ABSTRACT

Title of Thesis: EXAMINING HEALTHCARE EXPENDITURES: MECHANICAL VENTILATION & AN EVALUATION OF LONG-TERM (ACUTE) CARE HOSPITALS

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This study analyzed demographic and clinical characteristics, actual hospital/facility costs, and Medicare charges/payments among beneficiaries discharged to, and from, long-term (acute) care hospitals (LTCHs), skilled nursing facilities (SNFs), or inpatient rehabilitation facilities (IRFs) following an acute inpatient hospitalization under Medicare-severity diagnosis-related group (MS-DRG) 207, "respiratory system diagnosis with ventilator support for greater than 96 hours." We also examined the likelihood of discharge by provider type to determine criteria informing patient discharge to a LTCH, SNF, or IRF for treatment.

Concerning discharges to LTCHs, patients were not significantly older, did not have the highest length of stay, and had comparable diagnoses and diagnosis counts to those discharged elsewhere. Discharges from LTCHs had significantly higher diagnosis counts and lengths of stay. Costs, charges, and payments were significantly higher among discharges to, and from, LTCHs. Multinomial logistic regression analyses indicated numerous associations between certain variables and discharge location.

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by

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Introduction

Medicare, established in 1965 under Title XVIII of the Social Security Act and administered by the Centers for Medicare & Medicaid Services (CMS), currently provides health insurance coverage for roughly 48.7 million Americans, including those individuals who are aged 65 or older, under the age of 65 with certain disabilities, and/or diagnosed with End-Stage Renal Disease (ESRD). As such, in 2011, Medicare expenditures for the provision of services to this population were estimated at $549.1 billion. Unfortunately, these expenditures are projected to steadily increase in future years due to corresponding projected increases in the volume and cost of services provided to beneficiaries across all four parts of Medicare, including inpatient care (Part A), outpatient care (Part B), Medicare Advantage (Part C), and the Prescription Drug Benefit Program (Part D) (The Boards of Trustees, 2012).

This paper will focus on a portion of Medicare Part A expenditures. Medicare Part A provides hospital insurance which helps cover the costs associated with the receipt of inpatient healthcare services. Specifically, Part A, which does not cover physician services, covers those inpatient services provided by acute care hospitals, including critical access hospitals (CAHs), and SNFs, which provide skilled nursing or rehabilitation services (HHS, 2012). Coverage also extends to IRFs, which provide hospital-level care in addition to extensive rehabilitation services, LTCHs, which provide care to beneficiaries with medically complex problems who require hospital-level care over an extended period of time, hospice programs, and/or home health agencies (HHAs) (HHS, 2012). Currently, Part A services account for $256.7 billion of the $549.1 billion (46.8%) in total 2011 Medicare expenditures (The Boards of Trustees, 2012).

Among the many conditions treated in Part A hospitals/facilities and paid for by Medicare, this paper will focus on those patients diagnosed with diseases classified under Major Diagnostic Category (MDC) 4, Diseases and Disorders of the Respiratory System, as respiratory diseases constitute a substantial proportion of Medicare expenditures (Appendix I). This population will be further limited to those patients, with principal diagnoses under MDC 4, whose inpatient stays are subsequently grouped to MS-DRG 207 based on the billing of procedure code 9672, "continuous invasive mechanical ventilation for greater than 96 hours," defined as a non-operating room, or medical, procedure. These patients often require hospital-level care for extended periods of time.

Currently, Medicare Part A hospitals and facilities are reimbursed for services provided based on the applicable prospective payment system (PPS) (Appendix II). Under the inpatient PPS (IPPS), per this study's focus on MS-DRG 207, payments made to acute inpatient hospitals, for services provided, are adjusted based on the applicable MS-DRG. Specifically, MS-DRGs (Appendix III) reflect the average level of resources a hospital expends in treating Medicare patients with similar clinical characteristics relative to the average level of resources expended in treating all Medicare patients.

