disorders of Esophagus	33.2%	$4.84
I5600: Active Diagnoses: Malnutrition Code	4.2%	$4.64
RxCC84: Systemic Lupus Erythematosus, Other Connective Tissue Disorders, and Inflammatory Spondylopathies	3.5%	$4.48
RxCC215: Venous Thromboembolism	9.0%	$4.24
K0510B2: Nutritional Approaches While a Resident: Feeding Tube	4.0%	$4.22
RxCC227: Pulmonary Fibrosis and Other Chronic Lung Disorders	4.9%	$4.13
M1040F: Other Skin Problems: Burn(s) Code	0.2%	$3.99
RxCC134: Depression	25.6%	$3.98
RxCC80: Aseptic Necrosis of Bone	0.7%	$3.94
M1200E: Skin and Ulcer Treatments: Ulcer Care Code	14.8%	$3.92
RxCC131: Bipolar Disorders	4.9%	$3.90
O0100J2: Special Treatments/Programs: Dialysis Post-admit Code	4.2%	$3.64
RxCC316: Psoriasis, Except with Arthropathy	1.0%	$3.55
RxCC156: Myasthenia Gravis, Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease	0.5%	$3.46
RxCC55: Chronic Viral Hepatitis, Except Hepatitis C	0.2%	$3.41
RxCC41: Pituitary, Adrenal Gland, and Other Endocrine and Metabolic Disorders	11.5%	$3.40
RxCC66: Pancreatic Disorders and Intestinal Malabsorption, Except Pancreatitis	2.0%	$3.40

Condition/Service	% of Stays*	OLS Estimate
H0100A: Bladder and Bowel Appliances: Indwelling Catheter	11.1%	$3.01
M1200I: Skin and Ulcer Treatments: Application Dressings to Foot Code	5.1%	$2.95
RxCC83: Rheumatoid Arthritis and Other Inflammatory Polyarthropathy	4.1%	$2.86
RxCC186: Congestive Heart Failure	34.4%	$2.77
G0600D: Mobility Devices: Limb prosthesis	0.4%	$2.77
RxCC263: Chronic Kidney Disease Stage 4	5.8%	$2.48
M0300X1: Highest Stage of Unhealed Pressure Ulcer - Stage 3	1.8%	$2.41
M1040D: Other Skin Problems: Open Lesions Other Than Ulcers Rashes Cuts Code	1.6%	$2.41
RxCC17: Secondary Cancers of Bone, Lung, Brain, and Other Specified Sites; Liver Cancer	2.3%	$2.28
M1200G: Skin and Ulcer Treatments: Application Nonsurgical Dressing Code	21.5%	$2.26
RxCC185: Primary Pulmonary Hypertension	2.0%	$2.17
RxCC168: Trigeminal and Postherpetic Neuralgia	0.9%	$2.15
I5300: Active Diagnoses: Parkinson's Code	4.2%	$2.13
H0100B: Bladder and Bowel Appliances: External Catheter	0.3%	$2.00
M1200F: Skin and Ulcer Treatments: Surgical Wound Care Code	23.2%	$1.98
I0200: Active Diagnoses: Anemia Code	31.2%	$1.93
RxCC133: Specified Anxiety, Personality, and Behavior Disorders	3.0%	$1.87
RxCC193: Atrial Arrhythmias	28.0%	$1.84
RxCC18: Lung, Kidney, and Other Cancers	3.9%	$1.78
RxCC164: Epilepsy and Other Seizure Disorders, Except Intractable Epilepsy	5.8%	$1.78
H0100C: Bladder and Bowel Appliances: Ostomy	2.5%	$1.73
RxCC159: Inflammatory and Toxic Neuropathy	1.3%	$1.71
RxCC311: Chronic Ulcer of Skin, Except Pressure	9.4%	$1.65
RxCC135: Anxiety Disorders	7.7%	$1.65
RxCC243: Open-Angle Glaucoma	4.2%	$1.54
RxCC261: Dialysis Status	4.7%	$1.50
M1040E: Other Skin Problems: Surgical Wound(s) Code	26.9%	$1.45
RxCC188: Coronary Artery Disease	36.1%	$1.11
I3100: Active Diagnoses: Hyponatremia Code	2.9%	$1.03
RxCC16: Multiple Myeloma and Other Neoplastic Disorders	0.6%	$0.94
RxCC45: Disorders of Lipoid Metabolism	49.9%	$0.90
RxCC157: Spinal Cord Disorders	1.6%	$0.79
RxCC42: Thyroid Disorders	25.0%	$0.50
K0510D2: Nutritional Approaches While a Resident: Therapeutic diet	57.2%	$0.50
RxCC165: Convulsions	5.9%	$0.43

Regression includes stays from FYs 2014-2017 with 8 or more utilization days.

Table 47 shows the 77 conditions/services that are among the 50 costliest in either the Part C CC or Part D RxCC model. To select the top 50 from this combined list, Acumen first

dropped duplicate conditions/services between CCs and RxCCs with overlapping definitions. In one case, CC: Major Organ Transplant or Replacement Status perfectly overlapped with two RxCCs (RxCC: Lung Transplant Status and RxCC: Major Organ Transplant Status, Except Lung). In this case, we kept the two RxCCs because they are more specific.

To deal with partial overlaps, these relationships were redefined so that the conditions are mutually exclusive. In one case (reason "Overlap with Costlier CC" in Table 47), an MDS item that was kept in the RxCC model was dropped from the combined list because an overlapping CC in the combined model was more expensive. In this case, we could not make these two conditions mutually exclusive because the MDS item is not defined using ICD-10-CM codes.

Next, we excluded additional conditions/services based on clinical concerns. Esophageal reflux was excluded because it is a very common condition in the SNF population and clinicians noted that coding can be discretionary. Migraine headache was also excluded due to clinicians' concerns about coding reliability. Additionally, clinicians stated that in many cases migraine headache is not treated by medication, the largest component of NTA costs. Finally, we ran a regression on the list of remaining conditions/services to identify the top 50.

Table 47: Costliest Conditions/Services in Combined Model

Condition/Service	% of Stays*	Avg. NTA Costs per Day	Dropped	Reason	Action
Parenteral IV feeding: Level high	0.2%	$153.16	-	-	-
O0100F2: Special Treatments/Programs: Ventilator or Respirator Post-admit Code	0.3%	$147.66	-	-	-
HIV/AIDS	0.3%	$142.43	-	-	-
RxCC395: Lung Transplant Status	0.0%	$116.91	-	-	-
O0100H2: Special Treatments/Programs: Intravenous Medication Post-admit Code	8.1%	$114.02	-	-	-
O0100E2: Special Treatments/Programs: Tracheostomy Care Post-admit Code	0.8%	$112.49	-	-	-
O0100D2: Special Treatments/Programs: Suctioning Post-admit Code	0.8%	$111.32	-	-	-
Parenteral IV feeding: Level Low	0.0%	$108.36	-	-	-
CC39: Bone/Joint/Muscle Infections/Necrosis	2.3%	$103.72	Y	Superset	Redefined to Exclude RxCC: Aseptic Necrosis of Bone
I2500: Wound Infection Code	1.6%	$97.57	-	-	-
M1040B: Other Foot Skin Problems: Diabetic Foot Ulcer Code	1.1%	$96.50	-	-	-
I1700: Active Diagnoses: Multi-Drug Resistant Organism (MDRO) Code	2.0%	$96.41	-	-	-
RxCC260 RxCC396 RxCC397: Major Organ Transplant Status, Except Lung	0.6%	$95.02	-	-	-
CC6: Opportunistic Infections	0.4%	$94.27	Y	Perfect Overlap	Kept RxCC: Opportunistic Infections
RxCC5: Opportunistic Infections	0.4%	$94.27	-	-	-
CC186: Major Organ Transplant or Replacement Status	0.3%	$92.39	Y	Specificity	Kept RxCC: Lung Transplant Status and RxCC: Major Organ Transplant Status, Except Lung

Condition/Service	% of Stays*	Avg. NTA Costs per Day	Dropped	Reason	Action
M0300X1: Highest Stage of Unhealed Pressure Ulcer - Stage 4	1.1%	$91.77	-	-	-
O0100I2: Special Treatments/Programs: Transfusion Post-admit Code	0.3%	$91.52	-	-	-
Endocarditis	0.6%	$91.32	-	-	-
RxCC97: Immune Disorders	0.9%	$88.15	-	-	-
O0100M2: Special Treatments/Programs: Isolation Post-admit Code	1.3%	$85.19	-	-	-
CC110: Cystic Fibrosis	0.0%	$84.95	Y	Perfect Overlap	Kept RxCC: Cystic Fibrosis
RxCC225: Cystic Fibrosis	0.0%	$84.95	-	-	-
RxCC40: Specified Hereditary Metabolic/Immune Disorders	0.0%	$83.60	-	-	-
CC27: End-Stage Liver Disease	1.5%	$83.15	-	-	-
M1040A or M1040C: Other Foot Skin Problems: Foot Infection Code, Other Open Lesion on Foot Code, Except M1040B: Diabetic Foot Ulcer Code	1.4%	$81.22	-	-	-
RxCC15: Chronic Myeloid Leukemia	0.1%	$81.20	-	-	-
RxCC355: Narcolepsy and Cataplexy	0.1%	$80.16	-	-	-
CC122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1.0%	$79.86	-	-	-
RxCC241: Diabetic Retinopathy	3.5%	$79.37	Y	Superset	Redefined to Exclude CC: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage
RxCC54: Chronic Viral Hepatitis C	0.9%	$79.04	-	-	-
CC22: Morbid Obesity	8.8%	$78.72	Y	Perfect Overlap	Kept RxCC: Morbid Obesity
RxCC43: Morbid Obesity	8.8%	$78.72	-	-	-
I5200: Active Diagnoses: Multiple Sclerosis Code	0.7%	$78.42	-	-	-
CC176: Complications of Specified Implanted Device or Graft	2.7%	$78.27	-	-	-
CC34: Chronic Pancreatitis	0.6%	$77.65	Y	Perfect Overlap	Kept RxCC: Chronic Pancreatitis
RxCC65: Chronic Pancreatitis	0.6%	$77.65	-	-	-
CC28: Cirrhosis of Liver	2.3%	$77.11	-	-	-
M1200I: Skin and Ulcer Treatments: Application Dressings to Foot Code	5.1%	$76.64	-	-	-
O0100J2: Special Treatments/Programs: Dialysis Post-admit Code	4.2%	$75.90	Y	Overlap with Costlier CC	Kept CC: Dialysis Status
K0510B2: Nutritional Approaches While a Resident: Feeding Tube	4.0%	$75.61	-	-	-
CC47: Disorders of Immunity	3.7%	$75.41	Y	Superset	Redefined to Exclude RxCC: Immune Disorders
RxCC82: Psoriatic Arthropathy and Systemic Sclerosis	0.3%	$74.70	-	-	-
CC83: Respiratory Arrest	0.0%	$73.92	-	-	-
CC84: Cardio-Respiratory Failure and Shock	11.6%	$73.16	-	-	-
CC115: Pneumococcal Pneumonia, Emphysema, Lung Abscess	0.6%	$72.85	-	-	-
I6200: Active Diagnoses: Asthma COPD Chronic Lung Disease Code	26.7%	$72.47	-	-	-
RxCC166: Migraine Headaches	1.8%	$72.22	Y	Soft Diagnoses	-

Condition/Service	% of Stays*	Avg. NTA Costs per Day	Dropped	Reason	Action
CC162: Severe Skin Burn or Condition	0.0%	$71.91	-	-	-
RxCC80: Aseptic Necrosis of Bone	0.7%	$71.89	-	-	-
I2900: Active Diagnoses: Diabetes Mellitus (DM) Code	35.4%	$71.36	-	-	-
CC23: Other Significant Endocrine and Metabolic Disorders	9.1%	$71.07	Y	Superset	Redefined to Exclude RxCC: Specified Hereditary Metabolic/Immune Disorders and RxCC: Pituitary, Adrenal Gland, and Other Endocrine and Metabolic Disorders
CC35: Inflammatory Bowel Disease	1.4%	$70.39	Y	Perfect Overlap	Kept RxCC: Inflammatory Bowel Disease
RxCC67: Inflammatory Bowel Disease	1.4%	$70.39	-	-	-
CC46: Severe Hematological Disorders	1.5%	$70.14	Y	Superset	Redefined to Exclude RxCC: Myelodysplastic Syndromes and Myelofibrosis
RxCC96: Myelodysplastic Syndromes and Myelofibrosis	0.8%	$69.98	-	-	-
CC107: Vascular Disease with Complications	7.4%	$69.89	-	-	-
H0100C: Bladder and Bowel Appliances: Ostomy	2.5%	$69.52	-	-	-
RxCC215: Venous Thromboembolism	9.0%	$69.13	-	-	-
CC112: Fibrosis of Lung and Other Chronic Lung Disorders	5.5%	$68.99	Y	Superset	Redefined to Exclude RxCC: Pulmonary Fibrosis and Other Chronic Lung Disorders
RxCC227: Pulmonary Fibrosis and Other Chronic Lung Disorders	4.9%	$68.80	-	-	-
CC75: Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	1.6%	$68.72	-	-	-
RxCC316: Psoriasis, Except with Arthropathy	1.0%	$68.30	-	-	-
M1040D: Other Skin Problems: Open Lesions Other Than Ulcers Rashes Cuts Code	1.6%	$67.56	-	-	-
RxCC84: Systemic Lupus Erythematosus, Other Connective Tissue Disorders, and Inflammatory Spondylopathies	3.5%	$67.50	-	-	-
H0100A: Bladder and Bowel Appliances: Indwelling Catheter	11.1%	$67.42	-	-	-
O0100B2: Special Treatments/Programs: Radiation Post-admit Code	0.2%	$66.99	-	-	-
I5600: Active Diagnoses: Malnutrition Code	4.2%	$66.94	-	-	-
M1200G: Skin and Ulcer Treatments: Application Nonsurgical Dressing Code	21.5%	$66.61	-	-	-
M1040F: Other Skin Problems: Burn(s) Code	0.2%	$66.51	Y	Overlap with Costlier CC	Kept CC: Severe Skin Burn or Condition
M1200E: Skin and Ulcer Treatments: Ulcer Care Code	14.8%	$66.43	-	-	-
RxCC131: Bipolar Disorders	4.9%	$65.59	-	-	-
RxCC163: Intractable Epilepsy	0.7%	$65.31	-	-	-
CC40: Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	7.7%	$65.21	Y	Superset	Redefined to Exclude RxCC: Psoriatic Arthropathy and Systemic Sclerosis and RxCC: Systemic Lupus Erythematosus, Other Connective Tissue Disorders, and Inflammatory Spondylopathies
H0100D: Bladder and Bowel Appliances: Intermittent catheterization	0.9%	$64.43	-	-	-

Condition/Service	% of Stays*	Avg. NTA Costs per Day	Dropped	Reason	Action
RxCC68: Esophageal Reflux and Other Disorders of Esophagus	33.2%	$63.60	Y	Too Common	-
RxCC134: Depression	25.6%	$63.19	-	-	-

Regression includes stays from FYs 2014-2017 with 8 or more utilization days.

After identifying the 50 costliest comorbidities based on the methodology described above, we ran a final regression to estimate the costliness of each included comorbidity. This allows the coefficients of the included conditions/services to partly capture the effect of related conditions/services that were excluded. The final list of comorbidities is shown in Table 48.

Acumen considered three approaches to incorporate comorbidities into the payment model: an index model, a tier system, and a count system. An index model would assign weights, equivalent of a comorbidity's regression coefficient, to each comorbidity, and the weights for all comorbidities present would be summed to determine payment. A count system would assign payment based on the number of comorbidities a resident has upon admission to the SNF. A tier system would be similar to the system used in the IRF PPS and group comorbidities associated with similar NTA costs per day into hierarchical tiers. A simple count system would assign higher payment to residents with more comorbidities; however, it would not account for differences in the costliness of those conditions/services. A simple tier system that assigned payment based on the costliest condition/service present would account for differences in costliness but would not account for the presence of multiple comorbidities. Because of the weaknesses of these approaches, and to avoid the complexity of an index model, Acumen created a comorbidity score that combines the advantages of the count and tier approaches. The comorbidity score assigns points based on both the number and costliness of the conditions or services present. In other words, a resident's comorbidity score is the sum of points assigned to each comorbidity present.

Points were assigned to each included comorbidity by dividing each coefficient by 10 then rounding to the nearing integer. Doing so reduces the number of possible point values, making the model simpler while still capturing variation in costliness across comorbidities. This point assignment is also more robust in that it is less vunerable to changes in the ranking of comorbidities caused by small changes in relative costliness. Exceptions were made for the 9 least costly items because it would not be appropriate to assign 0 points for included conditions; these comorbidities were assigned a single point. The conditions and services included in the comorbidity score, frequency of stays with these conditions/services, OLS estimate of their impact on NTA costs per day, and assigned points are shown in Table 48.

Table 48: Comorbidities Included in Comorbidity Score and Assigned Points

Condition/Service	% of Stays*	OLS Estimate	Proposed Points
HIV/AIDS	0.3%	$78.84	8
Parenteral IV Feeding: Level High	0.2%	$67.74	7
O0100H2: Special Treatments/Programs: Intravenous Medication Post-admit Code	8.1%	$50.08	5
O0100F2: Special Treatments/Programs: Ventilator or Respirator Post-admit Code	0.3%	$39.65	4
Parenteral IV feeding: Level Low	0.0%	$32.79	3
RxCC395: Lung Transplant Status	0.0%	$26.92	3
O0100I2: Special Treatments/Programs: Transfusion Post-admit Code	0.3%	$21.17	2
RxCC260 RxCC396 RxCC397: Major Organ Transplant Status, Except Lung	0.6%	$20.45	2
I5200: Active Diagnoses: Multiple Sclerosis Code	0.7%	$18.51	2
RxCC5: Opportunistic Infections	0.4%	$17.78	2
I6200: Active Diagnoses: Asthma COPD Chronic Lung Disease Code	26.7%	$17.22	2
CC39: Bone/Joint/Muscle Infections/Necrosis - Except : RxCC80: Aseptic Necrosis of Bone	2.0%	$16.87	2
RxCC15: Chronic Myeloid Leukemia	0.1%	$16.85	2
I2500: Wound Infection Code	1.6%	$16.49	2
I2900: Active Diagnoses: Diabetes Mellitus (DM) Code	35.4%	$15.90	2
Endocarditis	0.6%	$14.97	1
RxCC97: Immune Disorders	0.9%	$13.50	1
CC27: End-Stage Liver Disease	1.5%	$13.45	1
M1040B: Other Foot Skin Problems: Diabetic Foot Ulcer Code	1.1%	$13.22	1
RxCC355: Narcolepsy and Cataplexy	0.1%	$12.92	1
RxCC225: Cystic Fibrosis	0.0%	$12.60	1
O0100E2: Special Treatments/Programs: Tracheostomy Care Post-admit Code	0.8%	$12.56	1
I1700: Active Diagnoses: Multi-Drug Resistant Organism (MDRO) Code	2.0%	$12.19	1
O0100M2: Special Treatments/Programs: Isolation Post-admit Code	1.3%	$11.37	1
RxCC40: Specified Hereditary Metabolic/Immune Disorders	0.0%	$10.94	1
RxCC43: Morbid Obesity	8.8%	$10.27	1
O0100B2: Special Treatments/Programs: Radiation Post-admit Code	0.2%	$9.30	1
M0300X1: Highest Stage of Unhealed Pressure Ulcer - Stage 4	1.1%	$9.03	1
RxCC82: Psoriatic Arthropathy and Systemic Sclerosis	0.3%	$8.72	1
RxCC65: Chronic Pancreatitis	0.6%	$8.21	1
CC122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1.0%	$7.66	1
M1040A or M1040C: Other Foot Skin Problems: Foot Infection Code, Other Open Lesion on Foot Code, Except M1040B: Diabetic Foot Ulcer Code	1.4%	$7.39	1
CC176: Complications of Specified Implanted Device or Graft	2.7%	$7.31	1
H0100D: Bladder and Bowel Appliances: Intermittent catheterization	0.9%	$7.12	1
RxCC67: Inflammatory Bowel Disease	1.4%	$7.06	1
RxCC80: Aseptic Necrosis of Bone	0.7%	$7.05	1
O0100D2: Special Treatments/Programs: Suctioning Post-admit Code	0.8%	$6.77	1
CC84: Cardio-Respiratory Failure and Shock	11.6%	$6.43	1

Condition/Service	% of Stays*	OLS Estimate	Proposed Points
RxCC96: Myelodysplastic Syndromes and Myelofibrosis	0.8%	$6.29	1
RxCC84: Systemic Lupus Erythematosus, Other Connective Tissue Disorders, and Inflammatory Spondylopathies	3.5%	$6.07	1
RxCC241: Diabetic Retinopathy - Except : CC122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	2.7%	$5.30	1
K0510B2: Nutritional Approaches While a Resident: Feeding Tube	4.0%	$4.93	1
CC162: Severe Skin Burn or Condition	0.0%	$4.92	1
RxCC163: Intractable Epilepsy	0.7%	$4.38	1
I5600: Active Diagnoses: Malnutrition Code	4.2%	$4.37	1
CC47: Disorders of Immunity - Except : RxCC97: Immune Disorders	2.8%	$4.34	1
CC28: Cirrhosis of Liver	2.3%	$4.23	1
H0100C: Bladder and Bowel Appliances: Ostomy	2.5%	$4.12	1
CC83: Respiratory Arrest	0.0%	$3.76	1
RxCC227: Pulmonary Fibrosis and Other Chronic Lung Disorders	4.9%	$3.52	1

Regression includes stays from FYs 2014-2017 with 8 or more utilization days.

Figure 7 shows frequency and NTA costs per day by comorbidity score. The figure shows there is a strong linear relationship between comorbidity score and NTA costs per day. Very few stays had more than 11 points, and no resident in our population had more than 32 points, although the theoretical maximum comorbidity score is 83.

Figure 7: Average NTA Costs per Day and Percentage of Stays by Comorbidity Score
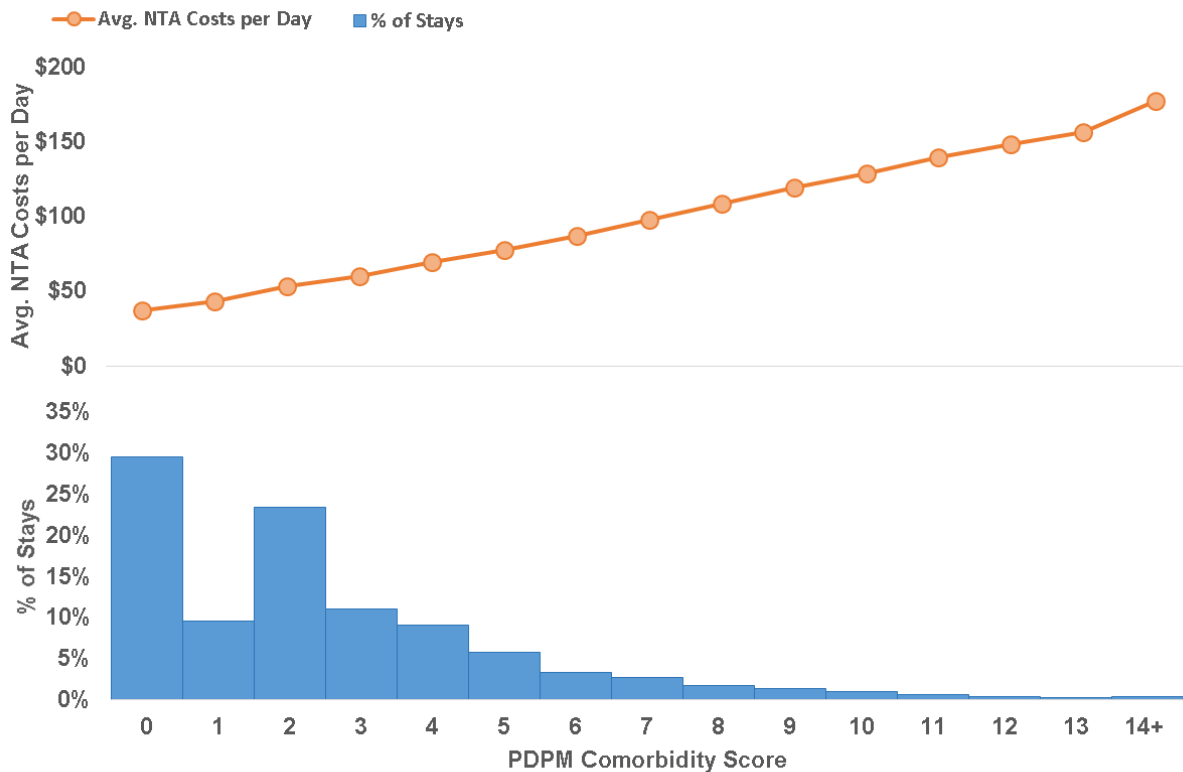
3.7.2 Variable Grouping Methods

After selecting independent variables related to NTA utilization, Acumen used the CART algorithm, described in Section 3.4.2, and FY 2017 data to explore possible payment groups. The dependent variable used in this analysis was NTA costs per day. The independent variable used was comorbidity score. The NTA groups created by CART are shown in Table 49.

Table 49: NTA Groups Created by CART

Comorbidity Score	# of Stays*	% of Stays	Avg. NTA Costs per Day
0-1	575,527	36.1%	$36
2	297,290	18.7%	$49
3-4	378,292	23.8%	$61
5-8	265,475	16.7%	$83
9-11	55,185	3.5%	$123
12+	20,990	1.3%	$157

Includes stays from FY 2017 with 8 or more utilization days.

In addition to the raw CART output, Acumen also developed an alternative classification, in which the splits were determined by reviewing information from the CART output. Table 50 shows average NTA costs per day for a 6-group model using comorbidity score bins. This classification departs from the CART comorbidity score bins in grouping residents with a comorbidity score of 1 with residents with scores of 2 instead of with residents with scores of 0. This is to maintain the distinction between residents with no comorbidities and the rest of the population. In addition, Acumen grouped residents with score of 5 together with residents with scores of 3-4 based on their similarity in average NTA costs per day. As the table shows, average NTA costs per day increase monotonically as comorbidity score increases across the six groups. This model was restricted to stays with 8 or more utilization days.

Table 50: Frequency and NTA Costs per Day for 6-Group Model

Comorbidity Score	# of Stays*	% of Stays	Avg. NTA Costs per Day
0	382,288	24.0%	$34
1-2	490,529	30.8%	$46
3-5	490,787	30.8%	$64
6-8	152,980	9.6%	$90
9-11	55,185	3.5%	$123
12+	20,990	1.3%	$157

Includes stays from FY 2017 with 8 or more utilization days.

Table 51 compares the predictive ability of the groups produced by CART and the alternative classification. Since there is no difference in predictive power between the two options, to have the distinction between residents with no comorbidity and with any comorbidity, Acumen decided to pursue the alternative classification.

Table 51: NTA Group Options R-squared Comparison

Model	# of Groups	R-squared Value
Alternative Classification	6	0.116
CART	6	0.116

3.8 Payment Adjustment for Residents with HIV/AIDS

This section describes the current HIV/AIDS payment adjustment and Acumen's investigations into whether the recommended resident classification model appropriately compensates for costs associated with this population.

3.8.1 Background on the Existing HIV/AIDS Adjustment

Section 511 of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA, Pub. L. 108-173) amended section 1888(e)(12) of the Social Security Act to enact a 128% increase in the PPS per diem payment for SNF residents with HIV/AIDS, effective for services provided on or after October 1, 2004. The adjustment for HIV/AIDS reflected research showing that SNF residents with HIV/AIDS were costlier than residents without this condition. In particular, the House Ways and Means Committee Report accompanying the MMA referenced HCFA-funded research by the Urban Institute as a justification for the adjustment.[41] The study found that SNF residents with HIV/AIDS had much higher drug and nursing costs than other residents and recommended modifying the PPS to better match the NTA and nursing utilization of this population. However, the current HIV/AIDS payment adjustment is applied to all payment components. This means that residents who receive high therapy minutes, placing them in high-paying RUGs, receive a much larger per-diem add-on for HIV/AIDS than residents in non-rehabilitation RUGs, although their costs related to HIV/AIDS may be similar.

Section 1888(e)(12) of the Act also contains a sunset provision stipulating that the HIV/AIDS adjustment only applies until the Secretary certifies that case-mix adjustment appropriately compensates for increased costs associated with this population.

3.8.2 Adequacy of HIV/AIDS Payment in PDPM

To determine whether the case-mix adjustment under PDPM appropriately compensates for costs of residents with HIV/AIDS, Acumen used HIV/AIDS status to separately predict costs per day for PT, OT, SLP, and NTA, controlling for case mix by including the PDPM resident groups as independent variables. Table 52 shows the results of this investigation. HIV/AIDS was associated with a negative and statistically significant decrease in PT, OT, and SLP costs per day. These results indicate HIV/AIDS is not associated with higher PT, OT, or SLP costs per day, when controlling for resident group. As shown in Table 52, HIV/AIDS was associated with a significant increase in NTA costs per day, even while controlling for case-mix assignment. However, these results suggest that the underestimation of NTA costs for residents with HIV/AIDS is balanced by overestimation of costs for the other ancillary components (PT, OT, and SLP). To explore this possibility, we used PDPM case-mix group assignment to predict PT, OT, SLP, and NTA costs per day for residents with HIV/AIDS. We summed predicted PT, OT, SLP, and NTA costs per day to estimate ancillary costs per day for residents with HIV/AIDS. We then compared this estimate to actual average ancillary costs per day for this subpopulation. As shown in Table 53, the recommended case-mix groups slightly overpredict ancillary costs for residents with HIV/AIDS, confirming that the overprediction of therapy costs balances the

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[41] Liu, Korbin, Amanda Lockshin, Carolyn Rimes, and Cristina Baseggio, "Medicare Payments for Patients with HIV/AIDS in Skilled Nursing Facilities," *Urban Institute. Washington, DC* (2001).

underprediction of NTA costs. Based on these findings, Acumen concluded that the recommended PT, OT, SLP, and NTA case-mix groups appropriately adjust for ancillary costs associated with the HIV/AIDS population.

Table 52: Results of Regressions Using HIV/AIDS to Predict Costs per Day for PT, OT, SLP, and NTA

Component	HIV/AIDS Coefficient	HIV/AIDS P-value
PT	-$4.41	<.0001
OT	-$3.24	<.0001
SLP	-$0.84	0.02
NTA*	$7.13	<.0001

* The regression was restricted to stays 8 days and longer. The restriction was implemented because length of stay is strongly correlated with NTA costs per day.

Table 53: Comparison of Estimated and Actual Ancillary Costs per Day for HIV/AIDS Residents

Component*	Estimate	Actual	Difference
PT	$68	$63	$5
OT	$57	$54	$3
SLP	$15	$14	$1
NTA	$133	$140	-$6
Total Ancillary	$274	$271	$2

* The regressions are restricted to stays 8 days and longer. The restriction was implemented because length of stay is strongly correlated with NTA costs per day.

Acumen conducted an analysis similar to that shown in Table 52 to test whether the recommended nursing component appropriately compensates for increased nursing utilization associated with HIV/AIDS. Because of the lack of resident-specific nursing costs, as discussed in Section 3.2.1, Acumen used HIV/AIDS status to predict nursing WWST, a measure of nursing utilization described in Section 3.2.1. As in the regressions used for the other components, Acumen controlled for case mix by including the PDPM resident groups as covariates. The results of this analysis are shown in Table 54. The results show that even after controlling for nursing case-mix group, HIV/AIDS status is associated with a positive and significant increase in nursing utilization. An increase of 25.56 in WWST represents an 18% increase over the weighted average nursing WWST for the full STRIVE population, which is 140 (The weighting adjusted this estimate to account for the deliberate over-sampling of certain subpopulations in the

STRIVE study). Based on these findings, Acumen concluded that the PDPM nursing groups may not completely capture the additional nursing costs associated with HIV/AIDS residents. As a result, PDPM incorporates an 18% add-on to the nursing payment for residents with HIV/AIDS.

Table 54: Results of Regression Using HIV/AIDS to Predict Nursing WWST

Dependent Variable	Independent Variables	HIV/AIDS Coefficient	HIV/AIDS P-value
Nursing WWST	HIV/AIDS, non-rehabilitation RUGs	24.66	0.00

3.9 Variable Per-Diem Payments

This section describes the motivation and methodology for developing variable per-diem payments, which track changes in resource use over a stay. Additionally, the recommended variable per-diem adjustment factors are presented.