As such, LTCHs are often utilized, as compared to SNFs or IRFs, for treating those patients with medically complex problems, such as mechanical ventilation, whereby hospital-level care is required for extended periods of time. However, recent research by the Medicare Payment Advisory Commission (MedPAC) suggests that the cost of treating medically complex patients, often characterized by multiple comorbidities, in LTCHs is much higher than the cost of treating similar beneficiaries admitted to other Part A hospitals/facilities (MedPAC, 2012b). This difference in costs

has been attributed to both the long arithmetic mean length of stay (ALOS) of patients in a LTCH and the higher level of care provided. In fact, LTCHs are paid by Medicare based on the LTCH PPS which has higher standardized base weights than other post-acute care facilities. Concerns have also arisen surrounding the rapid growth in LTCHs and clinical similarities between patients treated in LTCHs versus SNFs/IRFs.

Therefore, in order to address these concerns, beneficiary demographic and clinical characteristics, actual hospital/facility costs, and Medicare payments will be analyzed for those patients discharged to a LTCH, SNF, or IRF following a prior acute inpatient hospitalization under MS-DRG 207. These analyses will also be conducted across provider types by patient discharge status, such as being discharged alive, discharged to another hospital/facility for further treatment (or still a patient), or discharged dead. Primarily, actual hospital/facility costs and Medicare payments will be analyzed in order to discern any differences in the cost of and reimbursement for providing services. Specifically, Medicare payments represent the amount reimbursed to a hospital/facility for services provided to Medicare beneficiaries, based on the applicable PPS, while costs represent the actual cost of providing services to beneficiaries. Additionally, beneficiary demographic and clinical characteristics will be analyzed so as to discern any differences between patients based on their discharge location following an acute inpatient hospitalization and again based on the discharge status associated with their follow-on stay in a LTCH, SNF, or IRF.

Research Question/Specific Aims

Long-Term Objectives

Through this study, we aim to conduct analyses of beneficiary demographic and clinical characteristics, actual hospital/facility costs, and Medicare payments for those patients discharged to a LTCH, SNF, or IRF for a follow-on stay after a previous acute inpatient hospitalization under MS-DRG 207. We also seek to examine the association between beneficiary demographic and clinical characteristics and actual hospital/facility costs and discharge to a particular provider type for treatment. Additionally, we will analyze beneficiary demographic and clinical characteristics, actual hospital/facility costs, and Medicare payments for patients discharged from a follow-on stay in a LTCH, SNF, or IRF based on their discharge status (i.e. discharged alive, discharged/transferred for further treatment (or still a patient), and/or discharged dead).

Importance of Proposed Study

In 2011, Medicare provided health insurance coverage for roughly 48.7 million Americans with associated yearly expenditures for services rendered estimated at $549.1 billion. Unfortunately, with the aging of the U.S. population and increasing costs of rendering services, both the Medicare population and Medicare expenditures, already at their highest levels in the history of the program, are projected to rise going forward (The Boards of Trustees, 2012).

So as to maintain the solvency of Medicare, it is essential that steps be taken to reduce the amount spent on healthcare and ensure appropriate payment for services rendered. As it pertains to these goals, recent research has focused on Part A hospitals/facilities, specifically the variations in payment based on the population served

and services provided. In fact, a recent concern entails whether LTCHs, which receive higher payment(s) as a result of serving a higher proportion of medically complex beneficiaries, are providing cost-effective care which cannot be otherwise rendered in SNFs or IRFs. Following study completion, study findings may be utilized to guide the development of policy which proposes changes to the applicable PPS in an effort to allocate Medicare payments more equitably based on the actual costs of providing services, the medical complexity of patients treated, and the associated patient outcomes.

Specific Aims & Hypotheses

I. Conduct a comparative analysis of the patients discharged to a LTCH, SNF, or IRF following an acute inpatient hospitalization under MS-DRG 207.