3.9.1 Motivation

Under RUG-IV, SNFs are paid a constant per diem rate through the stay based on each resident's RUG-IV classification. However, Acumen observed that resource use for certain services is not constant over a stay but varies depending on the point in the stay. Specifically, PT and OT costs decline steadily over the course of the stay. NTA costs, driven largely by drug costs, are concentrated at the beginning of a stay and are much lower thereafter. Similar analyses showed that SLP costs remain relatively constant over the stay. There is no comparable data on nursing costs to measure changes in resource use throughout the stay. Section 3.9 of the SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) provides more details on the analysis of resource utilization over the course of the stay for each component. To reflect the changes in PT, OT, and NTA resource utilization over a stay, Acumen created variable per diem payment adjustments based on point in the stay. The following sub-sections describe how these adjustments were created.

3.9.2 Overview of Variable Per-Diem Payment

RUG-IV calculates payment for each resident group by multiplying the base rate for that component by the CMI for the specific group. For components that include variable per diem payment (PT, OT, and NTA), PDPM maintains this calculation but also incorporates an adjustment factor based on day in the stay. The adjustment factor is based on a variable per diem schedule and structured similarly to the Medicare Part A Inpatient Psychiatric Facility PPS. Payment for each resident group is calculated using the following equation:

$Per\ Diem\ Payment = Component\ Base\ Rate \times Resident\ Group\ CMI \times Component\ Adjustment\ Factor$

3.9.3 Methodology

The main difficulty in tracking costs over a stay is deriving per diem costs, since a single claim does not provide the costs of services on each utilization day separately. Costs are reported annually on facility cost reports and can be estimated at the claim and stay levels using the facility CCR, as described in Section 3.2. Costs per day can be calculated by averaging total costs for a stay by the length of the stay. However, costs per day represent the cost of an average day for a given stay, rather than the actual cost of a specific day in the stay.

To obtain a robust estimate of the cost of a specific day in a stay, Acumen took advantage of the claim submission schedule and the arbitrariness of the point in the month when a stay began. Facilities are required to submit monthly claims. Each claim covers the period from the first day during the month a resident is in the facility to the end of the month. If a resident is admitted on the first of the month and remains in the facility until the end of the month with continuous Part A SNF eligibility, the claim for that month will include all days in the month. However, if a resident is admitted after the first of the month, the first claim associated with the resident's stay will be shorter than a month. Acumen used first claims of varying lengths to estimate the cost of each additional day of SNF care.[42] For example, suppose that for stays that were 10 days long, the average costs of 4-day first claims were $250, and the average costs of 5-day first claims were $300. Assuming the cost distribution for the first four days is the same across the two types of stays, the marginal costs of Day 5 are $300 minus $250, or $50. Using this method, one can use the length of first claim to estimate per diem costs for the first 31 days of a stay. Similarly, one can use variation in the length of the last claim to estimate the per diem costs of the last 31 days of longer stays. Using this process, Acumen estimated PT, OT, and NTA costs for each day of the stay.[43]

The next step was to bin the days in the stay to remove some unnecessary variance. Acumen observed that PT and OT costs remained high for the first 20 days of a stay and started declining in the third week while NTA costs were high for the first three days of a stay before declining. Based on this observation, Acumen binned the first 20 days of the stay for PT and OT payment and the first three days of the stay for NTA payment, then calculated the average per

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[42] This methodology assumes variation in the day of a month when a resident is admitted is not related to the distribution of costs over a stay.

[43] For stays longer than 62 days, however, the first and last claim methods cannot estimate per diem costs for days in the middle of the stay because the middle claim is always one month long and therefore there is no variation in the length of the middle claim (besides small variation in the length of the month). Given that for most lengths of stay, the days for which costs cannot be estimated using the first or last claim methods only comprise a small proportion of the entire stay, the missing data should not substantially influence the estimated rates of decline in costs over a stay. Only 6.4% of stays are longer than 63 days in FY 2017.

diem costs for this flat period. The subsequent days in the stay were then binned into 5-day groups.[44]

After the data cleaning step, Acumen ran a regression to estimate the rate of decline after the initial drop in costs following the initial flat period. The regression equation is shown below, where d is the day since the start of the declining period (the period following the initial flat period), and s is the length of stay. The average initial per diem costs are the population average per diem costs of Days 1–20 for the PT and OT components, and of Day 4 for the NTA component. The output β is the estimated rate of decline in costs for each additional day of decline. Additionally, 1 is included as a constant so that the ratio equals 1 before the decline starts. Different reference points were chosen for each component because of differences in the observed pattern of resource use over a stay. PT and OT utilization declines gradually over a stay, whereas NTA utilization declines sharply. Therefore, Acumen estimated the decline in PT and OT costs as a continuous decline starting at the end of the initial flat period (Days 1-20). For the NTA component, Acumen estimated the rate of decline starting after Day 4, assuming a sharp decline between the flat period in Days 1-3 and Day 4. The SNF PMR technical report (available at www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/therapyresearch.html) provides more detail on these analyses.

$$Proportionality\ Factor(d,s) = \frac{Per\ Diem\ Costs(d,s)}{Average\ Initial\ Per\ Diem\ Costs} = 1 + \beta(d^{th}\ Decline\ Day)$$

The estimated rates of decline for the three components are shown in Table 55. The estimated rates of decline for PT and OT are both around 0.35% of the average per diem costs after the initial 20-day flat period. The estimated rate of decline for NTA after Day 4 is only 0.12%. Because the decline in NTA costs is concentrated during the first four days of a stay and very small thereafter, Acumen recommends maintaining a flat per diem payment for the NTA component after the initial decline between Days 1-3 and Day 4. As shown in Table 56, estimated per diem NTA costs decline from $150 during Days 1-3 to $45 during Days 4-100, a 70% decline.

Table 55: Estimated Rate of Decline

Component	Estimated % Decline	P-value
PT	-0.34%	0.000
OT	-0.36%	0.000
NTA	-0.12%	0.013

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[44] Acumen dropped observations where the derived marginal per diem costs are negative.

Table 56: Average NTA Per Diem Costs for NTA Flat Periods

Flat Period	Avg. NTA Per Diem Costs
Day 1- 3	$150
Day 4-100	$45

3.9.4 Variable Per Diem Payment Adjustment Factors

Based on the estimated rates of decline for the PT and OT components, PDPM reduces the PT and OT adjustment factors by 0.02 every seven days starting from Day 21 (the first day after the flat period). A decline of 0.02 in the adjustment factor corresponds to a 2% decline if we assign a weight of 1.00 to the first 20 days of the stay. Table 57 lists the recommended PT and OT variable per diem payment adjustment factors by day in the stay. Table 58 shows the NTA adjustment factor by day in the stay. The adjustment factor is set to 3.00 for days 1-3. Following the three day flat period, the adjustment factor is a constant 1.00, reflecting the 70% decline in per diem costs after the flat period and relatively constant per diem costs thereafter, as discussed above. Acumen set the adjustment factor to 1.00 for days 4-100 because for most stays, the majority of the stay falls within this range.

Table 57: Adjustment Factors for the PT and OT Components

Day in Stay	PT/OT Adjustment Factor
1-20	1.00
21-27	0.98
28-34	0.96
35-41	0.94
42-48	0.92
49-55	0.90
56-62	0.88
63-69	0.86
70-76	0.84
77-83	0.82
84-90	0.80
91-97	0.78
98-100	0.76

Table 58: Adjustment Factors for the NTA Component

Day in Stay	NTA Adjustment Factor
1-3	3.00
4-100	1.00

3.10 Estimation of Base Rates for Components

This section describes how the original base rates were developed and details how Acumen estimated base rates for the PDPM payment components. Estimation of base rates was necessary to study the impact of the recommended payment model, as discussed in Section 0.

3.10.1 Overview of Methodology

As discussed in Sections 3.3.1 and 3.3.2, PDPM contains three therapy components (PT, OT, and SLP) and two separate components for nursing and NTA. However, the current base rates correspond to the two case-mix components in RUG-IV (therapy and nursing) as well as the two non-case-mix components. To estimate the impacts of PDPM, it was necessary to bifurcate the existing base rates for case-mix therapy into three base rates and nursing into two base rates, with each of the five resulting case-mix base rates corresponding to one of the case-mix components in PDPM. The nursing base rate was split into separate base rates for nursing and NTA. Specifically, we estimated the NTA base rate as 43% of the current urban and rural nursing base rates, while the nursing base rate was estimated as 57% of the current nursing base rates. These estimates, discussed in further detail below, were based on guidance published by CMS regarding the portion of nursing costs attributable to NTA costs. The therapy base rate was split into separate base rates for PT, OT, and SLP. Because there was no comparable guidance on the proportion of therapy costs attributable to the three therapy disciplines, Acumen independently derived the therapy split as described below. To estimate the therapy split, Acumen generally followed the methodology used by CMS (then known as HCFA) to create the original case-mix therapy base rate in 1998, with some modifications. This methodology is described in the following section.

3.10.2 Calculation of Original Base Rates

To establish base rates for the four payment components in RUG-IV, HCFA calculated standardized, average per-diem costs for each of the components based on cost reporting periods beginning in FY 1995, as follows:

1) Exclusion of Cost Reports: HCFA included only cost reports for cost reporting periods beginning in FY 1995 and lasting 10-13 months. Additionally, only as-submitted and settled reports were included. SNFs that had a cost limit exemption were excluded.

2) Inclusion of Part A and Part B Costs: HCFA included both Part A costs from FY 1995 cost reports and an estimate of amounts payable under Part B for covered SNF services provided to Part A SNF residents.

3) Adjustment of Costs for As-Submitted Cost Reports: HCFA adjusted as-submitted cost reports by adjusting routine costs downward by 1.31% and adjusting ancillary costs downward by 3.26%. These adjustment factors were based on a comparison of as-

submitted and settled cost reports from FY 1992 to FY 1994, and were chosen to reflect average adjustments resulting from the process of cost report settlement.

4) Exclusion of Education Costs: HCFA excluded education costs from each component in the calculation of facility per diem costs.

5) Calculation of Per Diem Costs by Facility: To calculate per diem costs for each facility, HCFA divided a facility's total costs by the total number of Medicare days on the facility cost report. For the therapy component, costs were divided by the number of Medicare days related to therapy.

6) Removal of Outliers: For each cost component, facilities with estimated per diem costs more than three standard deviations from the geometric mean costs across all facilities were considered outliers and excluded from the calculation of that component's per diem costs.

7) Updating Costs to Initial Period of PPS: After the removal of outliers, per diem costs were adjusted using the SNF Market Basket Index (MBI) to reflect cost increases between the midpoint of the cost reporting period associated with the cost report and the initial period for PPS implementation (July 1, 1998 to September 30, 1998). The SNF MBI accounts for cost increases which affect routine, ancillary, and capital-related expenses. To update costs to the initial period of the PPS, costs were updated by the annual MBI minus one percentage point each year.

8) Standardization of Cost Data: Next, facility per diem costs were adjusted to account for the effects of case mix and geographic wage differences. To adjust costs for facility-level differences in case mix, given that MDS data was not available, HCFA created a crosswalk between claims data and RUG-III categories. HCFA used the facility-level distribution of residents across the RUG-III categories to estimate average case-mix index values, for nursing and therapy, for each facility. The facility-level estimated case-mix indexes were used to adjust facility-level costs to account for differences in case mix. To account for geographic wage differences, wage indexes were applied to the labor-related share of costs, estimated as 75.888%. Since SNF-specific wages were not available for the relevant time period, hospital wages from FY 1994 were used. HCFA mapped facilities to a wage index by Metropolitan Statistical Area (MSA) for urban facilities and by state for rural facilities.

9) Calculation of National Standardized Payment Rates: In calculating urban and rural base rates, urban facilities were defined as those located in an MSA or a New England County Metropolitan Area (NECMA), while all other facilities were categorized as rural. National standardized base rates were created as follows for each of the four components:

a. Calculate average per diem costs for the Medicare Part A population in each facility, following steps 5-8.

b. Compute the average per diem costs for all freestanding facilities, weighted by the number of Medicare Part A days in each facility.

c. Compute the average per diem costs for all freestanding and hospital-based facilities, weighted by the number of Medicare Part A days in each facility.

d. Compute the arithmetic mean of the amounts from steps (b) and (c) per SSA Section 1888(e)(4)(E)(i). This amount, calculated separately by component and for urban and rural facilities, is the base rate.

3.10.3 Estimation of PT, OT, and SLP Split

To run impact analyses that compare RUG-IV to PDPM, Acumen split the RUG-IV therapy case-mix base rate to derive estimated PT, OT, and SLP base rates under PDPM. This required estimating the fraction of therapy costs that correspond to each therapy discipline (PT, OT, and SLP). To derive these fractions, Acumen followed the original methodology used to derive the SNF PPS base rates, outlined in Section 3.10.2.

Facility cost reports from FY 1995 include costs for each of the three therapy disciplines (PT, OT, and SLP) as well as the number of Medicare Part A utilization days. Freestanding SNFs reported Medicare Part A costs for PT, OT, and SLP on CMS forms 2540-92 and 2540-96 in three cost centers corresponding to each therapy discipline. Hospital-based SNFs reported therapy costs in the same cost centers on CMS forms 2552-92 and 2552-96. Total therapy costs are calculated by summing across the three therapy cost centers.

Using this information, Acumen calculated average per-diem discipline-specific costs and average per-diem total therapy costs for each facility. Acumen obtained these SNF-level costs by following the process outlined in Section 3.10.2 and using the same exclusions and adjustments wherever possible. However, there are a few ways in which the data used for the PT, OT, and SLP percentage calculations differ from the data used for the 1998 base rates calculation. First, the 1998 calculation excludes cost reports for facilities which were exempted from cost limits in the base year. Acumen could not implement this restriction because available cost report data does not identify facilities exempted from cost limits. However, this is unlikely to have had a notable impact on Acumen's estimates since Acumen excluded facilities with per diem costs more than three standard deviations from the geometric mean across facilities. Given this exclusion, the influence of facilities with unusually high costs on the estimates of per diem costs was limited.

Second, the original base rates calculation excluded costs related to exceptions payments and approved educational activities. Available cost report data neither identified costs related to

exceptions payments nor indicated the percentage of overall therapy costs or costs by therapy discipline related to approved educational activities. Therefore, these costs could not be excluded from Acumen's estimate. However, since exceptions were only granted for routine costs and not for therapy costs, the inability to implement this exclusion should not affect Acumen's estimates. Similarly, based on cost report data, educational costs comprise less than one-hundredth of one percent of overall SNF costs. If the proportion of educational costs is fairly uniform across all cost categories, then the inclusion of education costs should have a negligible impact on Acumen's estimates of the discipline-specific percentages.

Third, as described above, the original base rates calculation incorporated estimates of amounts payable under Part B for SNF services provided to Part A SNF residents. To estimate these costs, Acumen interpreted the approach described in the 1998 interim final rule (63 FR 26256) in the following manner: Part B claims associated with a Part A SNF stay were matched to SNF cost reports. Next, for each cost center (PT, OT, and SLP) in the cost reports, Acumen calculated a ratio to estimate the amount by which Part A costs should be increased to account for the portion of costs payable under Part B. These ratios were calculated by dividing total charges from matched Part B claims by total charges from Part A SNF claims which overlapped with the cost report.

Lastly, the original base rates calculation standardized cost data to adjust for differences in facility case mix and geographic differences in wage levels. Acumen used the original methodology to standardize costs for wage differences, applying an index based on FY 1994 hospital wages to the labor-related share of costs, estimated at 75.888%. However, Acumen did not implement the case-mix adjustment used in the original calculation because the original case-mix adjustment was based on the now obsolete RUG-III classification system, and since the 1998 interim final rule did not document how SNF and inpatient claims were mapped to RUG-III clinical categories, this step could not be replicated. We believe that the inability to apply the case-mix adjustment likely has a small impact on our estimate of the PT, OT, and SLP percentages. The 1998 interim final rule indicates that the case-mix adjustment was applied by dividing facility per diem costs for a given component by average facility case mix for that component; in other words, multiplying by the inverse of average facility case mix. As long as average facility case-mix values are within a relatively narrow range, adjustment for facility case mix should not have a large impact on the estimated PT, OT, and SLP percentages. Because the RUG-III case-mix indexes shown in the 1998 interim final rule are within a relatively narrow range (for example, therapy indexes range from 0.43 to 2.25), we do not expect the inability to apply the case-mix adjustment to facility per diem costs to have a large influence on the estimated PT, OT, and SLP percentages.

Using the data obtained by following the process described in Section 3.10.2 with the differences noted above, Acumen followed the methodology provided in section II.A.3 of the 1998 interim rule with comment period (63 FR 26260) to estimate federal base payment rates. These steps were done separately for urban and rural facilities:

1. Acumen calculated mean PT, OT, and SLP per diem costs and mean therapy per diem costs based on freestanding SNFs, weighted by total number of Medicare days.

2. Acumen calculated mean PT, OT, and SLP per diem costs and mean therapy per diem costs for hospital-based and freestanding SNFs, weighted by total number of Medicare days.

3. Acumen calculated the arithmetic mean of the amounts derived in Steps 1 and 2.

4. Lastly, Acumen divided mean PT, OT, and SLP per diem costs from Step 3 by mean therapy per diem costs from Step 3 to estimate the percentage of therapy costs corresponding to PT, OT, and SLP.

Table 59, Table 60, and Table 61 show the results of steps 1, 2, and 3 respectively. Table 62 shows estimated shares of total therapy per diem costs accounted for by each therapy discipline. As discussed at the end of this section, Acumen used these percentages to separate the RUG-IV therapy case-mix base rate into estimated PT, OT, and SLP base rates under PDPM.

Table 59: Mean Per Diem Costs by Therapy Discipline for Freestanding SNFs, FY 1995 Cost Reports

Therapy Discipline	Urban		Rural	
	# Providers	Mean Per Diem Costs	# Providers	Mean Per Diem Costs
PT	5,135	$33.13	3,028	$34.48
OT	5,135	$34.98	3,028	$34.80
SLP	5,135	$14.25	3,028	$15.82
Total Therapy (PT+OT+SLP)	5,135	$82.36	3,028	$85.10

Table 60: Mean Per Diem Costs by Therapy Discipline for Freestanding and Hospital-Based SNFs, FY 1995 Cost Reports

Therapy Discipline	Urban		Rural	
	# Providers	Mean Per Diem Costs	# Providers	Mean Per Diem Costs
PT	6,005	$37.57	3,586	$37.43
OT	6,005	$30.71	3,586	$31.23
SLP	6,005	$12.07	3,586	$13.80
Total Therapy (PT+OT+SLP)	6,005	$80.35	3,586	$82.47

Table 61: Mean Per Diem Costs by Therapy Discipline (Arithmetic Mean of Freestanding and Freestanding + Hospital-Based SNFs), 1995 Cost Reports

Therapy Discipline	Urban		Rural	
	# Providers	Mean Per Diem Costs	# Providers	Mean Per Diem Costs
PT	6,005	$35.35	3,586	$35.95
OT	6,005	$32.85	3,586	$33.02
SLP	6,005	$13.16	3,586	$14.81
Total Therapy (PT+OT+SLP)	6,005	$81.36	3,586	$83.78

Table 62: Estimated Shares of PT, OT, and SLP Per Diem Costs, FY 1995 Cost Reports

Location	% Costs Based on FY 1995 Cost Reports		
	PT	OT	SLP
Urban	43.4%	40.4%	16.2%
Rural	42.9%	39.4%	17.7%

3.10.4 Estimation of Nursing and NTA Split

In order to run impact analyses that compare RUG-IV to PDPM, Acumen split the RUG-IV nursing base rate to derive estimated nursing and NTA base rates under PDPM. In this case, HCFA provided guidance which directly informs the appropriate split. The 1998 reopening of the comment period for the interim final rule (63 FR 65561) explains that NTA costs comprised 43.4 percent of the nursing base rate for urban facilities, with the remaining 56.6 percent attributable to nursing and social services costs. For rural facilities, these percentages are 42.7 and 57.3 percent respectively.

In addition to the CMS guidance, Acumen estimated NTA costs per day for urban and rural facilities using the same data and methodology that was used to estimate PT, OT, SLP, and total therapy costs per day. Using this methodology, Acumen estimated average NTA costs per day of $47.70 for urban facilities and $47.30 for rural facilities. These estimates account for 43.6% and 45.1% of the 1998 urban and rural nursing base rates, respectively. Given the similarity of the CMS and Acumen estimates, Acumen decided to attribute 43% of the nursing base rates to the estimated NTA base rates.

3.10.5 Estimated Base Rates for PDPM Components

Acumen used the splits derived as described above to estimate base rates for the five case-mix components of PDPM. Base rates were estimated for FY 2017 to match the year of data used in the analyses. To estimate the discipline specific therapy base rates, we multiplied the FY 2017 therapy case-mix base rates by the estimated shares of each discipline listed in

Table 62, for urban and rural facilities respectively.[45] To estimate NTA base rates, Acumen multiplied the FY 2017 nursing base rates by 43% and attributed the remaining 57% to the nursing base rates. Table 63 and Table 64 show the FY 2017 base rates and Acumen's estimated base rates for the six PDPM components (five case-mix and one non case-mix). As shown in the tables, the base rates for the non-case-mix component remain unchanged because this component would not be affected by PDPM.

Table 63: Actual RUG-IV FY 2017 Base Rates

Rate Type	Nursing Case-Mix	Therapy Case-Mix	Therapy Non-Case-Mix	Non-Case-Mix
Urban Per Diem Amount	$175.28	$132.03	$17.39	$89.46
Rural Per Diem Amount	$167.45	$152.24	$18.58	$91.11

Table 64: Estimated PDPM FY 2017 Base Rates

Rate Type	Nursing Case-Mix	NTA Case-Mix	PT Case-Mix	OT Case-Mix	SLP Case-Mix	Non-Case-Mix
Urban Per Diem Amount	$99.91	$75.37	$57.30	$53.34	$21.39	$89.46
Rural Per Diem Amount	$95.45	$72.00	$65.31	$59.98	$26.95	$91.11

3.11 Calculation of Case-Mix Indexes

This section describes the methodology for estimating CMIs for each of the recommended payment components. The following sub-sections describe the calculation of the unadjusted and adjusted CMIs. First, the unadjusted CMIs establish the relative proportionality of payments between groups for a given component. The next step was to adjust the CMIs to ensure both that PDPM system resources would be distributed across components in proportion to the statutory base rates and that PDPM would be budget neutral relative to RUG-IV. Budget neutrality was assumed in order to estimate the impacts of PDPM relative to RUG-IV. The adjusted CMIs are presented in Section 3.11.3.

3.11.1 Unadjusted CMI

As discussed in Section 3.9.2, the per diem payment for a resident in a given payment group depends on the product of three factors: the base rate for that component, the CMI for the payment group, and the variable per diem payment adjustment factor for components that use

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[45] The therapy non-case-mix component is not considered in these calculations and is dropped from PDPM. Given that all SNF residents under PDPM would be assigned to a classification group for each of the three recommended therapy-related case-mix adjusted components, it is not appropriate to include a separate payment component to cover therapy costs for residents who receive minimal therapy services, as these residents are accounted for in the development of the classifications and CMIs for the three PDPM therapy components.

variable per diem payment (PT, OT, and NTA). Because the base rate is the same for every resident group within a component, the relative average payment per day for a given group can be expressed in terms of the relative CMI and the relative average adjustment factor of the group.

At the same time, to accurately reflect relative resource use, the relative average PDPM payments for a group should match the relative average costs for that group. Based on these two expressions of relative PDPM payments, we can derive the following equation:

$$Unadjusted\ CMI = \frac{Relative\ Average\ Costs\ per\ Day}{Relative\ Average\ Adjustment\ Factor} = \frac{\dfrac{Avg.\ Costs\ per\ Day\ for\ Group}{Avg.\ Costs\ per\ Day\ for\ Full\ Population}}{\dfrac{Avg.\ Adjustment\ Factor\ for\ Group}{Avg.\ Adjustment\ Factor\ for\ Full\ Population}}$$

Acumen calculated the unadjusted CMI for each case-mix group using the above equation. Payments for the SLP and nursing components are constant throughout the stay, so the relative average adjustment factor for those components is 1 for all groups. Therefore, unadjusted CMIs for those two components are determined by relative average costs per day alone. However, for the PT, OT, and NTA components, payments vary depending on point in the stay, as discussed in Section 3.9. Because the length of stay distribution varies across resident groups within a given component, the average adjustment factor and consequently the relative average adjustment factor also varies by resident group. In order to standardize group CMI for differences in the length of stay distribution across case-mix groups, we divided relative average costs per day for a group by the relative average adjustment factor for that group, as shown in the above equation.

Finally, the two factors in the calculation of unadjusted CMIs (relative average costs per day and relative average adjustment factor) are weighted averages, where the weights are length of stay. This ensures that the share of total payments for a given group equals the share of total costs for that group.

3.11.2 Adjusted CMI

The unadjusted CMIs then need to be adjusted to ensure that all PDPM components have the same average case-mix adjustment and that total payment under PDPM is equal to the total payment under RUG-IV. As with other analyses used to build PDPM, FY 2017 data was used. That is, Acumen calculated adjusted CMIs such that total payments in FY 2017 if PDPM had been in place equal total actual RUG-IV payments in FY 2017.

First, to align the distribution of resources across components with the statutory base rates, Acumen set CMIs such that the average product of the CMI and the variable per diem adjustment factor for a day of care is the same (set to 1) for each of the five case-mix-adjusted

components in PDPM.[46] To do this, Acumen first calculated the product of the CMI and the adjustment factor for every utilization day for each component. Then, we calculated the average of this product for each component. Finally, Acumen calculated the ratio of 1 divided by the average product for each component. This ratio is the standardization multiplier, shown in Table 65 for each component. The unadjusted CMIs developed in the previous section were multiplied by the standardization multiplier to ensure that all PDPM components have the same average case-mix adjustment.

Next, it was necessary to further adjust the CMIs to ensure budget neutrality between PDPM and RUG-IV. The previous paragraph described how the average product of the CMI and the per diem adjustment factor was set to 1, which is an arbitrary value. The average CMIs for both the nursing and the therapy components under RUG-IV in recent years were much higher than 1, which indicates that a substantial adjustment to the PDPM CMIs would be required to ensure budget neutrality. The budget neutrality adjustment was implemented by multiplying the CMIs in all five components by a budget neutrality multiplier. This multiplier was developed by calculating the proportionality between total case-mix-related payments under RUG-IV and total case-mix-related payments under PDPM.

Acumen calculated total case-mix-related payments under PDPM using the estimated PDPM component base rates (see Section 3.10), the adjusted CMIs calculated as described in the second paragraph of this section, the variable per diem adjustment factors (see Section 3.9.4), the labor-related share, the geographic wage indexes, and the PDPM HIV/AIDS adjustment (see Section 3.8.2). For each utilization day and each component, the base rate was multiplied by the CMI corresponding to the beneficiary's group and, in the case of the PT, OT, and NTA components, by the appropriate variable per diem adjustment factor. In the case of residents with HIV/AIDS, the nursing component was multiplied by the HIV/AIDS adjustment. To implement the geographic adjustment, the labor-related share was multiplied by the appropriate geographic wage index for all components. The sum of the five case-mix-adjusted components was the PDPM case-mix-related payment for that utilization day. The sum of case-mix-related payment for all utilization days was the total PDPM case-mix-related payment for the population.

After calculating the total PDPM case-mix-related payment, we calculated total case-mix-related payment under RUG-IV. For each claim in the study population, RUG-IV payments were calculated by summing Medicare payment, beneficiary deductible amount, beneficiary coinsurance, primary payer claim paid amount, and beneficiary blood deductible liability.[47] The

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[46] Because the SLP and nursing components do not have variable per diem adjustment schedules, the variable per diem adjustment factor for each day of care is effectively 1 for these components.

[47] Payment from non-Medicare sources is included in this calculation because total case-mix-related payment represents the sum of total allowable Medicare payments. Therefore, in calculating budget neutrality, we must set

Medicare portion of payment was divided by 0.98 to add back the 2% reduction in Medicare payments under sequestration, which was in effect for FY 2017, the year of data used to develop PDPM. The portion of payments corresponding to the non-case-mix component had to be carved out for this calculation because the non-case-mix component is the same under both RUG-IV and PDPM. For each claim, the non-case-mix base rate, utilization days, labor share, and geographic wage indexes were used to calculate non-case-mix component payments. The non-case-mix payments for the claim were calculated by multiplying the number of utilization days by the non-case-mix base rate, then adjusting the labor share portion by the corresponding wage index. The result of this calculation was subtracted from the RUG-IV pre-sequestration payment to produce the RUG-IV case-mix-related payment for each claim. For the purpose of this calculation, RUG-IV case-mix-related payments include all payments associated with the 128% add-on for residents with HIV/AIDS, including the portion associated with the non-case-mix component. Because PDPM replaces this add-on with additional payments for residents with HIV/AIDS through the NTA and nursing components (as discussed in Section 3.8), all payments associated with the add-on under RUG-IV are re-allocated to the case-mix-adjusted components in PDPM. The sum of all RUG-IV case-mix-related payments for all claims was the total RUG-IV case-mix-related payment for the population.

Finally, the ratio of case-mix-related payments in RUG-IV over case-mix-related payments in PDPM (1.46), which is labeled "budget neutrality multiplier" in Table 65, was multiplied by the standardized CMIs from step one to arrive at the final adjusted CMIs. This method ensures equality of total case-mix-related payments under RUG-IV and PDPM. The multiplier is large because the average therapy and nursing CMIs under RUG-IV in recent years are substantially higher than 1.

Table 65: Multipliers Used to Derive Adjusted CMIs

Component	Standardization Multiplier	Budget Neutrality Multiplier
PT	1.03	1.46
OT	1.03	1.46
SLP	1.00	1.46
Nursing	1.00	1.46
NTA	0.82	1.46

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total case-mix-related payment under PDPM such that it equals total allowable Medicare payments under RUG-IV. This amount is equivalent to the sum of Medicare and non-Medicare payments for Medicare-covered days of service in the study population.

3.11.3 CMI per Component

Table 66, Table 67, Table 68, Table 69, and Table 70 show the adjusted CMIs for the PT, OT, SLP, nursing, and NTA components, respectively.[48]

Table 66: PT Component Case-Mix Indexes

Clinical Categories	PT and OT GG-based Function Score	# of Stays	% of Stays	Avg. PT Costs per Day	CMI
Major Joint Replacement or Spinal Surgery	0-5	8,437	0.5%	$69	1.53
Major Joint Replacement or Spinal Surgery	6-9	17,957	1.0%	$77	1.69
Major Joint Replacement or Spinal Surgery	10-23	132,397	7.1%	$91	1.88
Major Joint Replacement or Spinal Surgery	24	1,700	0.1%	$93	1.92
Other Orthopedic	0-5	27,833	1.5%	$62	1.42
Other Orthopedic	6-9	61,489	3.3%	$71	1.61
Other Orthopedic	10-23	186,578	10.0%	$76	1.67
Other Orthopedic	24	1,522	0.1%	$57	1.16
Medical Management	0-5	166,311	8.9%	$49	1.13
Medical Management	6-9	190,023	10.1%	$62	1.42
Medical Management	10-23	741,671	39.6%	$70	1.52
Medical Management	24	15,881	0.8%	$50	1.09
Non-Orthopedic Surgery and Acute Neurologic	0-5	49,679	2.7%	$55	1.27
Non-Orthopedic Surgery and Acute Neurologic	6-9	52,408	2.8%	$66	1.48
Non-Orthopedic Surgery and Acute Neurologic	10-23	214,916	11.5%	$72	1.55
Non-Orthopedic Surgery and Acute Neurologic	24	4,465	0.2%	$54	1.08

Table 67: OT Component Case-Mix Indexes

Clinical Categories	PT and OT GG-based Function Score	# of Stays	% of Stays	Avg. OT Costs per Day	CMI
Major Joint Replacement or Spinal Surgery	0-5	8,437	0.5%	$56	1.49
Major Joint Replacement or Spinal Surgery	6-9	17,957	1.0%	$62	1.63
Major Joint Replacement or Spinal Surgery	10-23	132,397	7.1%	$66	1.68
Major Joint Replacement or Spinal Surgery	24	1,700	0.1%	$62	1.53

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[48] For each component shown in Table 66, Table 67, Table 68, Table 69, and Table 70, the stay population is restricted to stays that can be classified into resident groups for that component. As a result, the total number of stays varies somewhat across each of the tables.

Clinical Categories	PT and OT GG-based Function Score	# of Stays	% of Stays	Avg. OT Costs per Day	CMI
Other Orthopedic	0-5	27,833	1.5%	$52	1.41
Other Orthopedic	6-9	61,489	3.3%	$60	1.59
Other Orthopedic	10-23	186,578	10.0%	$63	1.64
Other Orthopedic	24	1,522	0.1%	$47	1.15
Medical Management	0-5	166,311	8.9%	$43	1.17
Medical Management	6-9	190,023	10.1%	$54	1.44
Medical Management	10-23	741,671	39.6%	$60	1.54
Medical Management	24	15,881	0.8%	$42	1.11
Non-Orthopedic Surgery and Acute Neurologic	0-5	49,679	2.7%	$49	1.30
Non-Orthopedic Surgery and Acute Neurologic	6-9	52,408	2.8%	$57	1.49
Non-Orthopedic Surgery and Acute Neurologic	10-23	214,916	11.5%	$61	1.55
Non-Orthopedic Surgery and Acute Neurologic	24	4,465	0.2%	$46	1.09

Table 68: SLP Component Case-Mix Indexes

Presence of Acute Neurologic Condition, SLP-Related Comorbidity, or Cognitive Impairment	Mechanically Altered Diet or Swallowing Disorder	# of Stays	% of Stays	Avg. SLP Costs per Day	CMI
None	Neither	835,013	44.6%	$8	0.68
None	Either	116,407	6.2%	$24	1.82
None	Both	14,893	0.8%	$36	2.66
Any One	Neither	465,348	24.8%	$18	1.46
Any One	Either	208,539	11.1%	$31	2.33
Any One	Both	32,286	1.7%	$40	2.97
Any Two	Neither	93,117	5.0%	$26	2.04
Any Two	Either	56,884	3.0%	$37	2.85
Any Two	Both	10,371	0.6%	$46	3.51
All Three	Neither	18,713	1.0%	$38	2.98
All Three	Either	17,505	0.9%	$50	3.69
All Three	Both	4,191	0.2%	$57	4.19

Table 69: Nursing Component Case-Mix Indexes

Nursing RUG	Nursing GG-based Function Score	# of Stays	% of Stays	Nursing WWST	CMI
ES3	0-14	5,767	0.3%	420	4.04
ES2	0-14	10,738	0.6%	318	3.06
ES1	0-14	20,487	1.1%	303	2.91

Nursing RUG	Nursing GG-based Function Score	# of Stays	% of Stays	Nursing WWST	CMI
HDE2	0-5	6,723	0.4%	249	2.39
HDE1	0-5	71,884	3.8%	207	1.99
HBC2	6-14	11,417	0.6%	231	2.23
HBC1	6-14	169,690	9.1%	192	1.85
LDE2	0-5	7,444	0.4%	215	2.07
LDE1	0-5	109,411	5.8%	179	1.72
LBC2	6-14	8,713	0.5%	178	1.71
LBC1	6-14	184,464	9.8%	148	1.43
CDE2	0-5	7,549	0.4%	194	1.86
CDE1	0-5	114,067	6.1%	168	1.62
CBC2	6-14	17,852	1.0%	160	1.54
CA2	15-16	2,048	0.1%	113	1.08
CBC1	6-14	467,881	25.0%	138	1.34
CA1	15-16	48,634	2.6%	98	0.94
BAB2	11-16	1,004	0.1%	108	1.04
BAB1	11-16	56,861	3.0%	102	0.99
PDE2	0-5	2,054	0.1%	163	1.57
PDE1	0-5	88,198	4.7%	153	1.47
PBC2	6-14	5,621	0.3%	125	1.21
PA2	15-16	295	0.0%	73	0.70
PBC1	6-14	425,809	22.7%	115	1.13
PA1	15-16	28,656	1.5%	69	0.66

Table 70: NTA Component Case-Mix Indexes

Comorbidity Score	# of Stays	% of Stays	Avg. NTA Costs per Day	CMI
0	439,319	23.5%	$39	0.72
1-2	572,152	30.5%	$55	0.96
3-5	581,544	31.0%	$79	1.34
6-8	185,953	9.9%	$113	1.85
9-11	67,789	3.6%	$152	2.53
12+	26,510	1.4%	$196	3.25

3.12 Impact Analysis

Acumen conducted an impact analysis to study the effect PDPM would have on various resident and provider subpopulations. This analysis compared actual FY 2017 payments for a

given subpopulation under RUG-IV to what FY 2017 total payments would have been for that subpopulation had PDPM been in place.

For each claim associated with a subpopulation, actual payment under RUG-IV was calculated by summing Medicare payment, beneficiary deductible amount, beneficiary coinsurance, primary payer claim paid amount, and beneficiary blood deductible liability. We summed across all claims associated with a subpopulation to calculate the total actual payment under RUG-IV.

To calculate total estimated payment under PDPM, we summed total estimated case-mix-related payment and total non-case-mix payment for all utilization days associated with a subpopulation. To calculate estimated case-mix-related payment for each component for each utilization day under PDPM, we multiplied the component base rate and the CMI corresponding to the resident's case-mix group for each utilization day. For the PT, OT, and NTA components, we additionally multiplied this product by the appropriate variable per diem adjustment factor for each utilization day. In the case of residents with HIV/AIDS, the nursing component was multiplied by the HIV/AIDS adjustment. We then summed the estimated case-mix-related payments for the five case-mix components (PT, OT, SLP, nursing, and NTA) with the non-case-mix base rate for each utilization day. To implement the geographic adjustment, the labor-related share was multiplied by the appropriate geographic wage index for all components. The sum of wage-adjusted case-mix-related and non-case-mix payments for all utilization days for a given subpopulation is the total estimated PDPM payment for the subpopulation.

Both RUG-IV and PDPM payments were calculated including the 2% reduction in Medicare payments under budget sequestration, which was in effect in FY 2017. Additionally, the impact analysis uses a different resident population than the study population used to develop PDPM to ensure it is as inclusive as possible. For example, restrictions necessary to calculate costs for a stay were lifted because costs are not considered in the impact analysis. However, the impact analysis was restricted to stays that can be classified into a resident group for all payment components.

Residents were stratified into various subpopulations based on demographic, enrollment, and service use characteristics. Demographic information used to stratify residents included sex, age, and race/ethnicity. Enrollment information included original reason for Medicare enrollment. Service use characteristics included length of SNF stay, length of prior inpatient stay, and various therapy utilization measures (i.e., number of therapy disciplines received, combination of therapy disciplines received, therapy level). Additionally, Acumen examined the impact of recommended payments on potentially vulnerable subpopulations, including residents with the following traits: dual enrollment in Medicare and Medicaid, high NTA costs, use of extensive services, cognitive impairment, diabetes, wound infection, and use of IV medication.

Residents with high NTA costs were incorporated into the impact analysis because NTA costs are currently reimbursed through the nursing component. Because nursing payments do not correlate with NTA costs, as discussed in Section 3.3.2, RUG-IV may not adequately reimburse costs associated with this population. Use of extensive services was incorporated into the analysis because most residents are classified into rehabilitation RUGs in RUG-IV. As a result, nursing payments do not reflect various combinations of extensive services for most residents, and therefore current payment may not appropriately pay for this population. In response to ANPRM comments, we also added the following potentially vulnerable subpopulations to the impact analysis: residents with addictions, bleeding disorders, behavioral issues, chronic neurological conditions, and bariatric care.

Providers were also stratified into various subpopulations based on ownership, size, urban/rural designation, facility type, geographic location, and types of stays/days. Ownership stratifications included for-profit, non-profit, and government. Facility size was defined by number of beds. Facility type stratifications included freestanding and hospital-based/swing bed. Geographic stratifications included census division and region. Types of stays/days included: stays with exactly 100 utilization days, days billed to ultra-high rehabilitation RUGs, days billed to non-rehabilitation RUGs, and stays for residents who are dually enrolled in Medicare and Medicaid.

Table 71 and Table 72 compare actual payments under RUG-IV to estimated payments under PDPM. The first column, labeled "% Total Payment Under RUG-IV," shows the actual percentage of total payment associated with a given subpopulation under RUG-IV. The second column, labeled "% Total Payment Under PDPM," shows the estimated percentage of total payment associated with a given subpopulation under PDPM. The third column, labeled "Difference," shows the percentage point difference between the estimated percentage of total payment associated with a given subpopulation under PDPM and the actual percentage of total payment associated with that subpopulation under RUG-IV. The last column shows the estimated percentage change in total payments for a given subpopulation from RUG-IV to PDPM.

As shown in Table 71 and Table 72, the impact analysis found that PDPM would have distributional effects on payments for providers based on the resident and provider subpopulations examined. The most notable impact of PDPM would be to shift payments associated with residents receiving very high amounts of therapy under RUG-IV, which strongly incentivizes the provision of therapy, to residents with complex clinical needs. This can be seen in the estimated reduction of payments associated with residents who receive the highest level of therapy (residents in RUGs beginning with RU) and an estimated increase in payments associated with residents who receive extensive services or have high NTA costs. Additionally,

we estimate that PDPM would result in higher payments associated with the following resident types: residents who are dually enrolled in Medicare and Medicaid, use IV medication, have ESRD, diabetes, or a wound infection, receive amputation/prosthesis care, and have longer prior inpatient stays. Table 71 also shows that PDPM increases the proportion of total payment associated with each of the potentially vulnerable subpopulations added to the analysis based on ANPRM comments: residents with addictions, bleeding disorders, behavioral issues, chronic neurological conditions, and bariatric care.

Similar to the resident subpopulation analysis, the facility-level analysis shows that the most notable shift in Medicare payments under PDPM would be from facilities with a high proportion of rehabilitation residents to facilities with a high proportion of non-rehabilitation residents. This can be seen in the estimated reduction of payments to facilities with a high percentage of utilization days billed as RU and an estimated increase in payments to facilities with a high percentage of utilization days billed as non-rehabilitation. Additionally, we estimate that various provider subpopulations would also receive higher payments, including non-profits, government-owned facilities, hospital-based facilities, swing bed providers, and small facilities.

Table 71: Impact Analysis by Resident Subpopulations

Resident Characteristics	Stays		% Total Payment Under RUG-IV	% Total Payment Under PDPM	Difference	% Change in Total Payment
	#	%				
All Stays	1,873,267	100.0%	100.0%	100.0%	0.0%	0.0%
Sex						
Female	1,129,254	60.3%	60.9%	60.4%	-0.5%	-0.8%
Male	744,013	39.7%	39.1%	39.6%	0.5%	1.2%
Age						
Below 65 years	193,268	10.3%	10.1%	10.8%	0.7%	7.2%
65-74 years	451,048	24.1%	23.0%	23.7%	0.7%	3.1%
75-84 years	608,499	32.5%	32.0%	31.9%	-0.1%	-0.4%
85-89 years	329,055	17.6%	18.3%	17.7%	-0.6%	-3.1%
Over 90 years	291,397	15.6%	16.6%	15.9%	-0.7%	-4.3%
Race/Ethnicity						
White	1,569,426	83.8%	82.0%	81.9%	-0.2%	-0.2%
Black	210,542	11.2%	12.1%	12.2%	0.1%	0.8%
Hispanic	30,981	1.7%	2.0%	2.0%	0.0%	0.9%
Asian	24,625	1.3%	1.7%	1.7%	0.0%	-0.6%
Native American	9,288	0.5%	0.5%	0.5%	0.0%	7.1%
Other or Unknown	28,405	1.5%	1.7%	1.7%	0.0%	0.8%
Medicare/Medicaid Dual Status						
Dually Enrolled	649,104	34.7%	38.7%	40.0%	1.3%	3.3%
Not Dually Enrolled	1,224,163	65.3%	61.3%	60.0%	-1.3%	-2.1%

Resident Characteristics	Stays		% Total Payment Under RUG-IV	% Total Payment Under PDPM	Difference	% Change in Total Payment
	#	%				
Original Reason for Medicare Enrollment						
Aged	1,397,395	74.6%	74.8%	73.5%	-1.3%	-1.7%
Disabled	458,473	24.5%	24.4%	25.6%	1.2%	4.8%
ESRD	17,399	0.9%	0.8%	0.9%	0.1%	10.5%
Utilization Days						
1-15 days	662,549	35.4%	11.2%	12.8%	1.5%	13.7%
16-30 days	632,244	33.8%	28.0%	28.0%	0.0%	0.0%
31+ days	578,474	30.9%	60.8%	59.2%	-1.5%	-2.5%
Utilization Days = 100						
No	1,842,517	98.4%	94.0%	94.1%	0.1%	0.1%
Yes	30,750	1.6%	6.0%	5.9%	-0.1%	-1.9%
Length of Prior Inpatient Stay						
0-2 days	40,420	2.2%	1.9%	1.9%	0.0%	1.3%
3 days	421,425	22.5%	21.4%	20.7%	-0.7%	-3.3%
4-30 days	1,379,386	73.6%	74.5%	75.0%	0.5%	0.7%
31+ days	32,036	1.7%	2.2%	2.3%	0.1%	6.7%
Most Common Therapy Level						
RU	1,093,717	58.4%	71.2%	65.2%	-6.0%	-8.4%
RV	419,824	22.4%	19.0%	21.2%	2.2%	11.4%
RH	126,865	6.8%	4.3%	5.5%	1.2%	27.4%
RM	61,555	3.3%	1.6%	2.2%	0.7%	41.1%
RL	1,267	0.1%	0.0%	0.0%	0.0%	67.5%
Non-Rehab	170,039	9.1%	3.9%	5.9%	2.0%	50.5%
Number of Therapy Disciplines Used						
0	42,584	2.3%	0.6%	1.0%	0.4%	63.1%
1	44,794	2.4%	1.1%	1.6%	0.5%	44.2%
2	966,478	51.6%	46.3%	47.1%	0.7%	1.6%
3	819,411	43.7%	52.0%	50.3%	-1.6%	-3.1%
Physical Therapy Utilization						
No	70,058	3.7%	1.4%	2.1%	0.7%	50.9%
Yes	1,803,209	96.3%	98.6%	97.9%	-0.7%	-0.7%
Occupational Therapy Utilization						
No	83,973	4.5%	1.7%	2.6%	0.8%	47.7%
Yes	1,789,294	95.5%	98.3%	97.4%	-0.8%	-0.8%
Speech Language Pathology Utilization						
No	1,029,787	55.0%	47.2%	48.6%	1.3%	2.8%
Yes	843,480	45.0%	52.8%	51.4%	-1.3%	-2.5%
Therapy Utilization						

Resident Characteristics	Stays		% Total Payment Under RUG-IV	% Total Payment Under PDPM	Difference	% Change in Total Payment
	#	%				
PT+OT+SLP	819,411	43.7%	52.0%	50.3%	-1.6%	-3.1%
PT+OT Only	951,267	50.8%	45.8%	46.4%	0.6%	1.3%
PT+SLP Only	8,166	0.4%	0.3%	0.4%	0.1%	27.3%
OT+SLP Only	7,045	0.4%	0.3%	0.4%	0.1%	30.1%
PT Only	24,365	1.3%	0.6%	0.8%	0.2%	41.3%
OT Only	11,571	0.6%	0.3%	0.4%	0.1%	47.9%
SLP Only	8,858	0.5%	0.3%	0.4%	0.1%	46.8%
Non-Therapy	42,584	2.3%	0.6%	1.0%	0.4%	63.1%
NTA Costs ($)						
0-10	256,169	13.7%	13.7%	13.3%	-0.5%	-3.5%
10-50	832,946	44.5%	52.1%	50.4%	-1.7%	-3.2%
50-150	604,023	32.2%	29.3%	30.5%	1.2%	4.2%
150+	180,129	9.6%	4.9%	5.8%	0.9%	18.7%
NTA Comorbidity Score						
0	439,319	23.5%	24.4%	21.8%	-2.5%	-10.4%
1-2	572,152	30.5%	30.8%	29.4%	-1.5%	-4.7%
3-5	581,544	31.0%	29.9%	31.1%	1.2%	4.0%
6-8	185,953	9.9%	9.4%	10.8%	1.4%	15.0%
9-11	67,789	3.6%	3.8%	4.7%	0.9%	24.4%
12+	26,510	1.4%	1.7%	2.2%	0.5%	27.2%
Extensive Services Level						
Tracheostomy and Ventilator/Respirator	5,767	0.3%	0.6%	0.7%	0.1%	22.2%
Tracheostomy or Ventilator/Respirator	10,738	0.6%	0.9%	0.9%	0.1%	7.3%
Infection Isolation	20,487	1.1%	1.4%	1.5%	0.1%	9.1%
Neither	1,836,275	98.0%	97.2%	96.9%	-0.3%	-0.3%
CFS Level						
Cognitively Intact	1,096,535	58.5%	55.7%	55.5%	-0.2%	-0.3%
Mildly Impaired	387,927	20.7%	22.0%	21.9%	0.0%	-0.2%
Moderately Impaired	315,469	16.8%	18.7%	18.5%	-0.1%	-0.7%
Severely Impaired	73,336	3.9%	3.7%	4.0%	0.3%	8.8%
Clinical Category						
Acute Infections	122,259	6.5%	6.4%	6.6%	0.2%	3.4%
Acute Neurologic	119,511	6.4%	7.7%	7.4%	-0.3%	-3.7%
Cancer	85,854	4.6%	4.6%	4.4%	-0.1%	-3.2%
Cardiovascular and Coagulations	183,222	9.8%	8.7%	8.7%	0.0%	0.5%
Medical Management	570,343	30.4%	30.3%	30.3%	0.0%	0.0%
Non-Orthopedic Surgery	201,957	10.8%	10.0%	10.6%	0.6%	5.7%
Non-Surgical Orthopedic/Musculoskeletal	110,217	5.9%	6.8%	6.4%	-0.4%	-6.1%

Resident Characteristics	Stays		% Total Payment Under RUG-IV	% Total Payment Under PDPM	Difference	% Change in Total Payment
	#	%				
Major Joint Replacement or Spinal Surgery	160,491	8.6%	6.8%	6.7%	-0.1%	-2.1%
Orthopedic Surgery (Except Major Joint Replacement or Spinal Surgery)	167,205	8.9%	11.1%	10.8%	-0.3%	-2.4%
Pulmonary	152,208	8.1%	7.7%	8.1%	0.4%	5.4%
Level of Complications in MS-DRG of Prior Inpatient Stay						
No Complication	670,331	35.8%	35.9%	34.8%	-1.1%	-3.1%
CC/MCC	1,202,936	64.2%	64.1%	65.2%	1.1%	1.7%
Stroke						
No	1,702,192	90.9%	89.2%	89.1%	0.0%	0.0%
Yes	171,075	9.1%	10.8%	10.9%	0.0%	0.3%
HIV/AIDS						
No	1,867,770	99.7%	99.3%	99.6%	0.3%	0.3%
Yes	5,497	0.3%	0.7%	0.4%	-0.3%	-40.5%
IV Medication						
No	1,717,721	91.7%	91.8%	89.9%	-1.9%	-2.1%
Yes	155,546	8.3%	8.2%	10.2%	1.9%	23.5%
Diabetes						
No	1,199,005	64.0%	63.9%	61.9%	-1.9%	-3.0%
Yes	674,262	36.0%	36.1%	38.1%	1.9%	5.4%
Wound Infection						
No	1,852,449	98.9%	98.9%	98.6%	-0.3%	-0.3%
Yes	20,818	1.1%	1.1%	1.4%	0.3%	22.2%
Amputation/Prosthesis Care						
No	1,872,769	100.0%	100.0%	100.0%	0.0%	0.0%
Yes	498	0.0%	0.0%	0.0%	0.0%	6.4%
Presence of Dementia						
No	1,328,201	70.9%	68.2%	68.6%	0.4%	0.5%
Yes	545,066	29.1%	31.8%	31.4%	-0.4%	-1.2%
MDS Alzheimer's						
No	1,784,056	95.2%	94.8%	94.8%	0.0%	0.0%
Yes	89,168	4.8%	5.2%	5.2%	0.0%	-0.3%
Unknown	43	0.0%	0.0%	0.0%	0.0%	5.0%
Presence of Addictions						
No	1,771,965	94.6%	94.8%	94.7%	-0.1%	-0.1%
Yes	101,302	5.4%	5.2%	5.3%	0.1%	1.8%
Presence of Bleeding Disorders						
No	1,703,732	90.9%	91.4%	91.2%	-0.1%	-0.1%
Yes	169,535	9.1%	8.6%	8.8%	0.1%	1.5%
Presence of Behavioral Issues						

Resident Characteristics	Stays		% Total Payment Under RUG-IV	% Total Payment Under PDPM	Difference	% Change in Total Payment
	#	%				
No	994,162	53.1%	52.8%	52.3%	-0.5%	-0.9%
Yes	879,105	46.9%	47.2%	47.7%	0.5%	1.0%
Presence of Chronic Neurological Conditions						
No	1,394,142	74.4%	72.5%	72.3%	-0.2%	-0.2%
Yes	479,125	25.6%	27.5%	27.7%	0.2%	0.6%
Presence of Bariatric Care						
No	1,709,590	91.3%	91.3%	90.8%	-0.6%	-0.6%
Yes	163,677	8.7%	8.7%	9.3%	0.6%	6.5%

Table 72: Impact Analysis by Provider Subpopulations

Provider Characteristics	Providers		Stays in Providers		% Total Payment Under RUG-IV	% Total Payment Under PDPM	Difference	% Change in Total Payment
	#	%	#	%				
All Stays	14,270	100.0%	1,873,267	100.0%	100.0%	100.0%	0.0%	0.0%
Ownership								
For profit	10,271	72.0%	1,378,696	73.6%	77.0%	76.5%	-0.5%	-0.7%
Non-profit	3,228	22.6%	424,493	22.7%	19.4%	19.8%	0.4%	1.9%
Government	771	5.4%	70,078	3.7%	3.6%	3.7%	0.1%	4.2%
Number of Beds								
0-49	1,434	10.0%	115,564	6.2%	4.8%	5.0%	0.2%	3.5%
50-99	5,453	38.2%	522,136	27.9%	27.7%	27.9%	0.2%	0.6%
100-149	4,957	34.7%	737,841	39.4%	39.0%	38.9%	-0.1%	-0.2%
150-199	1,582	11.1%	302,950	16.2%	16.4%	16.4%	0.0%	-0.3%
200+	844	5.9%	194,776	10.4%	12.1%	11.9%	-0.2%	-1.8%
Location								
Urban	10,380	72.7%	1,564,339	83.5%	84.5%	83.9%	-0.6%	-0.7%
Rural	3,890	27.3%	308,928	16.5%	15.5%	16.1%	0.6%	3.8%
Facility Type								
Freestanding	13,729	96.2%	1,810,145	96.6%	98.1%	97.8%	-0.3%	-0.3%
Hospital-Based/Swing Bed	541	3.8%	63,122	3.4%	1.9%	2.3%	0.3%	16.7%
Location by Facility Type								
Urban | Freestanding	10,070	70.6%	1,516,950	81.0%	83.0%	82.2%	-0.8%	-1.0%
Urban | Hospital-Based/Swing Bed	310	2.2%	47,389	2.5%	1.5%	1.7%	0.2%	15.3%
Rural | Freestanding	3,659	25.6%	293,195	15.7%	15.1%	15.5%	0.5%	3.2%
Rural | Hospital-Based/Swing Bed	231	1.6%	15,733	0.8%	0.5%	0.6%	0.1%	21.1%
Census Division								
New England	847	5.9%	131,206	7.0%	6.2%	6.4%	0.1%	2.0%
Middle Atlantic	1,536	10.8%	270,738	14.5%	16.1%	15.7%	-0.4%	-2.6%

Provider Characteristics	Providers		Stays in Providers		% Total Payment Under RUG-IV	% Total Payment Under PDPM	Difference	% Change in Total Payment
	#	%	#	%				
East North Central	2,942	20.6%	354,025	18.9%	18.0%	18.1%	0.1%	0.7%
West North Central	1,782	12.5%	124,078	6.6%	5.3%	5.6%	0.4%	6.7%
South Atlantic	2,242	15.7%	398,672	21.3%	20.0%	20.0%	-0.1%	-0.4%
East South Central	942	6.6%	127,472	6.8%	6.2%	6.3%	0.1%	1.0%
West South Central	1,867	13.1%	177,206	9.5%	9.7%	9.6%	-0.1%	-1.0%
Mountain	673	4.7%	82,467	4.4%	4.0%	4.1%	0.0%	1.1%
Pacific	1,439	10.1%	207,403	11.1%	14.3%	14.2%	-0.1%	-0.8%
Location by Region								
Urban | New England	729	5.1%	117,370	6.3%	5.5%	5.6%	0.1%	1.8%
Urban | Middle Atlantic	1,352	9.5%	252,573	13.5%	15.3%	14.8%	-0.4%	-2.9%
Urban | East North Central	2,062	14.4%	281,210	15.0%	14.4%	14.3%	0.0%	-0.1%
Urban | West North Central	850	6.0%	81,289	4.3%	3.4%	3.6%	0.2%	4.6%
Urban | South Atlantic	1,796	12.6%	349,200	18.6%	17.7%	17.5%	-0.2%	-1.1%
Urban | East South Central	514	3.6%	80,133	4.3%	3.8%	3.8%	0.0%	0.3%
Urban | West South Central	1,241	8.7%	135,164	7.2%	7.4%	7.3%	-0.1%	-1.2%
Urban | Mountain	487	3.4%	69,661	3.7%	3.4%	3.4%	0.0%	0.1%
Urban | Pacific	1,349	9.5%	197,739	10.6%	13.6%	13.5%	-0.1%	-0.9%
Rural | New England	118	0.8%	13,836	0.7%	0.7%	0.7%	0.0%	4.0%
Rural | Middle Atlantic	184	1.3%	18,165	1.0%	0.9%	0.9%	0.0%	2.7%
Rural | East North Central	880	6.2%	72,815	3.9%	3.7%	3.8%	0.1%	3.6%
Rural | West North Central	932	6.5%	42,789	2.3%	1.8%	2.0%	0.2%	10.5%
Rural | South Atlantic	446	3.1%	49,472	2.6%	2.4%	2.5%	0.1%	4.2%
Rural | East South Central	428	3.0%	47,339	2.5%	2.5%	2.5%	0.1%	2.1%
Rural | West South Central	626	4.4%	42,042	2.2%	2.3%	2.3%	0.0%	-0.1%
Rural | Mountain	186	1.3%	12,806	0.7%	0.7%	0.7%	0.0%	6.2%
Rural | Pacific	90	0.6%	9,664	0.5%	0.6%	0.6%	0.0%	2.2%
% Stays with Maximum Utilization Days = 100								
0-10%	13,475	94.4%	1,819,624	97.1%	95.2%	95.4%	0.1%	0.1%
10-25%	733	5.1%	51,212	2.7%	4.5%	4.4%	-0.1%	-2.8%
25-100%	62	0.4%	2,431	0.1%	0.3%	0.3%	0.0%	-3.6%
% Medicare/Medicaid Dual Enrollment								
0-10%	1,232	8.6%	221,593	11.8%	9.8%	9.7%	-0.1%	-1.3%
10-25%	2,502	17.5%	511,839	27.3%	24.7%	24.4%	-0.3%	-1.3%
25-50%	5,142	36.0%	694,630	37.1%	37.2%	37.3%	0.1%	0.3%
50-75%	3,778	26.5%	336,580	18.0%	20.3%	20.5%	0.3%	1.3%
75-90%	1,173	8.2%	84,968	4.5%	6.1%	6.2%	0.0%	0.4%
90-100%	443	3.1%	23,657	1.3%	1.9%	1.9%	0.0%	1.6%
% Utilization Days Billed as RU								

Provider Characteristics	Providers		Stays in Providers		% Total Payment Under RUG-IV	% Total Payment Under PDPM	Difference	% Change in Total Payment
	#	%	#	%				
0-10%	1,264	8.9%	59,690	3.2%	2.1%	2.7%	0.6%	27.6%
10-25%	1,139	8.0%	81,442	4.3%	3.5%	4.1%	0.5%	15.5%
25-50%	3,432	24.1%	350,280	18.7%	16.9%	18.1%	1.2%	7.0%
50-75%	5,600	39.2%	838,887	44.8%	44.8%	44.7%	-0.2%	-0.4%
75-90%	2,461	17.2%	465,156	24.8%	27.7%	26.1%	-1.7%	-6.0%
90-100%	374	2.6%	77,812	4.2%	4.9%	4.4%	-0.5%	-9.8%
% Utilization Days Billed as Non-Rehab								
0-10%	11,384	79.8%	1,600,937	85.5%	86.9%	85.6%	-1.3%	-1.5%
10-25%	2,365	16.6%	246,176	13.1%	12.0%	13.0%	1.0%	8.6%
25-50%	383	2.7%	23,279	1.2%	1.0%	1.3%	0.2%	23.1%
50-75%	63	0.4%	2,144	0.1%	0.1%	0.1%	0.0%	35.8%
75-90%	22	0.2%	515	0.0%	0.0%	0.0%	0.0%	41.8%
90-100%	53	0.4%	216	0.0%	0.0%	0.0%	0.0%	33.6%

REFERENCES

Acumen, LLC. "SNF Therapy Payment Models Base Year Final Summary Report." *Acumen, LLC*. *Burlingame, CA* (2014). https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/Downloads/Summary_Report_20140501.pdf.

———. "SNF Therapy Payment Models Technical Expert Panel Summary." *Acumen, LLC*. *Burlingame, CA* (2015). https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/Downloads/SNF-payment-models-TEP-Summary-November-2015.pdf.

———. 2016a. "Skilled Nursing Facility Payment Models Nursing Component Technical Expert Panel Summary." *Acumen, LLC*. *Burlingame, CA* (2016). https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/Downloads/SNF_Nursing_TEP_Summary_20160322_508_compliant.pdf.

———. 2016b. "Skilled Nursing Facility Payment Models Technical Expert Panel Summary Report." *Acumen, LLC*. *Burlingame, CA* (2016). https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/Downloads/SNF_Third_TEP_Summary_Report_20160809.pdf.

———. 2016c. "Skilled Nursing Facility Payment Models Technical Expert Panel Summary Report." *Acumen, LLC*. *Burlingame, CA* (2016). https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/Downloads/SNF_Payment_Models_TEP_Summary_Report_201610.pdf.

ADL Data Systems, Inc. "Case Mix Information 2012." Hawthorne, NY: 2014. https://www.adldata.com/wp-content/uploads/2015/06/Case_Mix_Information_2012.pdf.

American Thoracic Society. "Functional Status." *American Thoracic Society Quality of Life Resource* (2007). http://qol.thoracic.org/sections/key-concepts/functional-status.html.

Angelelli, Joseph J., Kathleen H. Wilber, and Robert Myrtle. "A Comparison of Skilled Nursing Facility Rehabilitation Treatment and Outcomes Under Medicare Managed Care and Medicare Fee-for-Service Reimbursement." *The Gerontologist* 40 (2000): 646-653. https://gerontologist.oxfordjournals.org/content/40/6/646.full.pdf.

Arling, Greg, and Barry Daneman. "Nursing Home Case-Mix Reimbursement in Mississippi and South Dakota." *Health Services Research* 37 (2002): 377-395. https://www.ncbi.nlm.nih.gov/pmc/articles/OMC1430373.

Blum, Jonathan. "Post-Acute Care in the Medicare Program," testimony, June 14, 2013, before the U.S. House Committee on Ways and Means, Subcommittee on Health.

https://waysandmeans.house.gov/UploadedFiles/Blum_Testimony_Final_06-14-2013.pdf.

Breiman, Leo, Jerome Friedman, Charles J. Stone, and R.A. Olshen. *Classification and Regression Trees.* Monterey, CA: Wadsworth & Brooks/Cole Advanced Books & Software, 1984.

Briesacher, Becky A., Terry S. Field., Joann Baril, and Jerry H. Gurwitz. "Can pay-for-performance take nursing home care to the next level?" *Journal of American Geriatric Society*, 56 (2008): 1937-1939. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3089058.

———. "Pay-for-Performance in Nursing Homes." *Health Care Financing Review*, 30 (2009): 1-13. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2758526.

Buika, Kyle J., and Meghan Skira. "Nursing Home Clinical Quality and State Medicaid Pay-for-Performance Programs." In *Essays in Applied Microeconomics.* PhD diss., Boston College and University of Georgia, 2013.

Bureau of Labor Statistics, U.S. Department of Labor. "May 2016 National Industry-Specific Occupational Employment and Wage Estimates: NAICS 623100 – Nursing Care Facilities (Skilled Nursing Facilities)." *Occupational Employment Statistics*. Last modified March 31, 2017. https://www.bls.gov/oes/2016/may/naics4_623100.htm.

Carpenter-Mason, Beverly. "Implications for Home Health and Hospice Care under the New Prospective Payment System." *Home Health Care Management & Practice*, 10 (1998): 19-24. https://doi.org/10.1177/108482239801000607.

Carter, Carol, Bowen Garrett, and Doug Wissoker. "Reforming Medicare Payments to Skilled Nursing Facilities to Cut Incentives for Unneeded Care and Avoiding High-Cost Patients." *Health Affairs*, 31 (2012), 1303-1313. http://content.healthaffairs.org/content/31/6/1303.long.

———. "The Need to Reform Medicare's Payments to Skilled Nursing Facilities is as Strong as Ever." Urban Institute, Medicare Payment Advisory Commission (2015). http://www.urban.org/sites/default/files/publication/39036/2000072-The-Need-to-Reform-Medicare-Payments-to-SNF.pdf.

Carter, Grace M., Melinda B. Buntin, Orla Hayden, Jennifer Kawata, Susan M. Paddock, Daniel A. Relles, Gregory K. Ridgeway, et al. "Analyses for the Initial Implementation of the Inpatient Rehabilitation Facility Prospective Payment System." *RAND Health* (2002). https://www.rand.org/content/dam/rand/pubs/monograph_reports/ MR1500/MR1500.pdf.

Centers for Medicare & Medicaid Services (CMS), Department of Health and Human Services (HHS). *The Inpatient Rehabilitation Facility-Patient Assessment Instrument (IRF-PAI)*

Training Manual. https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/InpatientRehabFacPPS/IRFPAI.html.

———. *The Provider Reimbursement Manual – Part 1*. https://www.cms.gov/regulations-and-guidance/guidance/manuals/paper-based-manuals-items/cms021929.html.

———. *The Provider Reimbursement Manual – Part 2*. https://www.cms.gov/regulations-and-guidance/guidance/manuals/paper-based-manuals-items/cms021935.html.

———. 2005a. "CMS Quality Improvement Roadmap." https://www.cms.gov/Medicare/Coverage/CouncilonTechInnov/downloads/qualityroadmap.pdf

———. 2005b. "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities for FY 2006." *Federal Register* 70 no. 96 (May 19, 2005): 29070-29162. https://www.gpo.gov/fdsys/pkg/FR-2005-05-19/pdf/05-9934.pdf.

———. 2005c. "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities for FY 2006." *Federal Register* 70 no. 149 (August 4, 2005): 45026-45127.

———. "Report to Congress: Patient Classification under Medicare's Prospective Payment System for Skilled Nursing Facilities." Baltimore: 2006. https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/downloads/RC_2006_PC-PPSSNF.pdf.

———. 2007a. "Competitive Acquisition for Certain Durable Medical Equipment, Prosthetics, Orthotics, and Supplies (DMEPOS) and Other Issues." *Federal Register* 72 no. 68 (April 10, 2007): 17992-18090. https://www.gpo.gov/fdsys/pkg/FR-2007-04-10/pdf/07-1701.pdf

———. 2007b. "Medicare Program; Proposed Changes to the Hospital Inpatient Prospective Payment Systems and Fiscal Year 2008 Rates." *Federal Register* 72 no. 85 (May 3, 2007): 24680-25135. https://www.gpo.gov/fdsys/pkg/FR-2007-05-03/pdf/07-1920.pdf

———. 2007c. "Medicare Program; Changes to the Hospital Inpatient Prospective Payment Systems and Fiscal Year 2008 Rates." *Federal Register* 72 no. 162 (August 22, 2007): 47129-48175. https://www.gpo.gov/fdsys/pkg/FR-2007-08-22/pdf/FR-2007-08-22.pdf.

———. 2009a. "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities for FY 2010; Minimum Data Set, Version 3.0 for Skilled Nursing Facilities and Medicaid Nursing Facilities." *Federal Register* 74 no. 90 (May 12, 2009): 22208-22316. https://www.gpo.gov/fdsys/pkg/FR-2009-05-12/pdf/E9-10461.pdf

———. 2009b. "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities for FY 2010; Minimum Data Set, Version 3.0 for Skilled Nursing Facilities and Medicaid Nursing Facilities." *Federal Register* 74 no. 153 (August 11, 2009): 40288-40395. https://www.gpo.gov/fdsys/pkg/FR-2009-08-11/pdf/E9-18662.pdf

———. 2010a. "Medicare & Medicaid Statistical Supplement." *CMS.gov*. https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MedicareMedicaidStatSupp/index.html.

———. 2010b. "Medicare and Medicaid Programs; Electronic Health Record Incentive Program." *Federal Register* 75 no. 144 (July 28, 2010): 44313-44588. https://www.gpo.gov/fdsys/pkg/FR-2010-07-28/pdf/2010-17207.pdf

———. 2011a. "Report to Congress: Plan to Implement a Medicare Home Health Agency Value-Based Purchasing Program." Baltimore: 2011. http://www.cms.gov/medicare/medicare-fee-for-service-payment/homehealthpps/downloads/stage-2-nprm.pdf.

———. 2011b. "Report to Congress: Plan to Implement a Medicare Skilled Nursing Facility Value-Based Purchasing Program." Baltimore: 2011. http://www.cms.gov/medicare/medicare-fee-for-service-payment/snfpps/downloads/snf-vbp-rtc.pdf.

———. 2011c. "Update to Hospice Payment Rates, Hospice Cap, Hospice Wage Index and the Hospice Pricer for FY 2012." *MLN Matters*, MM7518 (2011). http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNMattersArticles/downloads/MM7518.pdf.

———. 2011d. "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities for FY 2012." *Federal Register* 76 no. 152 (August 8, 2011): 48485-48562. https://www.gpo.gov/fdsys/pkg/FR-2011-08-08/pdf/2011-19544.pdf.

———. 2012a. "Historical Questions & Answers on SNF Consolidated Billing." http://www.cms.gov/medicare/medicare-fee-for-service-payment/snfpps/downloads/historyqa.pdf.

———. 2012b. "How do I file a claim?" http://www.medicare.gov/claims-and-appeals/file-a-claim/file-a-claim.html.

———. 2012c. "Report to Congress: Fraud Prevention System First Implementation Year." Baltimore: 2012. http://www.stopmedicarefraud.gov/fraud-rtc12142012.pdf.

———. 2012d. *Long-Term Care Facility Resident Assessment Instrument User's Manual*.

———. 2012e. "Medicare Program; Hospital Inpatient Prospective Payment Systems for Acute Care Hospitals and the Long-Term Care Hospital Prospective Payment System and Fiscal Year 2013 Rates ; Hospitals' Resident Caps for Graduate Medical Education Payment Purposes; Quality Reporting Requirements for Specific Providers and for Ambulatory Surgical Centers." *Federal Register* 77 no. 92 (May 11, 2012): 27869-28192. https://www.gpo.gov/fdsys/pkg/FR-2012-05-11/pdf/2012-9985.pdf.

———. 2012f. "Hospital Outpatient Prospective and Ambulatory Surgical Center Payment Systems and Quality Reporting Programs; Electronic Reporting Pilot; Inpatient Rehabilitation Facilities Quality Reporting Program; Quality Improvement Organization Regulations." *Federal Register* 77 no. 146 (July 30, 2012): 45061-45233. https://www.gpo.gov/fdsys/pkg/FR-2012-07-30/pdf/2012-16813.pdf

———. 2012g. "Home Health Prospective Payment System Rate (HH PPS) Update for Calendar Year (CY) 2012." *MLN Matters*, MM7657 (2012). http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNMattersArticles/downloads/MM7657.pdf.

———. 2013a. "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities for FY 2014." *Federal Register* 78 no. 87 (May 6, 2013): 26438-26480. https://www.gpo.gov/fdsys/pkg/FR-2013-05-06/pdf/2013-10558.pdf.

———. 2013b. "Medicare and Medicaid Programs; Hospital Outpatient Prospective and Ambulatory Surgical Center Payment Systems and Quality Reporting Programs Hospital Value-Based Purchasing Program; Organ Procurement Organizations; Quality Improvement Organizations; Electronic Health Records (EHR) Incentive Program; Provider Reimbursement Determinations and Appeals." *Federal Register* 78 no. 237 (December 10, 2013): 74825-75200. https://www.gpo.gov/fdsys/pkg/FR-2013-12-10/pdf/2013-28737.pdf

———. "FY 2014 Final Rule Tables." *CMS.gov.* https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY-2014-IPPS-Final-Rule-Home-Page-Items/FY-2014-IPPS-Final-Rule-CMS-1599-F-Tables.html.

———. "FY 2015 Final Rule Tables." *CMS.gov.* https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY2015-IPPS-Final-Rule-Home-Page-Items/FY2015-Final-Rule-Tables.html.

———. "FY 2016 Final Rule, Correction Notice and Consolidated Appropriations Act of 2016 Tables." *CMS.gov.* https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY2016-IPPS-Final-Rule-Home-Page-Items/FY2016-IPPS-Final-Rule-Tables.html.

———. "FY 2017 Final Rule and Correction Notice Tables." *CMS.gov.* https://www.cms.gov/Medicare/Medicare-Fee-for-Service-

Payment/AcuteInpatientPPS/FY2017-IPPS-Final-Rule-Home-Page-Items/FY2017-IPPS-Final-Rule-Tables.html.

———. "Prohibition on Balance Billing Dually Eligible Individuals Enrolled in the Qualified Medicare Beneficiary (QMB) Program." *MLN Matters*, SE1128 (2014). http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNMattersArticles/downloads/SE1128.pdf.

———. "Chapter 9: Coverage of Hospice Services Under Hospital Insurance." *Medicare Benefit Policy Manual*. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/bp102c09.pdf.

———. 2016a. "Chapter 6: SNF Inpatient Part A Billing and SNF Consolidated Billing." *Medicare Claims Processing Manual*. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/clm104c06.pdf.

———. 2016b. "Chapter 8: Coverage of Extended Care (SNF) Services Under Hospital Insurance." *Medicare Benefit Policy Manual*. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/bp102c08.pdf.

———. 2016c. "Chapter 10: Home Health Agency Billing." *Medicare Claims Processing Manual*. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/clm104c10.pdf.

———. 2016d. "Chapter 1: Inpatient Hospital Services Covered Under Part A." *Medicare Benefit Policy Manual*. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/bp102c01.pdf.

———. 2017a. "Appendix PP – Guidance to Surveyors for Long Term Care Facilities." *State Operations Manual*. https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107ap_pp_guidelines.ltcf.pdf.

———. 2017b. "Chapter 3: Inpatient Hospital Billing." *Medicare Claims Processing Manual*. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/clm104c03.pdf.

Chen, Li-Wu, and Dennis G. Shea. "Does Prospective Payment Really Contain Nursing Home Costs?" *Health Services Research*, 37 (2002): 251-271. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1430360.

Clauser, Steven B., and Arlene S. Bierman. "Significance of Functional Status Data for Payment and Quality." *Health Care Financing Review,* 24 (2003), 1-12. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4194831.

Cotterill, Philip G. "Testing a diagnosis-related group index for skilled nursing facilities." *Health Care Financing Review* 7 (1986): 75-85. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4191503.

Cotterill, Philip G., and Barbara J. Gage. "Overview: Medicare Post-Acute Care Since the Balanced Budget Act 1997." *Health Care Financing Review,* 24 (2002): 1-6. https://www.cms.gov/Research-Statistics-Data-and-Systems/Research/HealthCareFinancingReview/downloads/02Winterpg1.pdf.

Cramton, Peter, and Brett E. Katzman. "Reducing Healthcare Costs Requires Good Market Design." *The Economists' Voice*, 7 (2010): 1-4. http://www.cramton.umd.edu/papers2010-2014/cramton-katzman-reducing-healthcare-costs.pdf.

Cromwell, Jerry, Michael G. Trisolini, Gregory C. Pope, Janet B. Mitchell, and Leslie M. Greenwald, eds. 2011. *Pay for Performance in Health Care: Methods and Approaches*. Research Triangle Park, NC: RTI Press, 2011. https://www.rti.org/sites/deafault/files/resources/bk-0002-1103-mitchell.pdf.

Deutsch, Anne, Tracy Kline, Cindy Kelleher, Lisa M. Lines, Laurie Coots, Danielle Garfinkel, Trudy Mallinson, and Barbara Gage. "Analysis of Crosscutting Medicare Functional Status Quality Metrics Using the Continuity and Assessment Record and Evaluation (CARE) Item Set." *RTI International, University of Southern California, Brookings Institution. Washington, DC* (2012). https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Post-Acute-Care-Quality-Initiatives/Downloads/ASPE-Report-Analysis-of-Crosscutting-Medicare-Functional-Status-Quality-Metrics-Using-the-Continuity-and-Assessment-Record-and-Evaluation-CARE-Item-Set-Final-Report.pdf.

Diamond, George A., and Sanjay Kaul. "Evidence-Based Financial Incentives for Healthcare Reform: Putting It Together." *Circulation: Cardiovascular and Quality Outcomes* 2 (2009): 134-140. http://circoutcomes.ahajournals.org/content/2/2/134.

Dowd, Bryan E., Robert F. Coulam, Roger Feldman, and Steven D. Pizer. "Fee-for-Service Medicare in a Competitive Market Environment." *Health Care Financing Review*, 27 (2005): 113-126. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4194921.

Dube, Nicole. "Massachusetts' Medicaid Nursing Home Payment System." 2009-R-0041. Hartford, CT, 2009. https://www.cga.ct.gov/2009/rpt/2009-R-0041.htm.

Dummit, Laura A. "Medicare's Bundling Pilot: Including Post-Acute Care Services." *Issue Brief 841*. National Health Policy Forum (2011). http://www.nhpf.org/library/issue-briefs/IB841_BundlingPostAcuteCare_03-28-11.pdf.

Eby, Jean, Dane Pelfrey, Kathy Langenberg, Brant Fries, Robert Godbout, David Maltiz, and David Oatway. "Staff Time and Resource Intensity Verification Project." *Iowa Foundation for Medical Care, University of Michigan, Stepwise Systems, CareTrack Systems. Baltimore, MD* (2009). https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/TimeStudy.html.

———. "Staff Time and Resource Intensity Verification Project Phase II." *Iowa Foundation for Medical Care, University of Michigan, Stepwise Systems, CareTrack Systems. Baltimore, MD* (2011). https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SNFPPS/TimeStudy.html.

Forester, T., and R. Simione. "Hospice payment reform: A look into the future." In *Address presented at 17th Annual National Association for Homecare & Hospice Financial Management Conference & Exposition, San Diego, CA.* 2011.

Fries, Brant E., Don P. Schneider, William J. Foley, and Mary Dowling. "Case-Mix Classification of Medicare Residents in Skilled Nursing Facilities: Resource Utilization Groups (RUG-T18)." *Medical Care*, 27 (1989): 843-858. http://www.jstor.org/stable/3765308.

Fries, Brant E. "Comparing case-mix systems for nursing home payment. *Health Care Financing Review*, 11 (1990): 103-119. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4193118.

Fries, Brant E., Don P. Schneider, William J. Foley, Marie Gavazzi, Robert Burke, and Elizabeth Cornelius. "Refining a Case-Mix Measure for Nursing Homes: Resource Utilization Groups (RUG-III)." *Medical Care*, 32 (1994): 668-685. http://ww.jstor.org/stable/3766161.

Gage, Barbara, Anne Deutsch, Laura Smith, Carole Schwartz, Jessica Ross, Laurie Coots, Karen Reilly, et al. "The Development and Testing of the Continuity Assessment Record and Evaluation (CARE) Item Set, Volumes 1-3." *RTI International, Visiting Nurse Service of New York, University of Pennsylvania, University of Southern California. Baltimore, MD* (2012).

Gage, Barbara. "Impact of the BBA on Post-Acute Utilization." *Health Care Financing Review*, 20 (1999), 103-126. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4194611.

Gage, Barbara, Melissa Morley, John Potelle, and Melvin Ingber. "Post-Acute Care Episodes Expanded Analytic File." *RTI International. Waltham, MA* (2011). https://aspe.hhs.gov/report/post-acute-care-episodes-expanded-analytic-file.

Gage, Barbara, Melissa Morley, Laura Smith, Melvin J. Ingber, Anne Deutsch, Tracy Kline, Jill Dever, et al. "Post-Acute Care Payment Reform Demonstration: Final Report." *RTI International. Baltimore, MD* (2012). https://www.cms.gov/Research-Statistics-Data-

and-Systems/Statistics-Trends-and-Reports/Reports/Research-Reports-Items/PAC_Payment_Reform_Demo_Final.html.

Garrett, Bowen, and Douglas A. Wissoker. 2008. "Modeling Alternative Designs for a Revised PPS for Skilled Nursing Facilities." Urban Institute. http://www.urban.org/sites/default/files/publication/31901/411706-Modeling-Alternative-Designs-for-Skilled-Nursing-Facilities.PDF.

Gold, Marsha, Marla Hudson, Gretchen Jacobson, and Tricia Neuman. "Medicare Advantage 2010 Data Spotlight: Benefits and Cost-Sharing." Menlo Park, CA: Henry J. Kaiser Family Foundation (2010). https://kaiserfamilyfoundation.files.wordpress.com/2013/01/8047.pdf.

Goldberg Dey, Judy, Margaret Johnson, William Pajerowski, Myra Tanamor, and Alyson Ward. "Home Health Study Report." *L&M Policy Research. Washington, DC* (2011). http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HomeHealthPPS/downloads/HHPPS_LiteratureReview.pdf.

Grabowski, David C. "Post-Acute and Long-Term Care: A Primer on Services, Expenditures and Payment Methods." *Harvard Medical School. Cambridge, MA* (2010). https://aspe.hhs.gov/system/files/pdf/76146/paltc.pdf.

Grabowski, David C., Peter J. Huckfeldt, Neeraj Sood, José J. Escarce, and Joseph P. Newhouse. "Medicare Postacute Care Payment Reforms Have Potential to Improve Efficiency, but May Need Changes to Cut Costs." *Health Affairs*, 31 (2012), 1941-1950. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3535322.

Health Care Financing Administration (HCFA), Department of Health and Human Services (HHS). "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities." *Federal Register* 63 no. 91 (May 12, 1998): 26252-26316. https://www.gpo.gov/fdsys/pkg/FR-1998-05-12/pdf/98-12208.pdf.

———. "Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities; Reopening of Comment Period." *Federal Register* 63 no. 228 (November 27, 1998): 65561-65562. https://www.gpo.gov/fdsys/pkg/FR-1998-11-27/pdf/98-31694.pdf.

Health Services Advisory Group, Inc. "A Blueprint for the CMS Measures Management System." Phoenix: 2012.

Hittle, David F., Eugene J. Nuccio, and Angela A. Richard. "Evaluation of the Medicare Home Health Pay-for-Performance Demonstration Final Report; Volume 1: Agency Characteristics, Costs, and Quality Measure Performance among Treatment, Control, and Non-Participant Groups." *Division of Health Care Policy and Research, University of*

Colorado Anschutz Medical Campus. Aurora, CO (2012).
https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/Downloads/HHP4P_Demo_Eval_Final_Vol1.pdf

Hustey, Fredric M., and Robert M. Palmer. "An Internet-Based Communication Network for Information Transfer During Patient Transitions from Skilled Nursing Facility to the Emergency Department." *Journal of the American Geriatrics Society*, 58 (2010): 1148-1152. https://doi.org/10.1111/j.1532-5415.2010.02864.x.

Hutt, Evelyn, Mary Ecord, Theresa B. Eilertsen, Elizabeth Frederickson, Jacqueline Cahill Kowalsky, and Andrew M. Kramer. "Prospective Payment for Nursing Homes Increased Therapy Provision without Improving Community Discharge Rates." *Journal of the American Geriatrics Society*, 49 (2001): 1071-1079. https://doi.org/10.1046/j.1532-5415.2001.49211.x.

John Snow, Inc. "Lessons Learned from Electronic Health Record Implementation at Three North Dakota Critical Access Hospitals." Denver: 2009. https://ruralhealth.und.edu/projects/flex/pdf/lessons_learned.pdf.

Kautter, John, and Gregory C. Pope. "Predictive Accuracy of Diagnostic Cost Group (DCG) Risk Adjustment Models. Final Report to the Centers for Medicare & Medicaid Services under Contract Number 500-95 048." *Health Economics Research, Inc. Waltham, MA* (2001).

Konetzka, R. Tamara, Deokhee Yi, Edward C. Norton, and Kerry E. Kilpatrick. "Effects of Medicare Payment Changes on Nursing Home Staffing and Deficiencies." *Health Services Research*, 39 (2004): 463-488. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1361020/pdf/hesr_00240.pdf.

Kramer, Andrew, Meg Kaehny, Angela Richard, and Karis May. "Survey Questions for EHR Adoption and Use in Nursing Homes: Final Report." *University of Colorado Denver, Division of Health Care Policy and Research. Denver, CO* (2010). http://aspe.hhs.gov/daltcp/reports/2010/EHRques.pdf.

Liu, Korbin, Bowen Garrett, Sharon Long, Stephanie Maxwell, Yu-Chu Shen, Douglas Wissoker, Brant Fries, et al. "Final Report to CMS: Options for Improving Medicare Payment for Skilled Nursing Facilities." *Urban Institute, University of Michigan, University of Colorado Health Sciences Center, and Harvard University. Baltimore, MD* (2007). http://www.urban.org/sites/default/files/alfresco/publication-pdfs/411526-Options-for-Improving-Medicare-Payment-for-Skilled-Nursing-Facilities.pdf.

Liu, Korbin, and Emily Jones. "Closures of Hospital-Based SNF Units: Insights from Interviews with Administrators, Discharge Planners and Referrig Physicians." *Urban Institute, Medicare Payment Advisory Commission. Washington, DC* (2007). http://67.59.137.244/documents/Mar07_Hospitalbased_SNFs_CONTRACTOR.pdf.

Liu, Korbin, Amanda Lockshin, Carolyn Rimes, and Cristina Baseggio. "Medicare Payments for Patients with HIV/AIDS in Skilled Nursing Facilities." *Urban Institute. Washington, DC* (2001).

Long Term Services & Supports, TennCare. "Nursing Facility Level of Care (LOC) Guide for TennCare CHOICES and PACE." Nashville: 2012. http://www.tba.org/sites/default/files/Level%20of%20Care%20Guide.pdf.

Lyda-McDonald, Brienne, Edward M. Drozd, and Barbara Gage. "Developing Outpatient Therapy Payment Alternatives (DOTPA): 2009 Utilization Report." *RTI International. Research Triangle Park, NC* (2012). http://www.aaos.org/Govern/federal/issues/DOTPA2009.pdf.

McCall, Nelda, Jodi Korb, Andrew Petersons, and Stanley Moore. "Reforming Medicare Payment: Early Effects of the 1997 Balanced Budget Act on Postacute Care." *Milbank Quarterly*, 81 (2003): 277-303. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2690212.

———. "Decreased Home Health Use: Does It Decrease Satisfaction?" *Medical Care Research and Review* 61 (2004): 64-88. https://doi.org/10.1177/1077558703260183.

McGuire, Catherine. "Medicaid Policy Cooperative Agreement Project: Case Mix Background Section Insert." *Cutler Institute for Health and Social Policy, Muskie School of Public Service. Portland, ME* (2010). https://www1.maine.gov/dhhs/reports/long-term-care-report-attachment.pdf.

Measure Applications Partnership (MAP). "MAP Pre-Rulemaking Report: 2013 Recommendations on Measures Under Consideration by HHS." *National Quality Forum. Washington, D.C.* (2013). http://nursingworld.org/DocumentVault/Care-Coordination-Panel-Docs/background-docs/MAP-PreRulemaking-Report-February-2013.pdf.

Medicare Payment Advisory Commission (MedPAC). "Report to the Congress: Medicare Payment Policy." Washington, DC: 2002. http://www.medpac.gov/docs/default-source/reports/Mar02_Entire_report.pdf.

———. "Report to the Congress: Increasing the Value of Medicare." Washington, DC: 2006. http://www.medpac.gov/documents/jun06_entirereport.pdf.

———. "Report to the Congress: Reforming the Delivery System." Washington, DC: 2008. http://www.medpac.gov/documents/jun08_entirereport.pdf.

———. "Report to the Congress: Medicare Payment Policy." Washington, DC: 2009. http://www.medpac.gov/docs/default-source/reports/march-2009-report-to-congress-medicare-payment-policy.pdf.

———. "Report to the Congress: Medicare Payment Policy." Washington, DC: 2010. http://www.medpac.gov/documents/Mar10_EntireReport.pdf.

———. "Report to the Congress: Medicare Payment Policy." Washington, DC: 2011. http://www.medpac.gov/documents/Mar11_EntireReport.pdf.

———. 2012a. "A Data Book: Health Care Spending and the Medicare Program." Washington, DC: 2012.

———. 2012b. "Report to the Congress: Medicare and the Health Care Delivery System." Washington, DC: 2012. http://www.medpac.gov/docs/default-source/reports/jun12_entirereport.pdf.

———. 2013a. "Report to the Congress: Medicare and the Health Care Delivery System." Washington, DC: 2013. http://www.medpac.gov/docs/default-source/reports/jun13_entirereport.pdf.

———. 2013b. "Report to the Congress: Medicare Payment Policy." Washington, DC: 2013. http://www.medpac.gov/documents/Mar13_EntireReport.pdf.

———. 2016a. "Durable Medical Equipment Payment System." Washington, DC: 2016. http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_dme_final.pdf.

———. 2016b. "Home Health Care Services Payment System." Washington, DC: 2016. http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_hha_final.pdf.

———. 2016c. "Hospice Services Payment System." Washington, DC: 2016. http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_hospice_final.pdf.

———. 2016d. "Hospital Acute Inpatient Services Payment System." Washington, DC: 2016. http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_hospital_final.pdf.

———. 2016e. "Inpatient Rehabilitation Facilities Payment System." Washington, DC: 2016. http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_irf_final.pdf.

———. 2017f. "Long-Term Care Hospitals Payment System." Washington, DC: 2016.
http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_ltch_final.pdf.

———. 2016g. "Medicare Advantage Program Payment System." Washington, DC: 2016.
http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_ma_final.pdf.

———. 2016h. "Outpatient Dialysis Services Payment System." Washington, DC: 2016.
http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_dialysis_final.pdf.

———. 2016i. "Outpatient Hospital Services Payment System." Washington, DC: 2016.
http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_opd_final.pdf.

———. 2016j. "Outpatient Therapy Services Payment System." Washington, DC: 2016.
http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_opt_final.pdf.

———. 2016k. "Part D Payment System." Washington, DC: 2016.
http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_16_partd_final.pdf.

Merlob, Brian, Charles R. Plott, and Yuanjun Zhang. "The CMS Auction: Experimental Studies of a Median-Bid Procurement Auction with Non-Binding Bids." *The Quarterly Journal of Economics*, 127 (2012): 793-827. https://doi.org/10.1093/qje/qjs013.

Milbank Memorial Fund. "Implementing the Resident Assessment Instrument: Case Studies of Policymaking for Long-Term Care in Eight Countries." *Milbank Memorial Fund. New York, NY* (2003). https://www.milbank.org/wp-content/uploads/2016/04/ResidentAssessment_Mech2.pdf.

Miller, Edward. A., Vincent Mor, David C. Grabowski, and Pedro L. Gozalo. "The Devil's in the Details: Trading Policy Goals for Complexity in Medicaid Nursing Home Reimbursement." *Journal of Health Politics, Policy and Law* 34 (2009): 93-135. https://doi.org/10.1215/03616878-2008-993.

Mor, Vincent, Orna Intrator, Zhanlian Feng, and David C. Grabowski. "The Revolving Door of Rehospitalization from Skilled Nursing Facilities." *Health Affairs*, 29 (2010): 57-64. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2826971.

Nelson, Lyle. "Lessons from Meciare's Demonstration Projects on Value-Based Payment." *Working Paper 2012-02*. Health and Human Resources Division, Congressional Budget

Office (2012). http://www.cbo.gov/sites/default/files/112th-congress-2011-2012/workingpaper/WP2012-02_Nelson_Medicare_VBP_Demonstrations_1.pdf.

Newhouse, Joseph P., Alan M. Garber, Robin P. Graham, Margaret A. McCoy, Michelle Mancher, and Ashna Kibria, eds. "Interim Report of the Committee on Geographic Variation in Health Care Spending and Promotion of High-Value Health Care: Prelimiary Committee Observations." Washington, DC: Institute of Medicine of The National Academies (2013). https://www.nap.edu/read/18308.

Office of the Inspector General, U.S. Department of Health and Human Services. "Inappropriate Payments to Skilled Nursing Facilities Cost Medicare More Than a Billion Dollars in 2009." Washington, DC: 2012. https://oig.hhs.gov/oei/reports/oei-02-09-00200.pdf.

———. "Abberant Medicare Home Health Outlier Payment Patterns in Miami-Data County and Other Geographic Areas in 2008." Washington, DC: 2009. https://oig.hhs.gov/oei/reports/oei-04-08-00570.pdf.

———. "Questionable Billing by Skilled Nursing Facilities." Washington, DC: 2010. https://oig.hhs.gov/oei/reports/oei-02-09-00202.pdf.

———. "Memorandum Report: Supplier Billing for Diabetes Test Strips and Inappropriate Supplier Activities in Competitive Bidding Areas." Washington, DC: 2012. https://oig.hhs.gov/oei/reports/oei-04-11-00760.pdf.

Pope, Gregory C., Randall P. Ellis, Arelene S. Ash, John Z. Ayanian, David W. Bates, Helen Burstin, Lisa I. Iezzoni, et al. "Diagnostic Cost Group Hierarchical Condition Category Models for Medicare Risk Adjustment: Final Report." *Health Economics Research, Inc.; Department of Economics, Boston University; Health Care Research Unit, Boston University School of Medicine; Harvard Medical School; Brigham and Women's Hospital; Partners Healthcare; Division of General Medicine and Primary Care, Beth Israel Deconess Medical Center; Hebrew Rehabilitiation Center for Aged. Baltimore, MD* (2000). https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/pope_2000_2.pdf.

Research Data Assistance Center (ResDAC). "Revenue Center Code." https://www.resdac.org/cms-data/variables/revenue-center-code.

Richard, Angela, Meg Kaehny, Karis May, and Andrew Kramer. "Existing Surveys on Health Information Technology, Including Surveys on Health Information Technology in Nursing Homes and Home Health." *Division of Health Care Policy and Research, University of Colorado*. *Denver, CO* (2009). https://aspe.hhs.gov/system/files/pdf/75641/HITlitrev.pdf.

Romano, Patrick S., and David H. Mark. "Bias in the Coding of Hospital Discharge Data and Its Implications for Quality Assessment." *Medical Care* 32 (1994): 81-90. http://www.jstor.org/stable/3766191.

Rudder, Cynthia, R. Mollot, and Beejal Mathuria. "Modifiying the case-mix Medicaid nursing home system to encourage quality, access and efficiency." New York: Long-Term Care Community Coalition (2009).

Saitto, Carlo, Claudia Marino, Danilo Fusco, Massimo Arcà, and Carlo A. Perucci. 2005. "Toward a New Payment System for Inpatient Rehabilitation, Part II: Reimbursing Providers." *Medical Care* 43 (2005): 856-864. http://www.jstor.org/stable/4640886.

Silver, Benjamin, Brienne Lyda-McDonald, Henry Bachofer, and Barbara Gage. "Developing Outpatient Therapy Payment Alternatives (DOTPA): 2010 Utilization Report." *RTI International. Research Triangle Park, NC* (2012). https://www.cms.gov/Medicare/Billing/TherapyServices/Downloads/2010-DOTPA-Utilization-Report.pdf.

Sood, Neeraj, Peter J. Huckfeldt, David C. Grabowski, Joseph P. Newhouse, and José J. Escarce. "The Effect of Prospective Payment on Admission and Treatment Policy: Evidence from Inpatient Rehabilitation Facilities." *Journal of Health Economics*, 32 (2013): 965-979. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3791147.

Sood, Neeraj, Peter J. Huckfeldt, José J. Escarce, David C. Grabowski, and Joseph P. Newhouse. "Medicare's Bundled Payment Pilot for Acute and Postacute Care: Analysis and Recommendations on Where to Begin." *Health Affairs*, 30 (2011): 1708-1717. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4109141.

Stineman, Margaret G., José J. Escarce, James E. Goin, Byron B. Hamilton, Carl V. Granger, and Sankey V. Williams. "A Case-Mix Classification System for Medical Rehabilitation." *Medical Care* 32 (1994): 366-379. https://doi.org/10.1097/00005650-199404000-00005.

Stineman, Margaret G., Charles J. Tassoni, José J. Escarce, James E. Goin, Carl V. Granger, Roger C. Fiedler, and Sankey V. Williams. "Development of Function-Related Groups Version 2.0: A Classification System for Medical Rehabilitation." *Health Services Research* 32 (1997): 529-548. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1070209.

Strunk, E. R. "Designing a Skilled Nursing Facility Value-Based Purchasing Program." *Gerinotes*, 21 (2011).

Therneau, Terry M., and Elizabeth J. Atkinson. "An Introduction to Recursive Partitioning Using the RPART Routines." *Mayo Foundation. Rochester, MN* (2015*).* https://cran.r-project.org/web/packages/rpart/vignettes/longintro.pdf.

Tibshirani, Robert. "Regression Shrinkage and Selection via the Lasso." *Journal of the Royal Statistical Society: Series B (Statistical Methodology)* 58 (1996): 267-288. https://statweb.stanford.edu/~tibs/lasso/lasso.pdf.

Turner-Stokes, Lynne, Stephen Sutch, Robert Dredge, and Kathy Eager. "International casemix and funding models: lessons for rehabilitation." *Clinical Rehabilitation* 26 (2011): 195-208. http://journals.sagepub.com/doi/pdf/10.1177/0269215511417468.

Ubokudom, Sunday E., James A. Woods, and Lorinda S. Schalk. "The Effects of Case-Mix Reimbursement on Ohio Medicaid Nursing Home Costs." *Policy Studies Journal* 30 (2002): 321-342. https://doi.org/10.1111/j.1541-0072.2002.tb02150.x.

Werner, Rachel M., R. Tamara Konetzka, and Kevin Liang. "State Adoption of Nursing Home Pay-for-Performance." *Medical Care Research and Review* 67 (2009): 364-377. https://doi.org/10.1177/1077558709350885.

White, Alan, Donna Hurd, Terry Moore, Andrew Kramer, David Hittle, and Ron Fish. "Nursing Home Value-Based Purchasing Demonstration: Design Refinements." *Abt Associates Inc. Baltimore, MD* (2009). https://innovation.cms.gov/Files/reports/NHP4P-Refinements-Report.pdf.

U.S. House. Committee on Small Business. *Medicare's Durable Medical Equipment Competitive Bidding Program: How Are Small Suppliers Faring?: Hearing before the Subcommittee on Healthcare and Technology.* 112th Cong., 2nd sess., September 11, 2012. https://www.gpo.gov/fdsys/pkg/CHRG-112hhrg77561/html/CHRG-112hhrg77561.htm.

U.S. Government Accountability Office. 2002a. "Skilled Nursing Facilities: Medicare Payments Exceed Costs for Most but Not All Facilities." GAO-03-183. Washington, DC, 2002. http://www.gao.gov/assets/240/236797.pdf.

———. 2002b. "Providers Have Responded to Medicare Payment Systems By Changing Practices." GAO-02-841. Washington, DC, 2002. http://www.gao.gov/products/GAO-02-841.

———. "Nursing Homes: Private Investment Homes Sometimes Differed from Others in Deficiencies, Staffing, and Financial Performance." GAO-11-571. Washington, DC, 2011. http://www.gao.gov/new.items/d115871.pdf.

———. "End-Stage Renal Disease: Reduction in Drug Utilization Suggests Bundled Payment is Too High." GAO-13-190R. Washington, DC, 2012. http://www.gao.gov/assets/660/650667.pdf.

Thomas, Kali S., David Dosa, Andrea Wysocki, and Vincent Mor. "The Minimum Data Set 3.0 Cognitive Function Scale." *Medical Care* (2015). https://doi.org/10.1097/MLR.0000000000000334.

Wissoker, Doug, and Stephen Zuckerman. "Impacts of a Revised Payment System for SNFs." *Urban Institute, Medicare Payment Advisory Commission. Washington, DC* (2012). http://67.59.137.244/documents/Mar12_Impacts_RevisedPaymentSystemSNFs_CONTRACTOR.pdf.

Wissoker, Doug, and A. Bowen Garrett. "Development of Updated Models of Non-Therapy Ancillary Costs." *Urban Institute, Medicare Payment Advisory Commission. Washington, DC* (2010). http://www.urban.org/sites/default/files/alfresco/publication-pdfs/412249-Development-of-Updated-Models-of-Non-Therapy-Ancillary-Costs.PDF.

Wodchis, Walter P., Brant E. Fries, and Richard A. Hirth. "The Effect of Medicare's Prospective Payment System on Discharge Outcomes of Skilled Nursing Facility Residents." *Inquiry*, 41 (2004): 418-434. http://journals.sagepub.com/doi/pdf/10.5034/inquiryjrnl_41.4.418.

Yip, Judy Y., Kathleen H. Wilber, and Robert C. Myrtle. "The Impact of the 1997 Balanced Budget Amendment's Prospective Payment System on Patient Case Mix and Rehabilitation Utilization in Skilled Nursing." *The Gerontologist*, 42 (2002), 653-660. https://doi.org/10.1093/geront/42.5.653.

Zhang, Ning Jackie, Lynn Unruh, and Thomas T. H. Wan. "Has the Medicare Prospective Payment System Led to Increased Nursing Home Efficiency?" *Health Services Research*, 43 (2008), 1043-1061. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2442238/

APPENDIX

Figure 8: Summary of Resident Classification Process Under RUG-IV
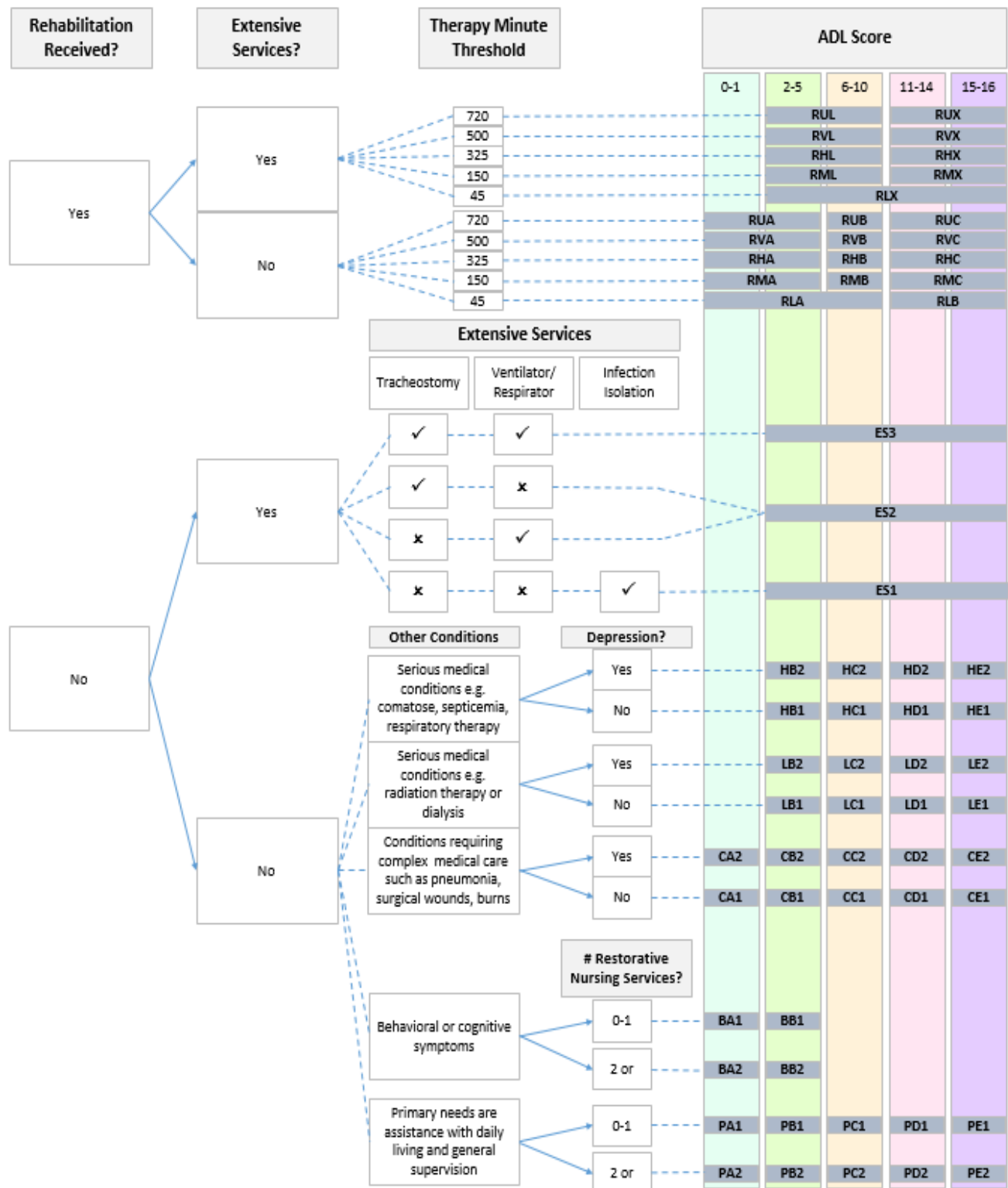
Table 73: Percentage of Utilization Days, ADL Range, and Minimum Therapy Minutes for each RUG-IV RUG sorted by RUG Hierarchy

RUG Groups	RUG	% of Utilization Days	ADL Range	Minimum Therapy Minutes
Rehabilitation Plus Extensive Services	RUX	0.53%	11-16	720
	RUL	0.43%	2-10	720
	RVX	0.20%	11-16	500
	RVL	0.18%	2-10	500
	RHX	0.07%	11-16	325
	RHL	0.05%	2-10	325
	RMX	0.04%	11-16	150
	RML	0.01%	2-10	150
	RLX	0.00%	2-16	45
Rehabilitation	RUC	19.83%	11-16	720
	RUB	27.60%	6-10	720
	RUA	13.65%	0-5	720
	RVC	8.20%	11-16	500
	RVB	8.51%	6-10	500
	RVA	6.03%	0-5	500
	RHC	2.60%	11-16	325
	RHB	2.07%	6-10	325
	RHA	1.65%	0-5	325
	RMC	1.20%	11-16	150
	RMB	0.79%	6-10	150
	RMA	0.64%	0-5	150
	RLB	0.01%	11-16	45
	RLA	0.00%	0-10	45
Extensive Services	ES3	0.21%	2-16	-
	ES2	0.14%	2-16	-
	ES1	0.09%	2-16	-
Special Care High	HE2	0.06%	15-16	-
	HE1	0.26%	15-16	-
	HD2	0.07%	11-14	-
	HD1	0.30%	11-14	-
	HC2	0.06%	6-10	-
	HC1	0.24%	6-10	-
	HB2	0.03%	2-5	-

RUG Groups	RUG	% of Utilization Days	ADL Range	Minimum Therapy Minutes
	HB1	0.25%	2-5	-
Special Care Low	LE2	0.06%	15-16	-
	LE1	0.42%	15-16	-
	LD2	0.06%	11-14	-
	LD1	0.60%	11-14	-
	LC2	0.03%	6-10	-
	LC1	0.43%	6-10	-
	LB2	0.01%	2-5	-
	LB1	0.17%	2-5	-
Clinically Complex	CE2	0.02%	15-16	-
	CE1	0.09%	15-16	-
	CD2	0.02%	11-14	-
	CD1	0.27%	11-14	-
	CC2	0.02%	6-10	-
	CC1	0.32%	6-10	-
	CB2	0.01%	2-5	-
	CB1	0.24%	2-5	-
	CA2	0.02%	0-1	-
	CA1	0.41%	0-1	-
Behavioral Symptoms and Cognitive Performance	BB2	0.00%	2-5	-
	BB1	0.06%	2-5	-
	BA2	0.00%	0-1	-
	BA1	0.04%	0-1	-
Reduced Physical Function	PE2	0.00%	15-16	-
	PE1	0.07%	15-16	-
	PD2	0.00%	11-14	-
	PD1	0.17%	11-14	-
	PC2	0.01%	6-10	-
	PC1	0.24%	6-10	-
	PB2	0.00%	2-5	-
	PB1	0.12%	2-5	-
	PA2	0.00%	0-1	-
	PA1	0.09%	0-1	-

Table 74: List of Revenue Center Codes and Categories[49]

Revenue Code	Revenue Code Description	Category
0100	All Inclusive Rate - Room & Board & Ancillary	Routine
0101	All Inclusive Rate - Room & Board	Routine
0110	Private medical or general - general classification	Routine
0111	Private medical or general-medical/surgical/GYN	Routine
0112	Private medical or general-OB	Routine
0113	Private medical or general-pediatric	Routine
0114	Private medical or general-psychiatric	Routine
0115	Private medical or general-hospice	Routine
0116	Private medical or general-detoxification	Routine
0117	Private medical or general-oncology	Routine
0118	Private medical or general-rehabilitation	Routine
0119	Private medical or general-other	Routine
0120	Semi-private 2 bed (medical or general) general classification	Routine
0121	Semi-private 2 bed (medical or general) medical/surgical/GYN	Routine
0122	Semi-private 2 bed (medical or general)-OB	Routine
0123	Semi-private 2 bed (medical or general)-pediatric	Routine
0124	Semi-private 2 bed (medical or general)-psychiatric	Routine
0125	Semi-private 2 bed (medical or general)-hospice	Routine
0126	Semi-private 2 bed (medical or general)-detoxification	Routine
0127	Semi-private 2 bed (medical or general)-oncology	Routine
0128	Semi-private 2 bed (medical or general)-rehabilitation	Routine
0129	Semi-private 2 bed (medical or general)-other	Routine
0130	Semi-private 3 and 4 beds-general classification	Routine
0131	Semi-private 3 and 4 beds-medical/surgical/GYN	Routine
0132	Semi-private 3 and 4 beds-OB	Routine
0133	Semi-private 3 and 4 beds-pediatric	Routine
0134	Semi-private 3 and 4 beds-psychiatric	Routine
0135	Semi-private 3 and 4 beds-hospice	Routine
0136	Semi-private 3 and 4 beds-detoxification	Routine
0137	Semi-private 3 and 4 beds-oncology	Routine
0138	Semi-private 3 and 4 beds-rehabilitation	Routine
0139	Semi-private 3 and 4 beds-other	Routine
0140	Private (deluxe)-general classification	Routine
0141	Private (deluxe)-medical/surgical/GYN	Routine

[49] Research Data Assistance Center (ResDAC). "Revenue Center Code." https://www.resdac.org/cms-data/variables/revenue-center-code.

Revenue Code	Revenue Code Description	Category
0142	Private (deluxe)-OB	Routine
0143	Private (deluxe)-pediatric	Routine
0144	Private (deluxe)-psychiatric	Routine
0145	Private (deluxe)-hospice	Routine
0146	Private (deluxe)-detoxification	Routine
0147	Private (deluxe)-oncology	Routine
0148	Private (deluxe)-rehabilitation	Routine
0149	Private (deluxe)-other	Routine
0150	Room & Board ward (medical or general)-general classification	Routine
0151	Room & Board ward (medical or general)-medical/surgical/GYN	Routine
0152	Room & Board ward (medical or general)-OB	Routine
0153	Room & Board ward (medical or general)-pediatric	Routine
0154	Room & Board ward (medical or general)-psychiatric	Routine
0155	Room & Board ward (medical or general)-hospice	Routine
0156	Room & Board ward (medical or general)-detoxification	Routine
0157	Room & Board ward (medical or general)-oncology	Routine
0158	Room & Board ward (medical or general)-rehabilitation	Routine
0159	Room & Board ward (medical or general)-other	Routine
0160	Other Room & Board-general classification	Routine
0164	Other Room & Board-sterile environment	Routine
0167	Other Room & Board-self care	Routine
0169	Other Room & Board-other	Routine
0170	Nursery-general classification	Routine
0171	Nursery-newborn level I (routine)	Routine
0172	Nursery-premature newborn-level II (continuing care)	Routine
0173	Nursery-newborn-level III	Routine
0174	Nursery-newborn-level IV	Routine
0179	Nursery-other	Routine
0180	Leave of absence-general classification	Routine
0181	Leave of absence - reserved	Routine
0182	Leave of absence-patient convenience charges billable	Routine
0183	Leave of absence-therapeutic leave	Routine
0184	Leave of absence-ICF mentally retarded-any reason	Routine
0185	Leave of absence-nursing home (hospitalization)	Routine
0189	Leave of absence-other leave of absence	Routine
0190	Subacute care - general classification	Routine
0191	Subacute care - level I	Routine

Revenue Code	Revenue Code Description	Category
0192	Subacute care - level II	Routine
0193	Subacute care - level III	Routine
0194	Subacute care - level I	Routine
0199	Other subacute care	Routine
0200	Intensive Care Unit	Routine
0201	ICU - Surgical	Routine
0202	ICU - Medical	Routine
0203	ICU - Pediatric	Routine
0204	ICU - Psychiatric	Routine
0206	Intermediate ICU	Routine
0207	ICU - Burn care	Routine
0208	ICU - Trauma	Routine
0209	Other intensive care	Routine
0210	Coronary care unit	Routine
0211	CCU - Myocardial Infarction	Routine
0212	CCU - Pulmonary Care	Routine
0213	CCU - Heart Transplant	Routine
0214	Intermediate CCU	Routine
0219	Other Coronary Care	Routine
0220	Special charges	Nursing
0221	Admission charge	Nursing
0222	Technical support charge	Nursing
0223	U.R. service charge	Nursing
0224	Late discharge, medically necessary	Nursing
0229	Other special charges	Nursing
0230	Incremental nursing charge rate	Nursing
0231	Nursery	Nursing
0232	OB	Nursing
0233	ICU	Nursing
0234	CCU	Nursing
0235	Hospice	Nursing
0239	Other incremental nursing charge rate	Nursing
0240	All inclusive Ancillary	Nursing
0241	Basic	Nursing
0242	Comprehensive	Nursing
0243	Specialty	Nursing
0249	Other all inclusive ancillary	Nursing
0250	Pharmacy	Non-Therapy Ancillary - Drug
0251	Pharmacy: Generic	Non-Therapy Ancillary - Drug

Revenue Code	Revenue Code Description	Category
0252	Pharmacy: Nongeneric	Non-Therapy Ancillary - Drug
0253	Take home drugs	Non-Therapy Ancillary - Drug
0254	Pharmacy: Incident to other diagnostic services	Non-Therapy Ancillary - Drug
0255	Pharmacy: Incident to radiology	Non-Therapy Ancillary - Drug
0256	Pharmacy: Experimental drugs	Non-Therapy Ancillary - Drug
0257	Pharmacy: Non-prescription	Non-Therapy Ancillary - Drug
0258	Pharmacy: IV solutions	Non-Therapy Ancillary - Drug
0259	Pharmacy: Other	Non-Therapy Ancillary - Drug
0260	IV Therapy	Non-Therapy Ancillary - Drug
0261	IV Therapy: Infusion pump	Non-Therapy Ancillary - Drug
0262	IV Therapy: IV Therapy, pharm services	Non-Therapy Ancillary - Drug
0263	IV Therapy: IV Therapy/drug/supp/delivery	Non-Therapy Ancillary - Drug
0264	IV Therapy: supplies	Non-Therapy Ancillary - Drug
0269	IV Therapy: Other IV therapy	Non-Therapy Ancillary - Drug
0270	Medical/Surgical Supplies	Non-Therapy Ancillary - ONTA
0271	Medical/Surgical Supplies: Nonsterile supplies	Non-Therapy Ancillary - ONTA
0272	Medical/Surgical Supplies: Sterile supplies	Non-Therapy Ancillary - ONTA
0273	Medical/Surgical Supplies: Take home supplies	Non-Therapy Ancillary - ONTA
0274	Medical/Surgical Supplies: Prosthetic/Orthotic devices	Non-Therapy Ancillary - ONTA
0275	Medical/Surgical Supplies: Pacemaker	Non-Therapy Ancillary - ONTA
0276	Medical/Surgical Supplies: Intraocular lens	Non-Therapy Ancillary - ONTA
0277	Oxygen-Take home	Non-Therapy Ancillary - ONTA
0278	Medical/Surgical Supplies: Other implants	Non-Therapy Ancillary - ONTA
0279	Medical/Surgical Supplies: Other supplies/devices	Non-Therapy Ancillary - ONTA
0280	Oncology	Non-Therapy Ancillary - ONTA
0289	Oncology: Other oncology	Non-Therapy Ancillary - ONTA
0290	Durable Medical Equipment	Nursing
0291	DME Rental	Nursing
0292	Durable Medical Equipment: Purchase - new equipment	Nursing
0293	Purchase of used DME	Nursing
0294	Supplies/Drugs for DME effectiveness (HHA only)	Nursing
0299	Durable Medical Equipment: Other equipment	Nursing
0300	Laboratory - Clinical Diagnostic	Non-Therapy Ancillary - ONTA
0301	Laboratory - Clinical Diagnostic: Chemistry	Non-Therapy Ancillary - ONTA
0302	Laboratory - Clinical Diagnostic: Immunology	Non-Therapy Ancillary - ONTA
0303	Laboratory - Clinical Diagnostic: Renal patient (home)	Nursing
0304	Laboratory - Clinical Diagnostic: Nonroutine dialysis	Non-Therapy Ancillary - ONTA
0305	Laboratory - Clinical Diagnostic: Hematology	Non-Therapy Ancillary - ONTA

Revenue Code	Revenue Code Description	Category
0306	Laboratory - Clinical Diagnostic: Bacteriology/microbiology	Non-Therapy Ancillary - ONTA
0307	Laboratory - Clinical Diagnostic: Urology	Non-Therapy Ancillary - ONTA
0309	Laboratory - Clinical Diagnostic: Other laboratory	Non-Therapy Ancillary - ONTA
0310	Laboratory - Pathology	Non-Therapy Ancillary - ONTA
0311	Laboratory - Pathology: Cytology	Nursing
0312	Laboratory - Pathology: Histology	Nursing
0314	Laboratory - Pathology: Biopsy	Non-Therapy Ancillary - ONTA
0319	Laboratory - Pathology: Other	Non-Therapy Ancillary - ONTA
0320	Radiology - Diagnostic	Non-Therapy Ancillary - ONTA
0321	Radiology - Diagnostic: Angiocardiography	Non-Therapy Ancillary - ONTA
0322	Radiology - Diagnostic: Arthrography	Non-Therapy Ancillary - ONTA
0323	Radiology - Diagnostic: Arteriography	Non-Therapy Ancillary - ONTA
0324	Radiology - Diagnostic: Chest X-ray	Non-Therapy Ancillary - ONTA
0329	Radiology - Diagnostic: Other	Non-Therapy Ancillary - ONTA
0330	Radiology - Therapeutic	Non-Therapy Ancillary - ONTA
0331	Radiology - Therapeutic: Chemotherapy - injected	Non-Therapy Ancillary - ONTA
0332	Radiology - Therapeutic: Chemotherapy - oral	Non-Therapy Ancillary - ONTA
0333	Radiology - Therapeutic: Radiation therapy	Non-Therapy Ancillary - ONTA
0335	Radiology - Therapeutic: Chemotherapy - IV	Non-Therapy Ancillary - ONTA
0339	Radiology - Therapeutic: Other	Non-Therapy Ancillary - ONTA
0340	Nuclear Medicine	Non-Therapy Ancillary - ONTA
0341	Nuclear Medicine: Diagnostic	Non-Therapy Ancillary - ONTA
0342	Nuclear Medicine: Therapeutic	Non-Therapy Ancillary - ONTA
0343	Diagnostic Radiopharms	Non-Therapy Ancillary - Drug
0344	Therapeutic Radiopharms	Non-Therapy Ancillary - Drug
0349	Nuclear Medicine: Other	Non-Therapy Ancillary - ONTA
0350	CT Scan	Non-Therapy Ancillary - ONTA
0351	CT Scan: Head	Non-Therapy Ancillary - ONTA
0352	CT Scan: Body	Non-Therapy Ancillary - ONTA
0359	CT Scan: Other CT scans	Non-Therapy Ancillary - ONTA
0360	Operating Room Services	Non-Therapy Ancillary - ONTA
0361	Operating Room Services: Minor surgery	Nursing
0362	Operating Room Services: Organ transplant, not kidney	Nursing
0367	Operating Room Services: Kidney transplant	Nursing
0369	Operating Room Services: Other operating room services	Non-Therapy Ancillary - ONTA
0370	Anesthesia	Nursing
0371	Anesthesia: Incident to radiology	Nursing
0372	Anesthesia: Incident to other diag services	Nursing

Revenue Code	Revenue Code Description	Category
0374	Acupuncture	Nursing
0379	Anesthesia: Other anesthesia	Nursing
0380	Blood	Non-Therapy Ancillary - ONTA
0381	Blood: Packed red cells	Non-Therapy Ancillary - ONTA
0382	Blood: Whole blood	Non-Therapy Ancillary - ONTA
0383	Blood: Plasma	Non-Therapy Ancillary - ONTA
0384	Blood: Platelets	Non-Therapy Ancillary - ONTA
0385	Blood: Leukocytes	Non-Therapy Ancillary - ONTA
0386	Blood: Other components	Non-Therapy Ancillary - ONTA
0387	Blood: Other derivatives	Non-Therapy Ancillary - ONTA
0389	Blood: Other blood	Non-Therapy Ancillary - ONTA
0390	Blood Storage/Processing	Nursing
0391	Blood: Administration (e.g. Transfusion)	Nursing
0392	Blood Storage/Processing	Nursing
0399	Other blood handling	Nursing
0400	Other Imaging Services	Non-Therapy Ancillary - ONTA
0401	Other Imaging Services: Diagnostic mammography	Non-Therapy Ancillary - ONTA
0402	Other Imaging Services: Ultrasound	Non-Therapy Ancillary - ONTA
0403	Other Imaging Services: Screening mammography	Nursing
0404	Other Imaging Services: PET scan	Nursing
0409	Other Imaging Services: Other imaging services	Non-Therapy Ancillary - ONTA
0410	Respiratory Services	Non-Therapy Ancillary - Respiratory
0412	Respiratory Services: Inhalation services	Non-Therapy Ancillary - Respiratory
0413	Respiratory Services: Hyperbaric oxygen therapy	Non-Therapy Ancillary - Respiratory
0419	Respiratory Services: Other respiratory services	Non-Therapy Ancillary - Respiratory
0420	Physical Therapy	Therapy Ancillary - Physical
0421	Physical Therapy: Visit charge	Therapy Ancillary - Physical
0422	Physical Therapy: Hourly charge	Therapy Ancillary - Physical
0423	Physical Therapy: Group rate	Therapy Ancillary - Physical
0424	Physical Therapy: Evaluation/re-evaluation	Therapy Ancillary - Physical
0429	Physical Therapy: Other physical therapy	Therapy Ancillary - Physical
0430	Occupational Therapy	Therapy Ancillary - Occupational
0431	Occupational Therapy: Visit charge	Therapy Ancillary - Occupational
0432	Occupational Therapy: Hourly charge	Therapy Ancillary - Occupational
0433	Occupational Therapy: Group rate	Therapy Ancillary - Occupational
0434	Occupational Therapy: Evaluation/re-evaluation	Therapy Ancillary - Occupational
0439	Occupational Therapy: Other occupational therapy	Therapy Ancillary - Occupational
0440	Speech-Language Pathology	Therapy Ancillary - Speech
0441	Speech-Language Pathology: Visit charge	Therapy Ancillary - Speech

Revenue Code	Revenue Code Description	Category
0442	Speech-Language Pathology: Hourly charge	Therapy Ancillary - Speech
0443	Speech-Language Pathology: Group rate	Therapy Ancillary - Speech
0444	Speech-Language Pathology: Evaluation/ re-evaluation	Therapy Ancillary - Speech
0449	Speech-Language Pathology: Other speech-language pathology	Therapy Ancillary - Speech
0450	Emergency Room	Nursing
0451	Emergency Room: EM/EMTALA	Nursing
0452	Emergency Room: ER/ Beyond EMTALA	Nursing
0456	Emergency Room: Urgent care	Nursing
0459	Emergency Room: Other emergency room	Nursing
0460	Pulmonary Function	Non-Therapy Ancillary - Respiratory
0469	Pulmonary Function: Other	Non-Therapy Ancillary - Respiratory
0470	Audiology	Non-Therapy Ancillary - ONTA
0471	Audiology: Diagnostic	Non-Therapy Ancillary - ONTA
0472	Audiology: Treatment	Non-Therapy Ancillary - ONTA
0479	Audiology: Other audiology	Non-Therapy Ancillary - ONTA
0480	Cardiology	Non-Therapy Ancillary - ONTA
0481	Cardiology: Cardiac catheter lab	Non-Therapy Ancillary - ONTA
0482	Cardiology: Stress test	Non-Therapy Ancillary - ONTA
0483	Cardiology: Echocardiology	Non-Therapy Ancillary - ONTA
0489	Cardiology: Other cardiology	Non-Therapy Ancillary - ONTA
0490	Ambulatory Surgery	Nursing
0499	Ambulatory Surgery: Other ambulatory surgical care	Nursing
0500	Outpatient Services	Nursing
0509	Other outpatient services	Nursing
0510	Clinic	Nursing
0511	Clinic: Chronic pain center	Nursing
0512	Clinic: Dental clinic	Nursing
0513	Clinic: Psychiatric clinic	Nursing
0514	Clinic: OB/GYN clinic	Nursing
0515	Clinic: Pediatric clinic	Nursing
0516	Clinic: Urgent care clinic	Nursing
0517	Clinic: Family clinic	Nursing
0519	Clinic: Other clinic	Nursing
0520	Free-Standing Clinic	Nursing
0521	Free-Standing clinic-Clinic visit by a member to RHC/FQHC	Nursing
0522	Free-Standing clinic-Home visit by a member to RHC/FQHC	Nursing
0523	Family Practice Clinic	Nursing
0524	RHC/FQHC visit in Part A covered SNF	Nursing

Revenue Code	Revenue Code Description	Category
0525	RHC/FQHC visit in noncovered SNF, NF, ICFMR or other	Nursing
0526	Urgent Care Clinic	Nursing
0527	Nurse visit to home in a HH shortage area	Nursing
0528	RHC/FQHC visit to other non RHC/FQHC site	Nursing
0529	Free-Standing Clinic: Other	Nursing
0530	Osteopathic Services	Therapy Ancillary - Physical
0531	Osteopathic Services: Osteopathic therapy	Therapy Ancillary - Physical
0539	Osteopathic Services: Other osteopathic services	Therapy Ancillary - Physical
0540	Ambulance	Nursing
0541	Supplies	Nursing
0542	Medical Transport	Nursing
0543	Heart Mobile	Nursing
0544	Oxygen	Nursing
0545	Air ambulance	Nursing
0546	Neonatal ambulance services	Nursing
0547	Pharmacy	Nursing
0548	Telephone Transmission EKG	Nursing
0549	Other ambulance	Nursing
0550	Skilled nursing	Nursing
0551	Visit charge	Nursing
0552	Hourly charge	Nursing
0559	Other skilled nursing	Nursing
0560	Home Health (HH) -- Medical Social Services	Nursing
0561	Home Heath (HH) Medical Social Services: Visit charge	Nursing
0562	Home Health (HH) Medical Social Services: Hourly charge	Nursing
0569	Home Health (HH) Medical Social Services: Other Medical Social Services	Nursing
0570	Home health-Home health aide	Nursing
0571	Visit charge	Nursing
0572	Hourly charge	Nursing
0579	Other home health aide	Nursing
0580	Home health-other visits	Nursing
0581	Visit charge	Nursing
0582	Hourly charge	Nursing
0583	Assessment	Nursing
0589	Other home health visit	Nursing
0590	Home health-units of service	Nursing
0600	Home health-oxygen	Nursing
0601	Oxygen-state/equip/suppl/ or cont	Nursing

Revenue Code	Revenue Code Description	Category
0602	Oxygen-state/equip/suppl/ or under 1 LPM	Nursing
0603	Oxygen-state/equip/over 4 LPM	Nursing
0604	Oxygen-Portable Add-on	Nursing
0610	Magnetic Resonance Tech. (MRT)	Non-Therapy Ancillary - ONTA
0611	Magnetic Resonance Tech. (MRT): Brain (incl. Brainstem)	Non-Therapy Ancillary - ONTA
0612	Magnetic Resonance Tech. (MRT): Spinal cord (incl. spine)	Non-Therapy Ancillary - ONTA
0614	Magnetic Resonance Tech. (MRT): MRI - Other	Non-Therapy Ancillary - ONTA
0615	Magnetic Resonance Tech. (MRT): MRA - Head and Neck	Non-Therapy Ancillary - ONTA
0616	Magnetic Resonance Tech. (MRT): MRA - Lower Ext	Non-Therapy Ancillary - ONTA
0618	Magnetic Resonance Tech. (MRT): MRA - Other	Non-Therapy Ancillary - ONTA
0619	Magnetic Resonance Tech. (MRT): Other MRT	Non-Therapy Ancillary - ONTA
0621	Med - Surg Supplies Ext. of 270: Incident to radiology	Non-Therapy Ancillary - ONTA
0622	Med - Surg Supplies Ext. of 270: Incident to other diag.	Non-Therapy Ancillary - ONTA
0623	Surgical dressings	Non-Therapy Ancillary - ONTA
0624	Med - Surg Supplies Ext. of 270: Investigational Device (IDE)	Nursing
0631	Drugs Require Specific ID: Single source drug	Non-Therapy Ancillary - Drug
0632	Drugs Require Specific ID: Multiple source drug	Non-Therapy Ancillary - Drug
0633	Drugs Require Specific ID: Restrictive prescription	Non-Therapy Ancillary - Drug
0634	Drugs Require Specific ID: EPO under 10,000 units	Non-Therapy Ancillary - Drug
0635	Drugs Require Specific ID: EPO over 10,000 units	Non-Therapy Ancillary - Drug
0636	Drugs Require Specific ID: Drugs requiring detail coding	Non-Therapy Ancillary - Drug
0637	Drugs Require Specific ID: Self admin drugs (insulin admin in emergency-diabetes coma)	Non-Therapy Ancillary - Drug
0640	Home IV Therapy Services	Nursing
0641	Nonroutine nursing, central line	Nursing
0642	IV site care, Central line	Nursing
0643	IV start/change, peripheral line	Nursing
0644	Nonroutine nursing, peripheral line	Nursing
0645	Training patient/caregiver, central line	Nursing
0646	Training, Disabled patient, central line	Nursing
0647	Training, patient/caregiver, peripheral line	Nursing
0648	Training, disabled patient, peripheral line	Nursing
0649	Other IV therapy services	Nursing
0650	Hospice service	Nursing
0651	Routine home care	Nursing
0652	Continuous home care	Nursing
0655	Inpatient respite care	Nursing

Revenue Code	Revenue Code Description	Category
0656	General inpatient care (non-respite)	Nursing
0657	Physician services	Nursing
0658	Hospice Room & Board-Nursing facility	Nursing
0659	Other hospice service	Nursing
0660	Respite Care	Nursing
0661	Hourly Respite Care Charge Nursing	Nursing
0662	Hourly Respite Care Charge Aide/Homemaker/Companion	Nursing
0663	Daily Respite Charge	Nursing
0669	Other respite care	Nursing
0670	Outpatient Special Residence Charges	Nursing
0671	Hospital based	Nursing
0672	Contracted	Nursing
0679	Other special residence charge	Nursing
0681	Trauma Response: Level I	Nursing
0682	Trauma Response: Level II	Nursing
0683	Trauma Response: Level III	Nursing
0684	Trauma Response: Level IV	Nursing
0689	Trauma Response: Other	Nursing
0700	Cast Room	Non-Therapy Ancillary - ONTA
0709	Other cast room	Non-Therapy Ancillary - ONTA
0710	Recovery Room	Non-Therapy Ancillary - ONTA
0719	Recovery Room: Other	Non-Therapy Ancillary - ONTA
0720	Labor Room	Nursing
0721	Labor Room: Labor	Nursing
0722	Labor Room: Delivery	Nursing
0723	Labor Room: Circumcision	Nursing
0724	Labor Room: Birthing center	Nursing
0729	Labor Room: Other labor room/delivery	Nursing
0730	EKG/ECG	Non-Therapy Ancillary - ONTA
0731	EKG/ECG: Holter monitor	Non-Therapy Ancillary - ONTA
0732	EKG/ECG: Telemetry	Non-Therapy Ancillary - ONTA
0739	EKG/ECG: Other EKG/ECG	Non-Therapy Ancillary - ONTA
0740	EEG	Non-Therapy Ancillary - ONTA
0749	EEG: Other	Non-Therapy Ancillary - ONTA
0750	Gastrointestinal	Non-Therapy Ancillary - ONTA
0759	Gastrointestinal: Other	Non-Therapy Ancillary - ONTA
0760	Treatment/Observation Room	Nursing
0761	Treatment/Observation Room: Treatment room	Nursing
0762	Treatment/Observation Room: Observation room	Nursing

Revenue Code	Revenue Code Description	Category
0769	Treatment/Observation Room: Other treatment room	Nursing
0770	Preventive Care Services	Nursing
0771	Preventive Care Services: Admin. of vaccine	Nursing
0780	Telemedicine	Nursing
0790	Extra-Corp Shock Wave Therapy	Nursing
0799	Extra-Corp Shock Wave Therapy: Other	Nursing
0800	Inpatient Dialysis	Non-Therapy Ancillary - ONTA
0801	Inpatient Hemodialysis	Non-Therapy Ancillary - ONTA
0802	Inpatient peritoneal dialysis	Non-Therapy Ancillary - ONTA
0803	inpatient dialysis CAPD	Non-Therapy Ancillary - ONTA
0804	Inpatient dialysis CCPD	Non-Therapy Ancillary - ONTA
0809	Other inp dialysis	Non-Therapy Ancillary - ONTA
0810	Organ Acquisition	Nursing
0811	Organ Acquisition: Living donor	Nursing
0812	Organ Acquisition: Cadaver donor	Nursing
0813	Organ Acquisition: Unknown donor	Nursing
0814	Organ Acquisition: Unsuccessful Organ Search Donor Bank Charges	Nursing
0819	Organ Acquisition: Other donor	Nursing
0820	Hemo OPD/Home	Nursing
0821	Hemo OPD/Home: Hemodialysis comp or other rate	Nursing
0822	Hemo OPD/Home supplies	Nursing
0823	Hemo OPD/home equipment	Nursing
0824	Hemo OPD/Home Maintenance 100%	Nursing
0825	Hemo OPD/Home Support Services	Nursing
0829	Hemo OPD/Home: Other HEMO outpatient	Nursing
0830	Peritoneal OPD/Home	Nursing
0831	Peritoneal OPD/Home: Peritoneal comp or other rate	Nursing
0832	Home supplies	Nursing
0833	Home equipment	Nursing
0834	Maintenance/100%	Nursing
0835	Support services	Nursing
0839	Peritoneal OPD/Home: Other peritoneal dialysis	Nursing
0840	CAPD OPD/Home	Nursing
0841	CAPD OPD/Home: CAPD comp or other rate	Nursing
0842	Home supplies	Nursing
0843	Home equipment	Nursing
0844	Maintenance/100%	Nursing
0845	Support services	Nursing
0849	CAPD OPD/Home: Other CAPD dialysis	Nursing

Revenue Code	Revenue Code Description	Category
0850	CCPD OPD/Home	Nursing
0851	CCPD OPD/Home: CCPD comp or other rate	Nursing
0852	Home supplies	Nursing
0853	Home equipment	Nursing
0854	Maintenance/100%	Nursing
0855	Support services	Nursing
0859	CCPD OPD/Home: Other CCPD dialysis	Nursing
0880	Miscellaneous Dialysis	Nursing
0881	Miscellaneous Dialysis: Ultrafiltration	Nursing
0882	Home dialysis aid visit	Nursing
0889	Miscellaneous Dialysis: Other misc dialysis	Nursing
0900	Behavior Health Treatment/Services - general classification	Nursing
0901	Behavior Health Treatment/Services - electroshock treatment	Nursing
0902	Behavior Health Treatment/Services - milieu therapy	Nursing
0903	Behavior Health/Therapy/Services - play therapy	Nursing
0904	Behavior Health Therapy/Services - activity therapy	Nursing
0905	Behavior Health Therapy/Services - intensive outpatient services-psychiatric	Nursing
0906	Behavior Health Therapy/Services - intensive outpatient services-chemical dependency	Nursing
0907	Behavior Health Therapy/Services - community behavioral health program-day treatment	Nursing
0911	Behavioral Health Treatment/Services-rehabilitation	Nursing
0912	Behavioral Health Treatment/Services-partial hospitalization-less intensive	Nursing
0913	Behavioral Health Treatment/Services-partial hospitalization-intensive	Nursing
0914	Behavioral Health Treatment/Services-individual therapy	Nursing
0915	Behavioral Health Treatment/Services-group therapy	Nursing
0916	Behavioral Health Treatment/Services-family therapy	Nursing
0917	Behavioral Health Treatment/Services-biofeedback	Nursing
0918	Behavioral Health Treatment/Services-testing	Nursing
0919	Behavioral Health Treatment/Services-other	Nursing
0920	Other Diagnostic Services	Non-Therapy Ancillary - ONTA
0921	Other Diagnostic Services: Peripheral vascular lab	Non-Therapy Ancillary - ONTA
0922	Other Diagnostic Services: Electromyelogram	Non-Therapy Ancillary - ONTA
0923	Other Diagnostic Services: Pap smear	Nursing
0924	Other Diagnostic Services: Allergy test	Nursing
0925	Other Diagnostic Services: Pregnancy test	Nursing
0929	Other Diagnostic Services: Other diagnostic services	Non-Therapy Ancillary - ONTA
0931	Medical rehab; half day	Nursing

Revenue Code	Revenue Code Description	Category
0932	Medical rehab; full day	Nursing
0940	Other Therapeutic Serv	Nursing
0941	Other Therapeutic Serv: Recreation Rx	Nursing
0942	Other Therapeutic Serv: Educ/training	Nursing
0943	Other Therapeutic Serv: Cardiac rehab	Nursing
0944	Other Therapeutic Serv: Drug rehab	Nursing
0945	Other Therapeutic Serv: Alcohol rehab	Nursing
0946	Complex medical equipment-Routine	Nursing
0947	Complex medical equipment-Ancillary	Nursing
0948	Pulmonary Rehabilitation	Nursing
0949	Other Therapeutic Serv: Additional RX SVS	Nursing
0951	Other therapeutic services-(940x) Athletic training	Nursing
0952	Other therapeutic services-(940x) Kinesiotherapy	Nursing
0960	Professional fees	Nursing
0961	Psychiatric	Nursing
0962	Ophthalmology	Nursing
0963	Anesthesiologist (MD)	Nursing
0964	Anesthetist (CRNA)	Nursing
0969	Other professional fee	Nursing
0971	Professional fees (096x) Laboratory	Nursing
0972	Professional fees (096x) Radiology-Diagnostic	Nursing
0973	Professional fees (096x) Radiology-Therapeutic	Nursing
0974	Professional fees (096x) Radiology-nuclear medicine	Nursing
0975	Professional fees (096x) Operating room	Nursing
0976	Professional fees (096x) Respiratory Therapy	Nursing
0977	Professional fees (096x) Physical therapy	Nursing
0978	Professional fees (096x) Occupational therapy	Nursing
0979	Professional fees (096x) Speech pathology	Nursing
0981	Professional fees (096x) Emergency room	Nursing
0982	Professional fees (096x) Outpatient services	Nursing
0983	Professional fees (096x) clinic	Nursing
0984	Professional fees (096x) medical social services	Nursing
0985	Professional fees (096x) EKG	Nursing
0986	Professional fees (096x) EEK	Nursing
0987	Professional fees (096x) Hospital visit	Nursing
0988	Professional fees (096x) Consultation	Nursing
0989	Private duty nurse	Nursing
0990	Patient convenience items	Nursing
0991	Cafeteria/guest tray	Nursing

Revenue Code	Revenue Code Description	Category
0992	private linen service	Nursing
0993	telephone/telegraph	Nursing
0994	TV/radio	Nursing
0995	Nonpatient room rentals	Nursing
0996	Late discharge charge	Nursing
0997	admission kits	Nursing
0998	Beauty shop/barber	Nursing
0999	Other patient convenience item	Nursing

Table 75: List of Ancillary Service Cost Centers on Form "SNF CMS 2540-10" (Freestanding SNFs)

Ancillary Service Cost Center	Category
Radiology	Non-Therapy Ancillary - ONTA
Laboratory	Non-Therapy Ancillary - ONTA
Intravenous Therapy	Non-Therapy Ancillary - Drug
Oxygen (Inhalation) Therapy	Non-Therapy Ancillary - Respiratory
Physical Therapy	Physical Therapy
Occupational Therapy	Occupational Therapy
Speech Pathology	Speech Pathology
Electrocardiology	Non-Therapy Ancillary - ONTA
Medical Supplies Charged to Patients	Non-Therapy Ancillary - ONTA
Drugs Charged to Patients	Non-Therapy Ancillary - Drug
Dental Care - Title XIX Only	Non-Therapy Ancillary - ONTA
Support Surfaces	Non-Therapy Ancillary - ONTA
Other Ancillary Service Cost	Non-Therapy Ancillary - ONTA

Table 76: List of Ancillary Service Cost Centers on Form "CMS 2552-10" (Hospital-based SNFs and Swing Bed Facilities)

Ancillary Service Cost Center	Category
Operating Room	Non-Therapy Ancillary - ONTA
Recovery Room	Non-Therapy Ancillary - ONTA
Labor Room and Delivery Room	Non-Therapy Ancillary - ONTA
Anesthesiology	Non-Therapy Ancillary - ONTA
Radiology- Diagnostic	Non-Therapy Ancillary - ONTA
Radiology-Therapeutic	Non-Therapy Ancillary - ONTA
Radioisotope	Non-Therapy Ancillary - ONTA

Ancillary Service Cost Center	Category
Computed Tomography (CT) Scan	Non-Therapy Ancillary - ONTA
Magnetic Resonance Imaging (MRI)	Non-Therapy Ancillary - ONTA
Cardiac Catheterization	Non-Therapy Ancillary - ONTA
Laboratory	Non-Therapy Ancillary - ONTA
PBP Clinical Laboratory Services - Prgm. Only	Excluded
Whole Blood & Packed Red Blood Cells	Non-Therapy Ancillary - ONTA
Blood Storing, Processing, & Trans.	Non-Therapy Ancillary - ONTA
Intravenous Therapy	Non-Therapy Ancillary - Drug
Respiratory Therapy	Non-Therapy Ancillary - Respiratory
Physical Therapy	Physical Therapy
Occupational Therapy	Occupational Therapy
Speech Pathology	Speech Pathology
Electrocardiology	Non-Therapy Ancillary - ONTA
Electroencephalography	Non-Therapy Ancillary - ONTA
Medical Supplies Charged to Patients	Non-Therapy Ancillary - ONTA
Implantable Devices Charged to Patients	Non-Therapy Ancillary - ONTA
Drugs Charged to Patients	Non-Therapy Ancillary - Drug
Renal Dialysis	Non-Therapy Ancillary - ONTA
ASC(Non-Distinct Part)	Non-Therapy Ancillary - ONTA
Other Ancillary (specify)	Non-Therapy Ancillary - ONTA

Table 77: Nursing Index and Average NTA Costs per Day by RUG

Longest RUG of Stay	# Stays*	% Stays	Avg. NTA Costs per Day	FY2017 Nursing Index
ES3	3,803	0.2%	$198	3.58
RUX	8,130	0.4%	$96	2.67
ES2	3,206	0.2%	$186	2.67
RVX	3,480	0.2%	$111	2.61
RUL	7,392	0.4%	$74	2.57
RHX	1,362	0.1%	$135	2.55
RMX	934	0.0%	$171	2.47
ES1	2,659	0.1%	$177	2.32
RLX	26	0.0%	$299	2.26
HE2	1,604	0.1%	$95	2.22
RVL	3,377	0.2%	$94	2.19
RML	410	0.0%	$165	2.19
RHL	1,135	0.1%	$127	2.15
HD2	1,882	0.1%	$119	2.04
LE2	1,058	0.1%	$92	1.96
HC2	1,462	0.1%	$128	1.89
HB2	626	0.0%	$151	1.86
LD2	1,204	0.1%	$121	1.86
HE1	7,364	0.4%	$122	1.74
CE2	550	0.0%	$83	1.68
HD1	10,949	0.6%	$157	1.60
RUC	314,105	16.5%	$56	1.56
RUB	482,811	25.4%	$50	1.56
LC2	752	0.0%	$115	1.56
CD2	777	0.0%	$105	1.56
LE1	7,647	0.4%	$109	1.54
RVC	139,791	7.4%	$72	1.51
RLB	1,124	0.1%	$174	1.50
CE1	3,970	0.2%	$111	1.50
PE2	51	0.0%	$42	1.50
HC1	10,481	0.6%	$178	1.48
HB1	9,204	0.5%	$186	1.46
LD1	13,642	0.7%	$136	1.46
RHC	50,444	2.7%	$88	1.45
LB2	224	0.0%	$148	1.45
PE1	2,529	0.1%	$88	1.40
CD1	12,119	0.6%	$146	1.38
PD2	69	0.0%	$66	1.38
RMC	27,681	1.5%	$97	1.36
CC2	686	0.0%	$141	1.29
PD1	7,714	0.4%	$117	1.28
RMB	21,027	1.1%	$113	1.22
LC1	11,725	0.6%	$163	1.22
RHB	41,012	2.2%	$92	1.19
CC1	15,924	0.8%	$161	1.15

Longest RUG of Stay	# Stays*	% Stays	Avg. NTA Costs per Day	FY2017 Nursing Index
CB2	348	0.0%	$169	1.15
LB1	5,294	0.3%	$200	1.14
RVB	148,959	7.8%	$68	1.11
RVA	120,678	6.4%	$73	1.10
PC2	103	0.0%	$57	1.10
CB1	11,995	0.6%	$185	1.02
PC1	12,240	0.6%	$134	1.02
RUA	267,511	14.1%	$57	0.99
BB2	21	0.0%	$59	0.97
RHA	36,287	1.9%	$96	0.91
BB1	2,916	0.2%	$128	0.90
CA2	508	0.0%	$197	0.88
RMA	18,254	1.0%	$126	0.84
PB2	33	0.0%	$87	0.84
CA1	16,557	0.9%	$216	0.78
PB1	8,351	0.4%	$160	0.78
RLA	708	0.0%	$225	0.71
BA2	22	0.0%	$36	0.70
BA1	2,206	0.1%	$125	0.64
PA2	22	0.0%	$59	0.59
PA1	7,925	0.4%	$188	0.54

*Stay counts do not add up to the full study population because for a small number of stays the longest reported RUG is SD, which is not a valid RUG-IV value.

Table 78: Mapping between MS-DRG Groups and Clinical Categories

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
000	Ungroupable	Medical Management	Non-Neurologic
001	Heart Transplant Or Implant Of Heart Assist System W MCC	Non-Orthopedic Surgery	Non-Neurologic
002	Heart Transplant Or Implant Of Heart Assist System W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
003	Ecmo Or Trach W Mv >96 Hrs Or Pdx Exc Face, Mouth & Neck W Maj O.R.	Non-Orthopedic Surgery	Non-Neurologic
004	Trach W Mv >96 Hrs Or Pdx Exc Face, Mouth & Neck W/O Maj O.R.	Non-Orthopedic Surgery	Non-Neurologic
005	Liver Transplant W Mcc Or Intestinal Transplant	Non-Orthopedic Surgery	Non-Neurologic
006	Liver Transplant W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
007	Lung Transplant	Non-Orthopedic Surgery	Non-Neurologic
008	Simultaneous Pancreas/Kidney Transplant	Non-Orthopedic Surgery	Non-Neurologic
010	Pancreas Transplant	Non-Orthopedic Surgery	Non-Neurologic
011	Tracheostomy For Face,mouth & Neck Diagnoses W MCC	Non-Orthopedic Surgery	Non-Neurologic
012	Tracheostomy For Face,mouth & Neck Diagnoses W CC	Non-Orthopedic Surgery	Non-Neurologic
013	Tracheostomy For Face,mouth & Neck Diagnoses W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
014	Allogeneic Bone Marrow Transplant	Non-Orthopedic Surgery	Non-Neurologic
016	Autologous Bone Marrow Transplant W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
017	Autologous Bone Marrow Transplant W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
020	Intracranial Vascular Procedures W Pdx Hemorrhage W MCC	Non-Orthopedic Surgery	Non-Neurologic
021	Intracranial Vascular Procedures W Pdx Hemorrhage W CC	Non-Orthopedic Surgery	Non-Neurologic
022	Intracranial Vascular Procedures W Pdx Hemorrhage W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
023	Cranio W Major Dev Impl/Acute Complex Cns Pdx W Mcc Or Chemo Implant	Acute Neurologic	Acute Neurologic
024	Cranio W Major Dev Impl/Acute Complex Cns Pdx W/O MCC	Acute Neurologic	Acute Neurologic
025	Craniotomy & Endovascular Intracranial Procedures W MCC	Acute Neurologic	Acute Neurologic
026	Craniotomy & Endovascular Intracranial Procedures W CC	Acute Neurologic	Acute Neurologic
027	Craniotomy & Endovascular Intracranial Procedures W/O CC/MCC	Acute Neurologic	Acute Neurologic

[50] Centers for Medicare & Medicaid Services (CMS), Department of Health and Human Services (HHS);
"FY 2014 Final Rule Tables," *CMS.gov,* https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY-2014-IPPS-Final-Rule-Home-Page-Items/FY-2014-IPPS-Final-Rule-CMS-1599-F-Tables.html;
"FY 2015 Final Rule Tables," *CMS.gov,* https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY2015-IPPS-Final-Rule-Home-Page-Items/FY2015-Final-Rule-Tables.html;
"FY 2016 Final Rule, Correction Notice and Consolidated Appropriations Act of 2016 Tables," *CMS.gov,* https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY2016-IPPS-Final-Rule-Home-Page-Items/FY2016-IPPS-Final-Rule-Tables.html;
"FY 2017 Final Rule and Correction Notice Tables," *CMS.gov,* https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY2017-IPPS-Final-Rule-Home-Page-Items/FY2017-IPPS-Final-Rule-Tables.html.

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
028	Spinal Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
029	Spinal Procedures W Cc Or Spinal Neurostimulators	Non-Orthopedic Surgery	Non-Neurologic
030	Spinal Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
031	Ventricular Shunt Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
032	Ventricular Shunt Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
033	Ventricular Shunt Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
034	Carotid Artery Stent Procedure W MCC	Non-Orthopedic Surgery	Non-Neurologic
035	Carotid Artery Stent Procedure W CC	Non-Orthopedic Surgery	Non-Neurologic
036	Carotid Artery Stent Procedure W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
037	Extracranial Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
038	Extracranial Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
039	Extracranial Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
040	Periph/Cranial Nerve & Other Nerv Syst Proc W MCC	Non-Orthopedic Surgery	Non-Neurologic
041	Periph/Cranial Nerve & Other Nerv Syst Proc W Cc Or Periph Neurostim	Non-Orthopedic Surgery	Non-Neurologic
042	Periph/Cranial Nerve & Other Nerv Syst Proc W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
052	Spinal Disorders & Injuries W CC/MCC	Acute Neurologic	Acute Neurologic
053	Spinal Disorders & Injuries W/O CC/MCC	Acute Neurologic	Acute Neurologic
054	Nervous System Neoplasms W MCC	Medical Management	Non-Neurologic
055	Nervous System Neoplasms W/O MCC	Medical Management	Non-Neurologic
056	Degenerative Nervous System Disorders W MCC	Medical Management	Non-Neurologic
057	Degenerative Nervous System Disorders W/O MCC	Medical Management	Non-Neurologic
058	Multiple Sclerosis & Cerebellar Ataxia W MCC	Acute Neurologic	Acute Neurologic
059	Multiple Sclerosis & Cerebellar Ataxia W CC	Acute Neurologic	Acute Neurologic
060	Multiple Sclerosis & Cerebellar Ataxia W/O CC/MCC	Acute Neurologic	Acute Neurologic
061	Acute Ischemic Stroke W Use Of Thrombolytic Agent W MCC	Acute Neurologic	Acute Neurologic
062	Acute Ischemic Stroke W Use Of Thrombolytic Agent W CC	Acute Neurologic	Acute Neurologic
063	Acute Ischemic Stroke W Use Of Thrombolytic Agent W/O CC/MCC	Acute Neurologic	Acute Neurologic
064	Intracranial Hemorrhage Or Cerebral Infarction W MCC	Acute Neurologic	Acute Neurologic
065	Intracranial Hemorrhage Or Cerebral Infarction W Cc Or Tpa In 24 Hrs	Acute Neurologic	Acute Neurologic
066	Intracranial Hemorrhage Or Cerebral Infarction W/O CC/MCC	Acute Neurologic	Acute Neurologic
067	Nonspecific Cva & Precerebral Occlusion W/O Infarct W MCC	Acute Neurologic	Acute Neurologic
068	Nonspecific Cva & Precerebral Occlusion W/O Infarct W/O MCC	Acute Neurologic	Acute Neurologic
069	Transient Ischemia	Acute Neurologic	Acute Neurologic
070	Nonspecific Cerebrovascular Disorders W MCC	Medical Management	Non-Neurologic
071	Nonspecific Cerebrovascular Disorders W CC	Medical Management	Non-Neurologic
072	Nonspecific Cerebrovascular Disorders W/O CC/MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
073	Cranial & Peripheral Nerve Disorders W MCC	Medical Management	Non-Neurologic
074	Cranial & Peripheral Nerve Disorders W/O MCC	Medical Management	Non-Neurologic
075	Viral Meningitis W CC/MCC	Acute Neurologic	Acute Neurologic
076	Viral Meningitis W/O CC/MCC	Acute Neurologic	Acute Neurologic
077	Hypertensive Encephalopathy W MCC	Acute Neurologic	Acute Neurologic
078	Hypertensive Encephalopathy W CC	Acute Neurologic	Acute Neurologic
079	Hypertensive Encephalopathy W/O CC/MCC	Acute Neurologic	Acute Neurologic
080	Nontraumatic Stupor & Coma W MCC	Medical Management	Non-Neurologic
081	Nontraumatic Stupor & Coma W/O MCC	Medical Management	Non-Neurologic
082	Traumatic Stupor & Coma, Coma >1 Hr W MCC	Acute Neurologic	Acute Neurologic
083	Traumatic Stupor & Coma, Coma >1 Hr W CC	Acute Neurologic	Acute Neurologic
084	Traumatic Stupor & Coma, Coma >1 Hr W/O CC/MCC	Acute Neurologic	Acute Neurologic
085	Traumatic Stupor & Coma, Coma <1 Hr W MCC	Acute Neurologic	Acute Neurologic
086	Traumatic Stupor & Coma, Coma <1 Hr W CC	Acute Neurologic	Acute Neurologic
087	Traumatic Stupor & Coma, Coma <1 Hr W/O CC/MCC	Acute Neurologic	Acute Neurologic
088	Concussion W MCC	Acute Neurologic	Acute Neurologic
089	Concussion W CC	Acute Neurologic	Acute Neurologic
090	Concussion W/O CC/MCC	Acute Neurologic	Acute Neurologic
091	Other Disorders Of Nervous System W MCC	Acute Neurologic	Acute Neurologic
092	Other Disorders Of Nervous System W CC	Acute Neurologic	Acute Neurologic
093	Other Disorders Of Nervous System W/O CC/MCC	Acute Neurologic	Acute Neurologic
094	Bacterial & Tuberculous Infections Of Nervous System W MCC	Medical Management	Non-Neurologic
095	Bacterial & Tuberculous Infections Of Nervous System W CC	Medical Management	Non-Neurologic
096	Bacterial & Tuberculous Infections Of Nervous System W/O CC/MCC	Medical Management	Non-Neurologic
097	Non-Bacterial Infect Of Nervous Sys Exc Viral Meningitis W MCC	Acute Neurologic	Acute Neurologic
098	Non-Bacterial Infect Of Nervous Sys Exc Viral Meningitis W CC	Acute Neurologic	Acute Neurologic
099	Non-Bacterial Infect Of Nervous Sys Exc Viral Meningitis W/O CC/MCC	Acute Neurologic	Acute Neurologic
100	Seizures W MCC	Medical Management	Non-Neurologic
101	Seizures W/O MCC	Medical Management	Non-Neurologic
102	Headaches W MCC	Medical Management	Non-Neurologic
103	Headaches W/O MCC	Medical Management	Non-Neurologic
113	Orbital Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
114	Orbital Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
115	Extraocular Procedures Except Orbit	Non-Orthopedic Surgery	Non-Neurologic
116	Intraocular Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
117	Intraocular Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
121	Acute Major Eye Infections W CC/MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
122	Acute Major Eye Infections W/O CC/MCC	Medical Management	Non-Neurologic
123	Neurological Eye Disorders	Medical Management	Non-Neurologic
124	Other Disorders Of The Eye W MCC	Medical Management	Non-Neurologic
125	Other Disorders Of The Eye W/O MCC	Medical Management	Non-Neurologic
129	Major Head & Neck Procedures W Cc/Mcc Or Major Device	Non-Orthopedic Surgery	Non-Neurologic
130	Major Head & Neck Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
131	Cranial/Facial Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
132	Cranial/Facial Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
133	Other Ear, Nose, Mouth & Throat O.R. Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
134	Other Ear, Nose, Mouth & Throat O.R. Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
135	Sinus & Mastoid Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
136	Sinus & Mastoid Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
137	Mouth Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
138	Mouth Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
139	Salivary Gland Procedures	Non-Orthopedic Surgery	Non-Neurologic
146	Ear, Nose, Mouth & Throat Malignancy W MCC	Medical Management	Non-Neurologic
147	Ear, Nose, Mouth & Throat Malignancy W CC	Medical Management	Non-Neurologic
148	Ear, Nose, Mouth & Throat Malignancy W/O CC/MCC	Medical Management	Non-Neurologic
149	Dysequilibrium	Medical Management	Non-Neurologic
150	Epistaxis W MCC	Medical Management	Non-Neurologic
151	Epistaxis W/O MCC	Medical Management	Non-Neurologic
152	Otitis Media & Uri W MCC	Medical Management	Non-Neurologic
153	Otitis Media & Uri W/O MCC	Medical Management	Non-Neurologic
154	Other Ear, Nose, Mouth & Throat Diagnoses W MCC	Medical Management	Non-Neurologic
155	Other Ear, Nose, Mouth & Throat Diagnoses W CC	Medical Management	Non-Neurologic
156	Other Ear, Nose, Mouth & Throat Diagnoses W/O CC/MCC	Medical Management	Non-Neurologic
157	Dental & Oral Diseases W MCC	Medical Management	Non-Neurologic
158	Dental & Oral Diseases W CC	Medical Management	Non-Neurologic
159	Dental & Oral Diseases W/O CC/MCC	Medical Management	Non-Neurologic
163	Major Chest Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
164	Major Chest Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
165	Major Chest Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
166	Other Resp System O.R. Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
167	Other Resp System O.R. Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
168	Other Resp System O.R. Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
175	Pulmonary Embolism W MCC	Medical Management	Non-Neurologic
176	Pulmonary Embolism W/O MCC	Medical Management	Non-Neurologic
177	Respiratory Infections & Inflammations W MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
178	Respiratory Infections & Inflammations W CC	Medical Management	Non-Neurologic
179	Respiratory Infections & Inflammations W/O CC/MCC	Medical Management	Non-Neurologic
180	Respiratory Neoplasms W MCC	Medical Management	Non-Neurologic
181	Respiratory Neoplasms W CC	Medical Management	Non-Neurologic
182	Respiratory Neoplasms W/O CC/MCC	Medical Management	Non-Neurologic
183	Major Chest Trauma W MCC	Medical Management	Non-Neurologic
184	Major Chest Trauma W CC	Medical Management	Non-Neurologic
185	Major Chest Trauma W/O CC/MCC	Medical Management	Non-Neurologic
186	Pleural Effusion W MCC	Medical Management	Non-Neurologic
187	Pleural Effusion W CC	Medical Management	Non-Neurologic
188	Pleural Effusion W/O CC/MCC	Medical Management	Non-Neurologic
189	Pulmonary Edema & Respiratory Failure	Medical Management	Non-Neurologic
190	Chronic Obstructive Pulmonary Disease W MCC	Medical Management	Non-Neurologic
191	Chronic Obstructive Pulmonary Disease W CC	Medical Management	Non-Neurologic
192	Chronic Obstructive Pulmonary Disease W/O CC/MCC	Medical Management	Non-Neurologic
193	Simple Pneumonia & Pleurisy W MCC	Medical Management	Non-Neurologic
194	Simple Pneumonia & Pleurisy W CC	Medical Management	Non-Neurologic
195	Simple Pneumonia & Pleurisy W/O CC/MCC	Medical Management	Non-Neurologic
196	Interstitial Lung Disease W MCC	Medical Management	Non-Neurologic
197	Interstitial Lung Disease W CC	Medical Management	Non-Neurologic
198	Interstitial Lung Disease W/O CC/MCC	Medical Management	Non-Neurologic
199	Pneumothorax W MCC	Medical Management	Non-Neurologic
200	Pneumothorax W CC	Medical Management	Non-Neurologic
201	Pneumothorax W/O CC/MCC	Medical Management	Non-Neurologic
202	Bronchitis & Asthma W CC/MCC	Medical Management	Non-Neurologic
203	Bronchitis & Asthma W/O CC/MCC	Medical Management	Non-Neurologic
204	Respiratory Signs & Symptoms	Medical Management	Non-Neurologic
205	Other Respiratory System Diagnoses W MCC	Medical Management	Non-Neurologic
206	Other Respiratory System Diagnoses W/O MCC	Medical Management	Non-Neurologic
207	Respiratory System Diagnosis W Ventilator Support >96 Hours	Medical Management	Non-Neurologic
208	Respiratory System Diagnosis W Ventilator Support <=96 Hours	Medical Management	Non-Neurologic
215	Other Heart Assist System Implant	Non-Orthopedic Surgery	Non-Neurologic
216	Cardiac Valve & Oth Maj Cardiothoracic Proc W Card Cath W MCC	Non-Orthopedic Surgery	Non-Neurologic
217	Cardiac Valve & Oth Maj Cardiothoracic Proc W Card Cath W CC	Non-Orthopedic Surgery	Non-Neurologic
218	Cardiac Valve & Oth Maj Cardiothoracic Proc W Card Cath W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
219	Cardiac Valve & Oth Maj Cardiothoracic Proc W/O Card Cath W MCC	Non-Orthopedic Surgery	Non-Neurologic
220	Cardiac Valve & Oth Maj Cardiothoracic Proc W/O Card Cath W CC	Non-Orthopedic Surgery	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
221	Cardiac Valve & Oth Maj Cardiothoracic Proc W/O Card Cath W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
222	Cardiac Defib Implant W Cardiac Cath W Ami/Hf/Shock W MCC	Non-Orthopedic Surgery	Non-Neurologic
223	Cardiac Defib Implant W Cardiac Cath W Ami/Hf/Shock W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
224	Cardiac Defib Implant W Cardiac Cath W/O Ami/Hf/Shock W MCC	Non-Orthopedic Surgery	Non-Neurologic
225	Cardiac Defib Implant W Cardiac Cath W/O Ami/Hf/Shock W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
226	Cardiac Defibrillator Implant W/O Cardiac Cath W MCC	Non-Orthopedic Surgery	Non-Neurologic
227	Cardiac Defibrillator Implant W/O Cardiac Cath W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
228	Other Cardiothoracic Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
229	Other Cardiothoracic Procedures W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
230	Other Cardiothoracic Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
231	Coronary Bypass W Ptca W MCC	Non-Orthopedic Surgery	Non-Neurologic
232	Coronary Bypass W Ptca W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
233	Coronary Bypass W Cardiac Cath W MCC	Non-Orthopedic Surgery	Non-Neurologic
234	Coronary Bypass W Cardiac Cath W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
235	Coronary Bypass W/O Cardiac Cath W MCC	Non-Orthopedic Surgery	Non-Neurologic
236	Coronary Bypass W/O Cardiac Cath W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
237	Major Cardiovasc Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
238	Major Cardiovasc Procedures W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
239	Amputation For Circ Sys Disorders Exc Upper Limb & Toe W MCC	Other Orthopedic	Non-Neurologic
240	Amputation For Circ Sys Disorders Exc Upper Limb & Toe W CC	Other Orthopedic	Non-Neurologic
241	Amputation For Circ Sys Disorders Exc Upper Limb & Toe W/O CC/MCC	Other Orthopedic	Non-Neurologic
242	Permanent Cardiac Pacemaker Implant W MCC	Non-Orthopedic Surgery	Non-Neurologic
243	Permanent Cardiac Pacemaker Implant W CC	Non-Orthopedic Surgery	Non-Neurologic
244	Permanent Cardiac Pacemaker Implant W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
245	Aicd Generator Procedures	Non-Orthopedic Surgery	Non-Neurologic
246	Perc Cardiovasc Proc W Drug-Eluting Stent W Mcc Or 4+ Vessels/Stents	Non-Orthopedic Surgery	Non-Neurologic
247	Perc Cardiovasc Proc W Drug-Eluting Stent W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
248	Perc Cardiovasc Proc W Non-Drug-Eluting Stent W Mcc Or 4+ Ves/Stents	Non-Orthopedic Surgery	Non-Neurologic
249	Perc Cardiovasc Proc W Non-Drug-Eluting Stent W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
250	Perc Cardiovasc Proc W/O Coronary Artery Stent W MCC	Non-Orthopedic Surgery	Non-Neurologic
251	Perc Cardiovasc Proc W/O Coronary Artery Stent W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
252	Other Vascular Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
253	Other Vascular Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
254	Other Vascular Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
255	Upper Limb & Toe Amputation For Circ System Disorders W MCC	Other Orthopedic	Non-Neurologic
256	Upper Limb & Toe Amputation For Circ System Disorders W CC	Other Orthopedic	Non-Neurologic
257	Upper Limb & Toe Amputation For Circ System Disorders W/O CC/MCC	Other Orthopedic	Non-Neurologic
258	Cardiac Pacemaker Device Replacement W MCC	Non-Orthopedic Surgery	Non-Neurologic
259	Cardiac Pacemaker Device Replacement W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
260	Cardiac Pacemaker Revision Except Device Replacement W MCC	Non-Orthopedic Surgery	Non-Neurologic
261	Cardiac Pacemaker Revision Except Device Replacement W CC	Non-Orthopedic Surgery	Non-Neurologic
262	Cardiac Pacemaker Revision Except Device Replacement W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
263	Vein Ligation & Stripping	Non-Orthopedic Surgery	Non-Neurologic
264	Other Circulatory System O.R. Procedures	Non-Orthopedic Surgery	Non-Neurologic
265	Aicd Lead Procedures	Non-Orthopedic Surgery	Non-Neurologic
266	Endovascular Cardiac Valve Replacement W MCC	Medical Management	Non-Neurologic
267	Endovascular Cardiac Valve Replacement W/O MCC	Medical Management	Non-Neurologic
268	Aortic And Heart Assist Procedures Except Pulsation Balloon W MCC	Medical Management	Non-Neurologic
269	Aortic And Heart Assist Procedures Except Pulsation Balloon W/O MCC	Medical Management	Non-Neurologic
270	Other Major Cardiovascular Procedures W MCC	Medical Management	Non-Neurologic
271	Other Major Cardiovascular Procedures W CC	Medical Management	Non-Neurologic
272	Other Major Cardiovascular Procedures W/O CC/MCC	Medical Management	Non-Neurologic
273	Percutaneous Intracardiac Procedures W MCC	Medical Management	Non-Neurologic
274	Percutaneous Intracardiac Procedures W/O MCC	Medical Management	Non-Neurologic
280	Acute Myocardial Infarction, Discharged Alive W MCC	Medical Management	Non-Neurologic
281	Acute Myocardial Infarction, Discharged Alive W CC	Medical Management	Non-Neurologic
282	Acute Myocardial Infarction, Discharged Alive W/O CC/MCC	Medical Management	Non-Neurologic
283	Acute Myocardial Infarction, Expired W MCC	Medical Management	Non-Neurologic
284	Acute Myocardial Infarction, Expired W CC	Medical Management	Non-Neurologic
285	Acute Myocardial Infarction, Expired W/O CC/MCC	Medical Management	Non-Neurologic
286	Circulatory Disorders Except Ami, W Card Cath W MCC	Medical Management	Non-Neurologic
287	Circulatory Disorders Except Ami, W Card Cath W/O MCC	Medical Management	Non-Neurologic
288	Acute & Subacute Endocarditis W MCC	Medical Management	Non-Neurologic
289	Acute & Subacute Endocarditis W CC	Medical Management	Non-Neurologic
290	Acute & Subacute Endocarditis W/O CC/MCC	Medical Management	Non-Neurologic
291	Heart Failure & Shock W MCC	Medical Management	Non-Neurologic
292	Heart Failure & Shock W CC	Medical Management	Non-Neurologic
293	Heart Failure & Shock W/O CC/MCC	Medical Management	Non-Neurologic
294	Deep Vein Thrombophlebitis W CC/MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
295	Deep Vein Thrombophlebitis W/O CC/MCC	Medical Management	Non-Neurologic
296	Cardiac Arrest, Unexplained W MCC	Medical Management	Non-Neurologic
297	Cardiac Arrest, Unexplained W CC	Medical Management	Non-Neurologic
298	Cardiac Arrest, Unexplained W/O CC/MCC	Medical Management	Non-Neurologic
299	Peripheral Vascular Disorders W MCC	Medical Management	Non-Neurologic
300	Peripheral Vascular Disorders W CC	Medical Management	Non-Neurologic
301	Peripheral Vascular Disorders W/O CC/MCC	Medical Management	Non-Neurologic
302	Atherosclerosis W MCC	Medical Management	Non-Neurologic
303	Atherosclerosis W/O MCC	Medical Management	Non-Neurologic
304	Hypertension W MCC	Medical Management	Non-Neurologic
305	Hypertension W/O MCC	Medical Management	Non-Neurologic
306	Cardiac Congenital & Valvular Disorders W MCC	Medical Management	Non-Neurologic
307	Cardiac Congenital & Valvular Disorders W/O MCC	Medical Management	Non-Neurologic
308	Cardiac Arrhythmia & Conduction Disorders W MCC	Medical Management	Non-Neurologic
309	Cardiac Arrhythmia & Conduction Disorders W CC	Medical Management	Non-Neurologic
310	Cardiac Arrhythmia & Conduction Disorders W/O CC/MCC	Medical Management	Non-Neurologic
311	Angina Pectoris	Medical Management	Non-Neurologic
312	Syncope & Collapse	Medical Management	Non-Neurologic
313	Chest Pain	Medical Management	Non-Neurologic
314	Other Circulatory System Diagnoses W MCC	Medical Management	Non-Neurologic
315	Other Circulatory System Diagnoses W CC	Medical Management	Non-Neurologic
316	Other Circulatory System Diagnoses W/O CC/MCC	Medical Management	Non-Neurologic
326	Stomach, Esophageal & Duodenal Proc W MCC	Non-Orthopedic Surgery	Non-Neurologic
327	Stomach, Esophageal & Duodenal Proc W CC	Non-Orthopedic Surgery	Non-Neurologic
328	Stomach, Esophageal & Duodenal Proc W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
329	Major Small & Large Bowel Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
330	Major Small & Large Bowel Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
331	Major Small & Large Bowel Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
332	Rectal Resection W MCC	Non-Orthopedic Surgery	Non-Neurologic
333	Rectal Resection W CC	Non-Orthopedic Surgery	Non-Neurologic
334	Rectal Resection W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
335	Peritoneal Adhesiolysis W MCC	Non-Orthopedic Surgery	Non-Neurologic
336	Peritoneal Adhesiolysis W CC	Non-Orthopedic Surgery	Non-Neurologic
337	Peritoneal Adhesiolysis W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
338	Appendectomy W Complicated Principal Diag W MCC	Non-Orthopedic Surgery	Non-Neurologic
339	Appendectomy W Complicated Principal Diag W CC	Non-Orthopedic Surgery	Non-Neurologic
340	Appendectomy W Complicated Principal Diag W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
341	Appendectomy W/O Complicated Principal Diag W MCC	Non-Orthopedic Surgery	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
342	Appendectomy W/O Complicated Principal Diag W CC	Non-Orthopedic Surgery	Non-Neurologic
343	Appendectomy W/O Complicated Principal Diag W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
344	Minor Small & Large Bowel Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
345	Minor Small & Large Bowel Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
346	Minor Small & Large Bowel Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
347	Anal & Stomal Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
348	Anal & Stomal Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
349	Anal & Stomal Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
350	Inguinal & Femoral Hernia Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
351	Inguinal & Femoral Hernia Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
352	Inguinal & Femoral Hernia Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
353	Hernia Procedures Except Inguinal & Femoral W MCC	Non-Orthopedic Surgery	Non-Neurologic
354	Hernia Procedures Except Inguinal & Femoral W CC	Non-Orthopedic Surgery	Non-Neurologic
355	Hernia Procedures Except Inguinal & Femoral W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
356	Other Digestive System O.R. Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
357	Other Digestive System O.R. Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
358	Other Digestive System O.R. Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
368	Major Esophageal Disorders W MCC	Medical Management	Non-Neurologic
369	Major Esophageal Disorders W CC	Medical Management	Non-Neurologic
370	Major Esophageal Disorders W/O CC/MCC	Medical Management	Non-Neurologic
371	Major Gastrointestinal Disorders & Peritoneal Infections W MCC	Medical Management	Non-Neurologic
372	Major Gastrointestinal Disorders & Peritoneal Infections W CC	Medical Management	Non-Neurologic
373	Major Gastrointestinal Disorders & Peritoneal Infections W/O CC/MCC	Medical Management	Non-Neurologic
374	Digestive Malignancy W MCC	Medical Management	Non-Neurologic
375	Digestive Malignancy W CC	Medical Management	Non-Neurologic
376	Digestive Malignancy W/O CC/MCC	Medical Management	Non-Neurologic
377	G.I. Hemorrhage W MCC	Medical Management	Non-Neurologic
378	G.I. Hemorrhage W CC	Medical Management	Non-Neurologic
379	G.I. Hemorrhage W/O CC/MCC	Medical Management	Non-Neurologic
380	Complicated Peptic Ulcer W MCC	Medical Management	Non-Neurologic
381	Complicated Peptic Ulcer W CC	Medical Management	Non-Neurologic
382	Complicated Peptic Ulcer W/O CC/MCC	Medical Management	Non-Neurologic
383	Uncomplicated Peptic Ulcer W MCC	Medical Management	Non-Neurologic
384	Uncomplicated Peptic Ulcer W/O MCC	Medical Management	Non-Neurologic
385	Inflammatory Bowel Disease W MCC	Medical Management	Non-Neurologic
386	Inflammatory Bowel Disease W CC	Medical Management	Non-Neurologic
387	Inflammatory Bowel Disease W/O CC/MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
388	G.I. Obstruction W MCC	Medical Management	Non-Neurologic
389	G.I. Obstruction W CC	Medical Management	Non-Neurologic
390	G.I. Obstruction W/O CC/MCC	Medical Management	Non-Neurologic
391	Esophagitis, Gastroent & Misc Digest Disorders W MCC	Medical Management	Non-Neurologic
392	Esophagitis, Gastroent & Misc Digest Disorders W/O MCC	Medical Management	Non-Neurologic
393	Other Digestive System Diagnoses W MCC	Medical Management	Non-Neurologic
394	Other Digestive System Diagnoses W CC	Medical Management	Non-Neurologic
395	Other Digestive System Diagnoses W/O CC/MCC	Medical Management	Non-Neurologic
405	Pancreas, Liver & Shunt Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
406	Pancreas, Liver & Shunt Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
407	Pancreas, Liver & Shunt Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
408	Biliary Tract Proc Except Only Cholecyst W Or W/O C.D.E. W MCC	Non-Orthopedic Surgery	Non-Neurologic
409	Biliary Tract Proc Except Only Cholecyst W Or W/O C.D.E. W CC	Non-Orthopedic Surgery	Non-Neurologic
410	Biliary Tract Proc Except Only Cholecyst W Or W/O C.D.E. W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
411	Cholecystectomy W C.D.E. W MCC	Non-Orthopedic Surgery	Non-Neurologic
412	Cholecystectomy W C.D.E. W CC	Non-Orthopedic Surgery	Non-Neurologic
413	Cholecystectomy W C.D.E. W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
414	Cholecystectomy Except By Laparoscope W/O C.D.E. W MCC	Non-Orthopedic Surgery	Non-Neurologic
415	Cholecystectomy Except By Laparoscope W/O C.D.E. W CC	Non-Orthopedic Surgery	Non-Neurologic
416	Cholecystectomy Except By Laparoscope W/O C.D.E. W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
417	Laparoscopic Cholecystectomy W/O C.D.E. W MCC	Non-Orthopedic Surgery	Non-Neurologic
418	Laparoscopic Cholecystectomy W/O C.D.E. W CC	Non-Orthopedic Surgery	Non-Neurologic
419	Laparoscopic Cholecystectomy W/O C.D.E. W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
420	Hepatobiliary Diagnostic Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
421	Hepatobiliary Diagnostic Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
422	Hepatobiliary Diagnostic Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
423	Other Hepatobiliary Or Pancreas O.R. Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
424	Other Hepatobiliary Or Pancreas O.R. Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
425	Other Hepatobiliary Or Pancreas O.R. Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
432	Cirrhosis & Alcoholic Hepatitis W MCC	Medical Management	Non-Neurologic
433	Cirrhosis & Alcoholic Hepatitis W CC	Medical Management	Non-Neurologic
434	Cirrhosis & Alcoholic Hepatitis W/O CC/MCC	Medical Management	Non-Neurologic
435	Malignancy Of Hepatobiliary System Or Pancreas W MCC	Medical Management	Non-Neurologic
436	Malignancy Of Hepatobiliary System Or Pancreas W CC	Medical Management	Non-Neurologic
437	Malignancy Of Hepatobiliary System Or Pancreas W/O CC/MCC	Medical Management	Non-Neurologic
438	Disorders Of Pancreas Except Malignancy W MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
439	Disorders Of Pancreas Except Malignancy W CC	Medical Management	Non-Neurologic
440	Disorders Of Pancreas Except Malignancy W/O CC/MCC	Medical Management	Non-Neurologic
441	Disorders Of Liver Except Malig,cirr,alc Hepa W MCC	Medical Management	Non-Neurologic
442	Disorders Of Liver Except Malig,cirr,alc Hepa W CC	Medical Management	Non-Neurologic
443	Disorders Of Liver Except Malig,cirr,alc Hepa W/O CC/MCC	Medical Management	Non-Neurologic
444	Disorders Of The Biliary Tract W MCC	Medical Management	Non-Neurologic
445	Disorders Of The Biliary Tract W CC	Medical Management	Non-Neurologic
446	Disorders Of The Biliary Tract W/O CC/MCC	Medical Management	Non-Neurologic
453	Combined Anterior/Posterior Spinal Fusion W MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
454	Combined Anterior/Posterior Spinal Fusion W CC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
455	Combined Anterior/Posterior Spinal Fusion W/O CC/MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
456	Spinal Fus Exc Cerv W Spinal Curv/Malig/Infec Or Ext Fus W MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
457	Spinal Fus Exc Cerv W Spinal Curv/Malig/Infec Or Ext Fus W CC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
458	Spinal Fus Exc Cerv W Spinal Curv/Malig/Infec Or Ext Fus W/O CC/MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
459	Spinal Fusion Except Cervical W MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
460	Spinal Fusion Except Cervical W/O MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
461	Bilateral Or Multiple Major Joint Procs Of Lower Extremity W MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
462	Bilateral Or Multiple Major Joint Procs Of Lower Extremity W/O MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
463	Wnd Debrid & Skn Grft Exc Hand, For Musculo-Conn Tiss Dis W MCC	Other Orthopedic	Non-Neurologic
464	Wnd Debrid & Skn Grft Exc Hand, For Musculo-Conn Tiss Dis W CC	Other Orthopedic	Non-Neurologic
465	Wnd Debrid & Skn Grft Exc Hand, For Musculo-Conn Tiss Dis W/O CC/MCC	Other Orthopedic	Non-Neurologic
466	Revision Of Hip Or Knee Replacement W MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
467	Revision Of Hip Or Knee Replacement W CC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
468	Revision Of Hip Or Knee Replacement W/O CC/MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
469	Major Joint Replacement Or Reattachment Of Lower Extremity W MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
470	Major Joint Replacement Or Reattachment Of Lower Extremity W/O MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
471	Cervical Spinal Fusion W MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
472	Cervical Spinal Fusion W CC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
473	Cervical Spinal Fusion W/O CC/MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
474	Amputation For Musculoskeletal Sys & Conn Tissue Dis W MCC	Other Orthopedic	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
475	Amputation For Musculoskeletal Sys & Conn Tissue Dis W CC	Other Orthopedic	Non-Neurologic
476	Amputation For Musculoskeletal Sys & Conn Tissue Dis W/O CC/MCC	Other Orthopedic	Non-Neurologic
477	Biopsies Of Musculoskeletal System & Connective Tissue W MCC	Other Orthopedic	Non-Neurologic
478	Biopsies Of Musculoskeletal System & Connective Tissue W CC	Other Orthopedic	Non-Neurologic
479	Biopsies Of Musculoskeletal System & Connective Tissue W/O CC/MCC	Other Orthopedic	Non-Neurologic
480	Hip & Femur Procedures Except Major Joint W MCC	Other Orthopedic	Non-Neurologic
481	Hip & Femur Procedures Except Major Joint W CC	Other Orthopedic	Non-Neurologic
482	Hip & Femur Procedures Except Major Joint W/O CC/MCC	Other Orthopedic	Non-Neurologic
483	Major Joint/Limb Reattachment Procedure Of Upper Extremities	Other Orthopedic	Non-Neurologic
484	Major Joint & Limb Reattachment Proc Of Upper Extremity W/O CC/MCC	Other Orthopedic	Non-Neurologic
485	Knee Procedures W Pdx Of Infection W MCC	Other Orthopedic	Non-Neurologic
486	Knee Procedures W Pdx Of Infection W CC	Other Orthopedic	Non-Neurologic
487	Knee Procedures W Pdx Of Infection W/O CC/MCC	Other Orthopedic	Non-Neurologic
488	Knee Procedures W/O Pdx Of Infection W CC/MCC	Other Orthopedic	Non-Neurologic
489	Knee Procedures W/O Pdx Of Infection W/O CC/MCC	Other Orthopedic	Non-Neurologic
490	Back & Neck Proc Exc Spinal Fusion W Cc/Mcc Or Disc Device/Neurostim	Major Joint Replacement or Spinal Surgery	Non-Neurologic
491	Back & Neck Proc Exc Spinal Fusion W/O CC/MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
492	Lower Extrem & Humer Proc Except Hip,foot,femur W MCC	Other Orthopedic	Non-Neurologic
493	Lower Extrem & Humer Proc Except Hip,foot,femur W CC	Other Orthopedic	Non-Neurologic
494	Lower Extrem & Humer Proc Except Hip,foot,femur W/O CC/MCC	Other Orthopedic	Non-Neurologic
495	Local Excision & Removal Int Fix Devices Exc Hip & Femur W MCC	Other Orthopedic	Non-Neurologic
496	Local Excision & Removal Int Fix Devices Exc Hip & Femur W CC	Other Orthopedic	Non-Neurologic
497	Local Excision & Removal Int Fix Devices Exc Hip & Femur W/O CC/MCC	Other Orthopedic	Non-Neurologic
498	Local Excision & Removal Int Fix Devices Of Hip & Femur W CC/MCC	Other Orthopedic	Non-Neurologic
499	Local Excision & Removal Int Fix Devices Of Hip & Femur W/O CC/MCC	Other Orthopedic	Non-Neurologic
500	Soft Tissue Procedures W MCC	Other Orthopedic	Non-Neurologic
501	Soft Tissue Procedures W CC	Other Orthopedic	Non-Neurologic
502	Soft Tissue Procedures W/O CC/MCC	Other Orthopedic	Non-Neurologic
503	Foot Procedures W MCC	Other Orthopedic	Non-Neurologic
504	Foot Procedures W CC	Other Orthopedic	Non-Neurologic
505	Foot Procedures W/O CC/MCC	Other Orthopedic	Non-Neurologic
506	Major Thumb Or Joint Procedures	Other Orthopedic	Non-Neurologic
507	Major Shoulder Or Elbow Joint Procedures W CC/MCC	Other Orthopedic	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
508	Major Shoulder Or Elbow Joint Procedures W/O CC/MCC	Other Orthopedic	Non-Neurologic
509	Arthroscopy	Other Orthopedic	Non-Neurologic
510	Shoulder,elbow Or Forearm Proc,exc Major Joint Proc W MCC	Other Orthopedic	Non-Neurologic
511	Shoulder,elbow Or Forearm Proc,exc Major Joint Proc W CC	Other Orthopedic	Non-Neurologic
512	Shoulder,elbow Or Forearm Proc,exc Major Joint Proc W/O CC/MCC	Other Orthopedic	Non-Neurologic
513	Hand Or Wrist Proc, Except Major Thumb Or Joint Proc W CC/MCC	Other Orthopedic	Non-Neurologic
514	Hand Or Wrist Proc, Except Major Thumb Or Joint Proc W/O CC/MCC	Other Orthopedic	Non-Neurologic
515	Other Musculoskelet Sys & Conn Tiss O.R. Proc W MCC	Other Orthopedic	Non-Neurologic
516	Other Musculoskelet Sys & Conn Tiss O.R. Proc W CC	Other Orthopedic	Non-Neurologic
517	Other Musculoskelet Sys & Conn Tiss O.R. Proc W/O CC/MCC	Other Orthopedic	Non-Neurologic
518	Back & Neck Proc Exc Spinal Fusion W Mcc Or Disc Device/Neurostim	Major Joint Replacement or Spinal Surgery	Non-Neurologic
519	Back & Neck Proc Exc Spinal Fusion W CC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
520	Back & Neck Proc Exc Spinal Fusion W/O CC/MCC	Major Joint Replacement or Spinal Surgery	Non-Neurologic
533	Fractures Of Femur W MCC	Other Orthopedic	Non-Neurologic
534	Fractures Of Femur W/O MCC	Other Orthopedic	Non-Neurologic
535	Fractures Of Hip & Pelvis W MCC	Other Orthopedic	Non-Neurologic
536	Fractures Of Hip & Pelvis W/O MCC	Other Orthopedic	Non-Neurologic
537	Sprains, Strains, & Dislocations Of Hip, Pelvis & Thigh W CC/MCC	Other Orthopedic	Non-Neurologic
538	Sprains, Strains, & Dislocations Of Hip, Pelvis & Thigh W/O CC/MCC	Other Orthopedic	Non-Neurologic
539	Osteomyelitis W MCC	Medical Management	Non-Neurologic
540	Osteomyelitis W CC	Medical Management	Non-Neurologic
541	Osteomyelitis W/O CC/MCC	Medical Management	Non-Neurologic
542	Pathological Fractures & Musculoskelet & Conn Tiss Malig W MCC	Other Orthopedic	Non-Neurologic
543	Pathological Fractures & Musculoskelet & Conn Tiss Malig W CC	Other Orthopedic	Non-Neurologic
544	Pathological Fractures & Musculoskelet & Conn Tiss Malig W/O CC/MCC	Other Orthopedic	Non-Neurologic
545	Connective Tissue Disorders W MCC	Other Orthopedic	Non-Neurologic
546	Connective Tissue Disorders W CC	Other Orthopedic	Non-Neurologic
547	Connective Tissue Disorders W/O CC/MCC	Other Orthopedic	Non-Neurologic
548	Septic Arthritis W MCC	Medical Management	Non-Neurologic
549	Septic Arthritis W CC	Medical Management	Non-Neurologic
550	Septic Arthritis W/O CC/MCC	Medical Management	Non-Neurologic
551	Medical Back Problems W MCC	Other Orthopedic	Non-Neurologic
552	Medical Back Problems W/O MCC	Other Orthopedic	Non-Neurologic
553	Bone Diseases & Arthropathies W MCC	Other Orthopedic	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
554	Bone Diseases & Arthropathies W/O MCC	Other Orthopedic	Non-Neurologic
555	Signs & Symptoms Of Musculoskeletal System & Conn Tissue W MCC	Other Orthopedic	Non-Neurologic
556	Signs & Symptoms Of Musculoskeletal System & Conn Tissue W/O MCC	Other Orthopedic	Non-Neurologic
557	Tendonitis, Myositis & Bursitis W MCC	Other Orthopedic	Non-Neurologic
558	Tendonitis, Myositis & Bursitis W/O MCC	Other Orthopedic	Non-Neurologic
559	Aftercare, Musculoskeletal System & Connective Tissue W MCC	Other Orthopedic	Non-Neurologic
560	Aftercare, Musculoskeletal System & Connective Tissue W CC	Other Orthopedic	Non-Neurologic
561	Aftercare, Musculoskeletal System & Connective Tissue W/O CC/MCC	Other Orthopedic	Non-Neurologic
562	Fx, Sprn, Strn & Disl Except Femur, Hip, Pelvis & Thigh W MCC	Other Orthopedic	Non-Neurologic
563	Fx, Sprn, Strn & Disl Except Femur, Hip, Pelvis & Thigh W/O MCC	Other Orthopedic	Non-Neurologic
564	Other Musculoskeletal Sys & Connective Tissue Diagnoses W MCC	Other Orthopedic	Non-Neurologic
565	Other Musculoskeletal Sys & Connective Tissue Diagnoses W CC	Other Orthopedic	Non-Neurologic
566	Other Musculoskeletal Sys & Connective Tissue Diagnoses W/O CC/MCC	Other Orthopedic	Non-Neurologic
570	Skin Debridement W MCC	Non-Orthopedic Surgery	Non-Neurologic
571	Skin Debridement W CC	Non-Orthopedic Surgery	Non-Neurologic
572	Skin Debridement W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
573	Skin Graft For Skin Ulcer Or Cellulitis W MCC	Non-Orthopedic Surgery	Non-Neurologic
574	Skin Graft For Skin Ulcer Or Cellulitis W CC	Non-Orthopedic Surgery	Non-Neurologic
575	Skin Graft For Skin Ulcer Or Cellulitis W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
576	Skin Graft Exc For Skin Ulcer Or Cellulitis W MCC	Non-Orthopedic Surgery	Non-Neurologic
577	Skin Graft Exc For Skin Ulcer Or Cellulitis W CC	Non-Orthopedic Surgery	Non-Neurologic
578	Skin Graft Exc For Skin Ulcer Or Cellulitis W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
579	Other Skin, Subcut Tiss & Breast Proc W MCC	Non-Orthopedic Surgery	Non-Neurologic
580	Other Skin, Subcut Tiss & Breast Proc W CC	Non-Orthopedic Surgery	Non-Neurologic
581	Other Skin, Subcut Tiss & Breast Proc W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
582	Mastectomy For Malignancy W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
583	Mastectomy For Malignancy W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
584	Breast Biopsy, Local Excision & Other Breast Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
585	Breast Biopsy, Local Excision & Other Breast Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
592	Skin Ulcers W MCC	Medical Management	Non-Neurologic
593	Skin Ulcers W CC	Medical Management	Non-Neurologic
594	Skin Ulcers W/O CC/MCC	Medical Management	Non-Neurologic
595	Major Skin Disorders W MCC	Medical Management	Non-Neurologic
596	Major Skin Disorders W/O MCC	Medical Management	Non-Neurologic
597	Malignant Breast Disorders W MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
598	Malignant Breast Disorders W CC	Medical Management	Non-Neurologic
599	Malignant Breast Disorders W/O CC/MCC	Medical Management	Non-Neurologic
600	Non-Malignant Breast Disorders W CC/MCC	Medical Management	Non-Neurologic
601	Non-Malignant Breast Disorders W/O CC/MCC	Medical Management	Non-Neurologic
602	Cellulitis W MCC	Medical Management	Non-Neurologic
603	Cellulitis W/O MCC	Medical Management	Non-Neurologic
604	Trauma To The Skin, Subcut Tiss & Breast W MCC	Medical Management	Non-Neurologic
605	Trauma To The Skin, Subcut Tiss & Breast W/O MCC	Medical Management	Non-Neurologic
606	Minor Skin Disorders W MCC	Medical Management	Non-Neurologic
607	Minor Skin Disorders W/O MCC	Medical Management	Non-Neurologic
614	Adrenal & Pituitary Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
615	Adrenal & Pituitary Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
616	Amputat Of Lower Limb For Endocrine,nutrit,& Metabol Dis W MCC	Other Orthopedic	Non-Neurologic
617	Amputat Of Lower Limb For Endocrine,nutrit,& Metabol Dis W CC	Other Orthopedic	Non-Neurologic
618	Amputat Of Lower Limb For Endocrine,nutrit,& Metabol Dis W/O CC/MCC	Other Orthopedic	Non-Neurologic
619	O.R. Procedures For Obesity W MCC	Non-Orthopedic Surgery	Non-Neurologic
620	O.R. Procedures For Obesity W CC	Non-Orthopedic Surgery	Non-Neurologic
621	O.R. Procedures For Obesity W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
622	Skin Grafts & Wound Debrid For Endoc, Nutrit & Metab Dis W MCC	Non-Orthopedic Surgery	Non-Neurologic
623	Skin Grafts & Wound Debrid For Endoc, Nutrit & Metab Dis W CC	Non-Orthopedic Surgery	Non-Neurologic
624	Skin Grafts & Wound Debrid For Endoc, Nutrit & Metab Dis W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
625	Thyroid, Parathyroid & Thyroglossal Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
626	Thyroid, Parathyroid & Thyroglossal Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
627	Thyroid, Parathyroid & Thyroglossal Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
628	Other Endocrine, Nutrit & Metab O.R. Proc W MCC	Non-Orthopedic Surgery	Non-Neurologic
629	Other Endocrine, Nutrit & Metab O.R. Proc W CC	Non-Orthopedic Surgery	Non-Neurologic
630	Other Endocrine, Nutrit & Metab O.R. Proc W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
637	Diabetes W MCC	Medical Management	Non-Neurologic
638	Diabetes W CC	Medical Management	Non-Neurologic
639	Diabetes W/O CC/MCC	Medical Management	Non-Neurologic
640	Misc Disorders Of Nutrition,metabolism,fluids/Electrolytes W MCC	Medical Management	Non-Neurologic
641	Misc Disorders Of Nutrition,metabolism,fluids/Electrolytes W/O MCC	Medical Management	Non-Neurologic
642	Inborn And Other Disorders Of Metabolism	Medical Management	Non-Neurologic
643	Endocrine Disorders W MCC	Medical Management	Non-Neurologic
644	Endocrine Disorders W CC	Medical Management	Non-Neurologic
645	Endocrine Disorders W/O CC/MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
652	Kidney Transplant	Non-Orthopedic Surgery	Non-Neurologic
653	Major Bladder Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
654	Major Bladder Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
655	Major Bladder Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
656	Kidney & Ureter Procedures For Neoplasm W MCC	Non-Orthopedic Surgery	Non-Neurologic
657	Kidney & Ureter Procedures For Neoplasm W CC	Non-Orthopedic Surgery	Non-Neurologic
658	Kidney & Ureter Procedures For Neoplasm W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
659	Kidney & Ureter Procedures For Non-Neoplasm W MCC	Non-Orthopedic Surgery	Non-Neurologic
660	Kidney & Ureter Procedures For Non-Neoplasm W CC	Non-Orthopedic Surgery	Non-Neurologic
661	Kidney & Ureter Procedures For Non-Neoplasm W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
662	Minor Bladder Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
663	Minor Bladder Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
664	Minor Bladder Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
665	Prostatectomy W MCC	Non-Orthopedic Surgery	Non-Neurologic
666	Prostatectomy W CC	Non-Orthopedic Surgery	Non-Neurologic
667	Prostatectomy W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
668	Transurethral Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
669	Transurethral Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
670	Transurethral Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
671	Urethral Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
672	Urethral Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
673	Other Kidney & Urinary Tract Procedures W MCC	Non-Orthopedic Surgery	Non-Neurologic
674	Other Kidney & Urinary Tract Procedures W CC	Non-Orthopedic Surgery	Non-Neurologic
675	Other Kidney & Urinary Tract Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
682	Renal Failure W MCC	Medical Management	Non-Neurologic
683	Renal Failure W CC	Medical Management	Non-Neurologic
684	Renal Failure W/O CC/MCC	Medical Management	Non-Neurologic
685	Admit For Renal Dialysis	Medical Management	Non-Neurologic
686	Kidney & Urinary Tract Neoplasms W MCC	Medical Management	Non-Neurologic
687	Kidney & Urinary Tract Neoplasms W CC	Medical Management	Non-Neurologic
688	Kidney & Urinary Tract Neoplasms W/O CC/MCC	Medical Management	Non-Neurologic
689	Kidney & Urinary Tract Infections W MCC	Medical Management	Non-Neurologic
690	Kidney & Urinary Tract Infections W/O MCC	Medical Management	Non-Neurologic
691	Urinary Stones W Esw Lithotripsy W CC/MCC	Medical Management	Non-Neurologic
692	Urinary Stones W Esw Lithotripsy W/O CC/MCC	Medical Management	Non-Neurologic
693	Urinary Stones W/O Esw Lithotripsy W MCC	Medical Management	Non-Neurologic
694	Urinary Stones W/O Esw Lithotripsy W/O MCC	Medical Management	Non-Neurologic
695	Kidney & Urinary Tract Signs & Symptoms W MCC	Medical Management	Non-Neurologic
696	Kidney & Urinary Tract Signs & Symptoms W/O MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
697	Urethral Stricture	Medical Management	Non-Neurologic
698	Other Kidney & Urinary Tract Diagnoses W MCC	Medical Management	Non-Neurologic
699	Other Kidney & Urinary Tract Diagnoses W CC	Medical Management	Non-Neurologic
700	Other Kidney & Urinary Tract Diagnoses W/O CC/MCC	Medical Management	Non-Neurologic
707	Major Male Pelvic Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
708	Major Male Pelvic Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
709	Penis Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
710	Penis Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
711	Testes Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
712	Testes Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
713	Transurethral Prostatectomy W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
714	Transurethral Prostatectomy W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
715	Other Male Reproductive System O.R. Proc For Malignancy W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
716	Other Male Reproductive System O.R. Proc For Malignancy W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
717	Other Male Reproductive System O.R. Proc Exc Malignancy W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
718	Other Male Reproductive System O.R. Proc Exc Malignancy W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
722	Malignancy, Male Reproductive System W MCC	Medical Management	Non-Neurologic
723	Malignancy, Male Reproductive System W CC	Medical Management	Non-Neurologic
724	Malignancy, Male Reproductive System W/O CC/MCC	Medical Management	Non-Neurologic
725	Benign Prostatic Hypertrophy W MCC	Medical Management	Non-Neurologic
726	Benign Prostatic Hypertrophy W/O MCC	Medical Management	Non-Neurologic
727	Inflammation Of The Male Reproductive System W MCC	Medical Management	Non-Neurologic
728	Inflammation Of The Male Reproductive System W/O MCC	Medical Management	Non-Neurologic
729	Other Male Reproductive System Diagnoses W CC/MCC	Medical Management	Non-Neurologic
730	Other Male Reproductive System Diagnoses W/O CC/MCC	Medical Management	Non-Neurologic
734	Pelvic Evisceration, Rad Hysterectomy & Rad Vulvectomy W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
735	Pelvic Evisceration, Rad Hysterectomy & Rad Vulvectomy W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
736	Uterine & Adnexa Proc For Ovarian Or Adnexal Malignancy W MCC	Non-Orthopedic Surgery	Non-Neurologic
737	Uterine & Adnexa Proc For Ovarian Or Adnexal Malignancy W CC	Non-Orthopedic Surgery	Non-Neurologic
738	Uterine & Adnexa Proc For Ovarian Or Adnexal Malignancy W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
739	Uterine,adnexa Proc For Non-Ovarian/Adnexal Malig W MCC	Non-Orthopedic Surgery	Non-Neurologic
740	Uterine,adnexa Proc For Non-Ovarian/Adnexal Malig W CC	Non-Orthopedic Surgery	Non-Neurologic
741	Uterine,adnexa Proc For Non-Ovarian/Adnexal Malig W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
742	Uterine & Adnexa Proc For Non-Malignancy W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
743	Uterine & Adnexa Proc For Non-Malignancy W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
744	D&c, Conization, Laparoscopy & Tubal Interruption W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
745	D&c, Conization, Laparoscopy & Tubal Interruption W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
746	Vagina, Cervix & Vulva Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
747	Vagina, Cervix & Vulva Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
748	Female Reproductive System Reconstructive Procedures	Non-Orthopedic Surgery	Non-Neurologic
749	Other Female Reproductive System O.R. Procedures W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
750	Other Female Reproductive System O.R. Procedures W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
754	Malignancy, Female Reproductive System W MCC	Medical Management	Non-Neurologic
755	Malignancy, Female Reproductive System W CC	Medical Management	Non-Neurologic
756	Malignancy, Female Reproductive System W/O CC/MCC	Medical Management	Non-Neurologic
757	Infections, Female Reproductive System W MCC	Acute Neurologic	Acute Neurologic
758	Infections, Female Reproductive System W CC	Acute Neurologic	Acute Neurologic
759	Infections, Female Reproductive System W/O CC/MCC	Acute Neurologic	Acute Neurologic
760	Menstrual & Other Female Reproductive System Disorders W CC/MCC	Medical Management	Non-Neurologic
761	Menstrual & Other Female Reproductive System Disorders W/O CC/MCC	Medical Management	Non-Neurologic
765	Cesarean Section W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
766	Cesarean Section W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
767	Vaginal Delivery W Sterilization &/Or D&c	Non-Orthopedic Surgery	Non-Neurologic
768	Vaginal Delivery W O.R. Proc Except Steril &/Or D&c	Non-Orthopedic Surgery	Non-Neurologic
769	Postpartum & Post Abortion Diagnoses W O.R. Procedure	Non-Orthopedic Surgery	Non-Neurologic
770	Abortion W D&c, Aspiration Curettage Or Hysterotomy	Non-Orthopedic Surgery	Non-Neurologic
774	Vaginal Delivery W Complicating Diagnoses	Medical Management	Non-Neurologic
775	Vaginal Delivery W/O Complicating Diagnoses	Medical Management	Non-Neurologic
776	Postpartum & Post Abortion Diagnoses W/O O.R. Procedure	Medical Management	Non-Neurologic
777	Ectopic Pregnancy	Medical Management	Non-Neurologic
778	Threatened Abortion	Medical Management	Non-Neurologic
779	Abortion W/O D&c	Medical Management	Non-Neurologic
780	False Labor	Medical Management	Non-Neurologic
781	Other Antepartum Diagnoses W Medical Complications	Medical Management	Non-Neurologic
782	Other Antepartum Diagnoses W/O Medical Complications	Medical Management	Non-Neurologic
789	Neonates, Died Or Transferred To Another Acute Care Facility	Medical Management	Non-Neurologic
790	Extreme Immaturity Or Respiratory Distress Syndrome, Neonate	Medical Management	Non-Neurologic
791	Prematurity W Major Problems	Medical Management	Non-Neurologic
792	Prematurity W/O Major Problems	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
793	Full Term Neonate W Major Problems	Medical Management	Non-Neurologic
794	Neonate W Other Significant Problems	Medical Management	Non-Neurologic
795	Normal Newborn	Medical Management	Non-Neurologic
799	Splenectomy W MCC	Non-Orthopedic Surgery	Non-Neurologic
800	Splenectomy W CC	Non-Orthopedic Surgery	Non-Neurologic
801	Splenectomy W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
802	Other O.R. Proc Of The Blood & Blood Forming Organs W MCC	Non-Orthopedic Surgery	Non-Neurologic
803	Other O.R. Proc Of The Blood & Blood Forming Organs W CC	Non-Orthopedic Surgery	Non-Neurologic
804	Other O.R. Proc Of The Blood & Blood Forming Organs W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
808	Major Hematol/Immun Diag Exc Sickle Cell Crisis & Coagul W MCC	Medical Management	Non-Neurologic
809	Major Hematol/Immun Diag Exc Sickle Cell Crisis & Coagul W CC	Medical Management	Non-Neurologic
810	Major Hematol/Immun Diag Exc Sickle Cell Crisis & Coagul W/O CC/MCC	Medical Management	Non-Neurologic
811	Red Blood Cell Disorders W MCC	Medical Management	Non-Neurologic
812	Red Blood Cell Disorders W/O MCC	Medical Management	Non-Neurologic
813	Coagulation Disorders	Medical Management	Non-Neurologic
814	Reticuloendothelial & Immunity Disorders W MCC	Medical Management	Non-Neurologic
815	Reticuloendothelial & Immunity Disorders W CC	Medical Management	Non-Neurologic
816	Reticuloendothelial & Immunity Disorders W/O CC/MCC	Medical Management	Non-Neurologic
820	Lymphoma & Leukemia W Major O.R. Procedure W MCC	Non-Orthopedic Surgery	Non-Neurologic
821	Lymphoma & Leukemia W Major O.R. Procedure W CC	Non-Orthopedic Surgery	Non-Neurologic
822	Lymphoma & Leukemia W Major O.R. Procedure W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
823	Lymphoma & Non-Acute Leukemia W Other O.R. Proc W MCC	Non-Orthopedic Surgery	Non-Neurologic
824	Lymphoma & Non-Acute Leukemia W Other O.R. Proc W CC	Non-Orthopedic Surgery	Non-Neurologic
825	Lymphoma & Non-Acute Leukemia W Other O.R. Proc W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
826	Myeloprolif Disord Or Poorly Diff Neopl W Maj O.R. Proc W MCC	Non-Orthopedic Surgery	Non-Neurologic
827	Myeloprolif Disord Or Poorly Diff Neopl W Maj O.R. Proc W CC	Non-Orthopedic Surgery	Non-Neurologic
828	Myeloprolif Disord Or Poorly Diff Neopl W Maj O.R. Proc W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
829	Myeloprolif Disord Or Poorly Diff Neopl W Other O.R. Proc W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
830	Myeloprolif Disord Or Poorly Diff Neopl W Other O.R. Proc W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
834	Acute Leukemia W/O Major O.R. Procedure W MCC	Medical Management	Non-Neurologic
835	Acute Leukemia W/O Major O.R. Procedure W CC	Medical Management	Non-Neurologic
836	Acute Leukemia W/O Major O.R. Procedure W/O CC/MCC	Medical Management	Non-Neurologic
837	Chemo W Acute Leukemia As Sdx Or W High Dose Chemo Agent W MCC	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
838	Chemo W Acute Leukemia As Sdx W Cc Or High Dose Chemo Agent	Medical Management	Non-Neurologic
839	Chemo W Acute Leukemia As Sdx W/O CC/MCC	Medical Management	Non-Neurologic
840	Lymphoma & Non-Acute Leukemia W MCC	Medical Management	Non-Neurologic
841	Lymphoma & Non-Acute Leukemia W CC	Medical Management	Non-Neurologic
842	Lymphoma & Non-Acute Leukemia W/O CC/MCC	Medical Management	Non-Neurologic
843	Other Myeloprolif Dis Or Poorly Diff Neopl Diag W MCC	Medical Management	Non-Neurologic
844	Other Myeloprolif Dis Or Poorly Diff Neopl Diag W CC	Medical Management	Non-Neurologic
845	Other Myeloprolif Dis Or Poorly Diff Neopl Diag W/O CC/MCC	Medical Management	Non-Neurologic
846	Chemotherapy W/O Acute Leukemia As Secondary Diagnosis W MCC	Medical Management	Non-Neurologic
847	Chemotherapy W/O Acute Leukemia As Secondary Diagnosis W CC	Medical Management	Non-Neurologic
848	Chemotherapy W/O Acute Leukemia As Secondary Diagnosis W/O CC/MCC	Medical Management	Non-Neurologic
849	Radiotherapy	Medical Management	Non-Neurologic
853	Infectious & Parasitic Diseases W O.R. Procedure W MCC	Non-Orthopedic Surgery	Non-Neurologic
854	Infectious & Parasitic Diseases W O.R. Procedure W CC	Non-Orthopedic Surgery	Non-Neurologic
855	Infectious & Parasitic Diseases W O.R. Procedure W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
856	Postoperative Or Post-Traumatic Infections W O.R. Proc W MCC	Non-Orthopedic Surgery	Non-Neurologic
857	Postoperative Or Post-Traumatic Infections W O.R. Proc W CC	Non-Orthopedic Surgery	Non-Neurologic
858	Postoperative Or Post-Traumatic Infections W O.R. Proc W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
862	Postoperative & Post-Traumatic Infections W MCC	Medical Management	Non-Neurologic
863	Postoperative & Post-Traumatic Infections W/O MCC	Medical Management	Non-Neurologic
864	Fever	Medical Management	Non-Neurologic
865	Viral Illness W MCC	Medical Management	Non-Neurologic
866	Viral Illness W/O MCC	Medical Management	Non-Neurologic
867	Other Infectious & Parasitic Diseases Diagnoses W MCC	Medical Management	Non-Neurologic
868	Other Infectious & Parasitic Diseases Diagnoses W CC	Medical Management	Non-Neurologic
869	Other Infectious & Parasitic Diseases Diagnoses W/O CC/MCC	Medical Management	Non-Neurologic
870	Septicemia Or Severe Sepsis W Mv >96 Hours	Medical Management	Non-Neurologic
871	Septicemia Or Severe Sepsis W/O Mv >96 Hours W MCC	Medical Management	Non-Neurologic
872	Septicemia Or Severe Sepsis W/O Mv >96 Hours W/O MCC	Medical Management	Non-Neurologic
876	O.R. Procedure W Principal Diagnoses Of Mental Illness	Non-Orthopedic Surgery	Non-Neurologic
880	Acute Adjustment Reaction & Psychosocial Dysfunction	Medical Management	Non-Neurologic
881	Depressive Neuroses	Medical Management	Non-Neurologic
882	Neuroses Except Depressive	Medical Management	Non-Neurologic
883	Disorders Of Personality & Impulse Control	Medical Management	Non-Neurologic
884	Organic Disturbances & Intellectual Disability	Medical Management	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
885	Psychoses	Medical Management	Non-Neurologic
886	Behavioral & Developmental Disorders	Medical Management	Non-Neurologic
887	Other Mental Disorder Diagnoses	Medical Management	Non-Neurologic
894	Alcohol/Drug Abuse Or Dependence, Left Ama	Medical Management	Non-Neurologic
895	Alcohol/Drug Abuse Or Dependence W Rehabilitation Therapy	Medical Management	Non-Neurologic
896	Alcohol/Drug Abuse Or Dependence W/O Rehabilitation Therapy W MCC	Medical Management	Non-Neurologic
897	Alcohol/Drug Abuse Or Dependence W/O Rehabilitation Therapy W/O MCC	Medical Management	Non-Neurologic
901	Wound Debridements For Injuries W MCC	Non-Orthopedic Surgery	Non-Neurologic
902	Wound Debridements For Injuries W CC	Non-Orthopedic Surgery	Non-Neurologic
903	Wound Debridements For Injuries W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
904	Skin Grafts For Injuries W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
905	Skin Grafts For Injuries W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
906	Hand Procedures For Injuries	Non-Orthopedic Surgery	Non-Neurologic
907	Other O.R. Procedures For Injuries W MCC	Non-Orthopedic Surgery	Non-Neurologic
908	Other O.R. Procedures For Injuries W CC	Non-Orthopedic Surgery	Non-Neurologic
909	Other O.R. Procedures For Injuries W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
913	Traumatic Injury W MCC	Other Orthopedic	Non-Neurologic
914	Traumatic Injury W/O MCC	Other Orthopedic	Non-Neurologic
915	Allergic Reactions W MCC	Medical Management	Non-Neurologic
916	Allergic Reactions W/O MCC	Medical Management	Non-Neurologic
917	Poisoning & Toxic Effects Of Drugs W MCC	Medical Management	Non-Neurologic
918	Poisoning & Toxic Effects Of Drugs W/O MCC	Medical Management	Non-Neurologic
919	Complications Of Treatment W MCC	Medical Management	Non-Neurologic
920	Complications Of Treatment W CC	Medical Management	Non-Neurologic
921	Complications Of Treatment W/O CC/MCC	Medical Management	Non-Neurologic
922	Other Injury, Poisoning & Toxic Effect Diag W MCC	Medical Management	Non-Neurologic
923	Other Injury, Poisoning & Toxic Effect Diag W/O MCC	Medical Management	Non-Neurologic
927	Extensive Burns Or Full Thickness Burns W Mv >96 Hrs W Skin Graft	Non-Orthopedic Surgery	Non-Neurologic
928	Full Thickness Burn W Skin Graft Or Inhal Inj W CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
929	Full Thickness Burn W Skin Graft Or Inhal Inj W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
933	Extensive Burns Or Full Thickness Burns W Mv >96 Hrs W/O Skin Graft	Medical Management	Non-Neurologic
934	Full Thickness Burn W/O Skin Grft Or Inhal Inj	Medical Management	Non-Neurologic
935	Non-Extensive Burns	Medical Management	Non-Neurologic
939	O.R. Proc W Diagnoses Of Other Contact W Health Services W MCC	Non-Orthopedic Surgery	Non-Neurologic
940	O.R. Proc W Diagnoses Of Other Contact W Health Services W CC	Non-Orthopedic Surgery	Non-Neurologic
941	O.R. Proc W Diagnoses Of Other Contact W Health Services W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic

MS-DRG	MS-DRG Description[50]	Clinical Category Mapping	
		PT and OT	SLP
945	Rehabilitation W CC/MCC	Medical Management	Non-Neurologic
946	Rehabilitation W/O CC/MCC	Medical Management	Non-Neurologic
947	Signs & Symptoms W MCC	Medical Management	Non-Neurologic
948	Signs & Symptoms W/O MCC	Medical Management	Non-Neurologic
949	Aftercare W CC/MCC	Medical Management	Non-Neurologic
950	Aftercare W/O CC/MCC	Medical Management	Non-Neurologic
951	Other Factors Influencing Health Status	Medical Management	Non-Neurologic
955	Craniotomy For Multiple Significant Trauma	Non-Orthopedic Surgery	Non-Neurologic
956	Limb Reattachment, Hip & Femur Proc For Multiple Significant Trauma	Other Orthopedic	Non-Neurologic
957	Other O.R. Procedures For Multiple Significant Trauma W MCC	Non-Orthopedic Surgery	Non-Neurologic
958	Other O.R. Procedures For Multiple Significant Trauma W CC	Non-Orthopedic Surgery	Non-Neurologic
959	Other O.R. Procedures For Multiple Significant Trauma W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
963	Other Multiple Significant Trauma W MCC	Other Orthopedic	Non-Neurologic
964	Other Multiple Significant Trauma W CC	Other Orthopedic	Non-Neurologic
965	Other Multiple Significant Trauma W/O CC/MCC	Other Orthopedic	Non-Neurologic
969	Hiv W Extensive O.R. Procedure W MCC	Non-Orthopedic Surgery	Non-Neurologic
970	Hiv W Extensive O.R. Procedure W/O MCC	Non-Orthopedic Surgery	Non-Neurologic
974	Hiv W Major Related Condition W MCC	Medical Management	Non-Neurologic
975	Hiv W Major Related Condition W CC	Medical Management	Non-Neurologic
976	Hiv W Major Related Condition W/O CC/MCC	Medical Management	Non-Neurologic
977	Hiv W Or W/O Other Related Condition	Medical Management	Non-Neurologic
981	Extensive O.R. Procedure Unrelated To Principal Diagnosis W MCC	Non-Orthopedic Surgery	Non-Neurologic
982	Extensive O.R. Procedure Unrelated To Principal Diagnosis W CC	Non-Orthopedic Surgery	Non-Neurologic
983	Extensive O.R. Procedure Unrelated To Principal Diagnosis W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
984	Prostatic O.R. Procedure Unrelated To Principal Diagnosis W MCC	Non-Orthopedic Surgery	Non-Neurologic
985	Prostatic O.R. Procedure Unrelated To Principal Diagnosis W CC	Non-Orthopedic Surgery	Non-Neurologic
986	Prostatic O.R. Procedure Unrelated To Principal Diagnosis W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
987	Non-Extensive O.R. Proc Unrelated To Principal Diagnosis W MCC	Non-Orthopedic Surgery	Non-Neurologic
988	Non-Extensive O.R. Proc Unrelated To Principal Diagnosis W CC	Non-Orthopedic Surgery	Non-Neurologic
989	Non-Extensive O.R. Proc Unrelated To Principal Diagnosis W/O CC/MCC	Non-Orthopedic Surgery	Non-Neurologic
998	Principal Diagnosis Invalid As Discharge Diagnosis	Medical Management	Non-Neurologic
999	Ungroupable	Medical Management	Non-Neurologic

Table 79: Mapping of RIC during IRF Stay to Clinical Categories

RIC	RIC Description	Assigned Clinical Category
01	Stroke	Acute Neurologic
02	Traumatic brain Injury	Acute Neurologic
03	Non-traumatic brain injury	Acute Neurologic
04	Traumatic spinal cord injury	Major Joint Replacement or Spinal Surgery
05	Non-traumatic spinal cord injury	Major Joint Replacement or Spinal Surgery
06	Neurological	Medical Management
07	Fracture of lower extremity	Orthopedic Surgery (Except Major Joint Replacement or Spinal Surgery)
08	Replacement of lower extremity	Major Joint Replacement or Spinal Surgery
09	Other orthopedic	Non-Surgical Orthopedic/Musculoskeletal
10	Amputation, lower extremity	Orthopedic Surgery (Except Major Joint Replacement or Spinal Surgery)
11	Amputation, other	Orthopedic Surgery (Except Major Joint Replacement or Spinal Surgery)
12	Osteoarthritis	Non-Surgical Orthopedic/Musculoskeletal
13	Rheumatoid, other arthritis	Non-Surgical Orthopedic/Musculoskeletal
14	Cardiac	Cardiovascular and Coagulations
15	Pulmonary	Pulmonary
16	Pain syndrome	Medical Management
17	Major multiple trauma, no brain injury or spinal cord injury	Orthopedic Surgery (Except Major Joint Replacement or Spinal Surgery)
18	Major multiple trauma, with brain injury or spinal cord injury	Acute Neurologic
19	Guillian Barre	Medical Management
20	Miscellaneous	Medical Management
21	Burns	Medical Management

Table 80: Mapping of Conditions to ICD-10-CM Codes for PT/OT Comorbidities Analysis

Condition	ICD-10-CM Codes
Amputation	Z89.2, Z89.43, Z89.44, Z89.5, Z89.6, S78, S58, S88
Anemia	D50-D53, D55, D58-D64
Arthritis	M12-M19
Cancer	C0-C8, D0, C40, C41,C43, C4A C45-C49
Hyperglycemia and Hypoglycemia	E16.0-E16.2, R73.9
Musculoskeletal Pain	M22-M24, M40-M54, M61-M63, M65, M67, M70, M71.2-M71.5, M71.8, M71.9, M75-M79
Osteoporosis	M80, M81
Peripheral Neuropathy	G60-G63
Rheumatoid Arthritis	M05, M06, M08.0-M08.4
Spinal Cord Injury	S14, S24, S34
Substance Abuse	F10-F12, F14, F16
Vertigo with Specific Cause	H81.2, H81.4

Table 81: Mapping Between SLP-Related Comorbidities and ICD-10-CM Codes

SLP-Related Comorbidity	ICD-10-CM Code	Description
ALS	G12.21	Amyotrophic lateral sclerosis
Apraxia	I69.990	Apraxia following unspecified cerebrovascular disease
Dysphagia	I69.991	Dysphagia following unspecified cerebrovascular disease
Laryngeal Cancer	C32.0	Malignant neoplasm of glottis
Laryngeal Cancer	C32.1	Malignant neoplasm of supraglottis
Laryngeal Cancer	C32.2	Malignant neoplasm of subglottis
Laryngeal Cancer	C32.3	Malignant neoplasm of laryngeal cartilage
Laryngeal Cancer	C32.8	Malignant neoplasm of other specified sites of larynx
Laryngeal Cancer	C32.9	Malignant neoplasm of larynx, unspecified
Oral Cancers	C00.0	Malignant neoplasm of external upper lip
Oral Cancers	C00.1	Malignant neoplasm of external lower lip
Oral Cancers	C00.3	Malignant neoplasm of upper lip, inner aspect
Oral Cancers	C00.4	Malignant neoplasm of lower lip, inner aspect
Oral Cancers	C00.5	Malignant neoplasm of lip, unspecified, inner aspect
Oral Cancers	C00.6	Malignant neoplasm of commissure of lip, unspecified
Oral Cancers	C00.8	Malignant neoplasm of overlapping sites of lip
Oral Cancers	C00.2	Malignant neoplasm of external lip, unspecified
Oral Cancers	C00.9	Malignant neoplasm of lip, unspecified
Oral Cancers	C01	Malignant neoplasm of base of tongue
Oral Cancers	C02.0	Malignant neoplasm of dorsal surface of tongue
Oral Cancers	C02.1	Malignant neoplasm of border of tongue

SLP-Related Comorbidity	ICD-10-CM Code	Description
Oral Cancers	C02.2	Malignant neoplasm of ventral surface of tongue
Oral Cancers	C02.3	Malignant neoplasm of anterior two-thirds of tongue, part unspecified
Oral Cancers	C02.8	Malignant neoplasm of overlapping sites of tongue
Oral Cancers	C02.4	Malignant neoplasm of lingual tonsil
Oral Cancers	C02.8	Malignant neoplasm of overlapping sites of tongue
Oral Cancers	C02.9	Malignant neoplasm of tongue, unspecified
Oral Cancers	C03.0	Malignant neoplasm of upper gum
Oral Cancers	C03.1	Malignant neoplasm of lower gum
Oral Cancers	C03.9	Malignant neoplasm of gum, unspecified
Oral Cancers	C03.9	Malignant neoplasm of gum, unspecified
Oral Cancers	C04.0	Malignant neoplasm of anterior floor of mouth
Oral Cancers	C04.1	Malignant neoplasm of lateral floor of mouth
Oral Cancers	C04.8	Malignant neoplasm of overlapping sites of floor of mouth
Oral Cancers	C04.9	Malignant neoplasm of floor of mouth, unspecified
Oral Cancers	C09.9	Malignant neoplasm of tonsil, unspecified
Oral Cancers	C09.8	Malignant neoplasm of overlapping sites of tonsil
Oral Cancers	C09.0	Malignant neoplasm of tonsillar fossa
Oral Cancers	C09.1	Malignant neoplasm of tonsillar pillar (anterior) (posterior)
Oral Cancers	C10.0	Malignant neoplasm of vallecula
Oral Cancers	C10.1	Malignant neoplasm of anterior surface of epiglottis
Oral Cancers	C10.8	Malignant neoplasm of overlapping sites of oropharynx
Oral Cancers	C10.2	Malignant neoplasm of lateral wall of oropharynx
Oral Cancers	C10.3	Malignant neoplasm of posterior wall of oropharynx
Oral Cancers	C10.4	Malignant neoplasm of branchial cleft
Oral Cancers	C10.8	Malignant neoplasm of overlapping sites of oropharynx
Oral Cancers	C10.9	Malignant neoplasm of oropharynx, unspecified
Oral Cancers	C14.0	Malignant neoplasm of pharynx, unspecified
Oral Cancers	C14.2	Malignant neoplasm of waldeyer's ring
Oral Cancers	C14.8	Malignant neoplasm of overlapping sites of lip, oral cavity and pharynx
Oral Cancers	C14.8	Malignant neoplasm of overlapping sites of lip, oral cavity and pharynx
Oral Cancers	C06.0	Malignant neoplasm of cheek mucosa
Oral Cancers	C06.1	Malignant neoplasm of vestibule of mouth
Oral Cancers	C05.0	Malignant neoplasm of hard palate
Oral Cancers	C05.1	Malignant neoplasm of soft palate
Oral Cancers	C05.2	Malignant neoplasm of uvula
Oral Cancers	C05.9	Malignant neoplasm of palate, unspecified
Oral Cancers	C05.8	Malignant neoplasm of overlapping sites of palate
Oral Cancers	C06.2	Malignant neoplasm of retromolar area
Oral Cancers	C06.89	Malignant neoplasm of overlapping sites of other parts of mouth
Oral Cancers	C06.80	Malignant neoplasm of overlapping sites of unspecified parts of mouth

SLP-Related Comorbidity	ICD-10-CM Code	Description
Oral Cancers	C06.9	Malignant neoplasm of mouth, unspecified
Speech and Language Deficits	I69.928	Other speech and language deficits following unspecified cerebrovascular disease
Speech and Language Deficits	I69.920	Aphasia following unspecified cerebrovascular disease
Speech and Language Deficits	I69.921	Dysphasia following unspecified cerebrovascular disease
Speech and Language Deficits	I69.922	Dysarthria following unspecified cerebrovascular disease
Speech and Language Deficits	I69.923	Fluency disorder following unspecified cerebrovascular disease
Speech and Language Deficits	I69.928	Other speech and language deficits following unspecified cerebrovascular disease