Hypothesis: *Demographic/clinical characteristics and actual hospital/facility costs are associated with a patient's discharge location.*

1) Descriptive Statistics
    i. Means and standard deviations (s) for continuous variables
    ii. Frequencies and relative frequencies (%) for categorical variables
2) Analytical Statistics
    i. One-way analysis of variance (ANOVA) or Kruskal-Wallis ANOVA for continuous variables
    ii. Pearson's chi-square test or Fisher's exact test for categorical variables
    iii. Utilize multinomial logistic regression to analyze the impact of applicable variables on the likelihood of discharge to a particular hospital/facility

a) **Outcome Variable:** Discharge Location

b) **Independent Variables:** Age, Race, Gender, Diagnosis code, Diagnosis code count, Length of stay, Costs

II. Conduct a comparative analysis of the patients discharged alive, discharged for further treatment (or still a patient), or discharged dead from a follow-on stay in a LTCH, SNF, or IRF.

1) Descriptive Statistics

   i. Means and standard deviations (s) for continuous variables

   ii. Frequencies and relative frequencies (%) for categorical variables

2) Analytical Statistics

   i. One-way analysis of variance (ANOVA) or Kruskal-Wallis ANOVA for continuous variables

   ii. Pearson's chi-square test or Fisher's exact test for categorical variables

III. Conduct a comparative analysis of non-standardized and standardized actual hospital/facility costs, total charges, and Medicare payments for patients based on:

#1 – Discharge location after an inpatient hospitalization under MS-DRG 207

#2 – Discharge status associated with a follow-on stay in a LTCH, SNF, or IRF

1) Descriptive Statistics: Means and standard deviations (s) for continuous variables

2) Analytical Statistics: One-way analysis of variance (ANOVA) or Kruskal-Wallis ANOVA for continuous variables

Background (Literature Review)

Background on LTCHs

Services covered under Medicare Part A may be rendered by inpatient hospitals, CAHs, IRFs, LTCHs, SNFs, hospice programs, and/or HHAs. While these facilities are each responsible for providing certain types and levels of care to Medicare beneficiaries, not all are equipped to treat medically complex patients, or those patients diagnosed with severe conditions often coupled with multiple comorbidities. In fact, following an acute inpatient hospital stay, LTCHs are often responsible for providing care over an extended period of time to medically complex beneficiaries such as those suffering from chronic respiratory failure (CMS, 2012d).

To receive reimbursement from Medicare for the treatment of these patients, LTCHs must meet certain conditions set forth by Medicare so as to qualify for payment under the Medicare program. Foremost, these hospitals must meet Medicare's certification requirements for short-term acute care hospitals. Also, concerning Medicare patients, these hospitals must maintain an average inpatient length of stay which is greater than 25 days (CMS, 2012c). Following qualification as a LTCH, payments are received, per the LTCH PPS, for the provision of services to Medicare beneficiaries. Under the LTCH PPS, patient stays are grouped to Medicare-severity long-term care diagnosis-related groups (MS-LTC-DRGs) using the same clinical MS-DRG grouping logic used for inpatient short stay acute care under the IPPS.

Recently, concerns have arisen surrounding the payments made to LTCHs based on their respective PPS. With higher relative MS-LTC-DRG weights, especially in comparison to the MS-DRG weights under the IPPS, reimbursement for services

provided to Medicare beneficiaries are often higher than that received if treatment was provided in facilities such as SNFs or IRFs. Furthermore, in a recent analysis of LTCHs, MedPAC found that Medicare pays more for patients discharged and treated in LTCHs than for similar patients in other settings (MedPAC, 2012b). As such, recent research has questioned whether the patients treated in LTCHs can be similarly treated, for lower costs to Medicare, in SNFs or IRFs. These concerns surrounding the treatment of Medicare beneficiaries by LTCHs will be further examined.

Comparison of LTCHs to SNFs/IRFs

Currently, LTCHs are often utilized as an alternative to intensive care units (ICUs) for the treatment of severely ill patients and also as an alternative to SNFs and/or IRFs for those less severely ill patients (Kahn, Benson, Appleby, Carson, & Iwashyna, 2010). However, LTCHs receive higher payments for the provision of services to medically complex beneficiaries than do other facilities that provide similar levels of care, such as SNFs and IRFs (MedPAC, 2012b).

Regarding these higher payments, there have been numerous concerns over the past few years regarding the rapid growth of, and transfers to, LTCHs, Medicare reimbursement to these hospitals, and the clinical criteria guiding which hospitals/facilities should treat medically complex patients. In fact, for the purpose of reviewing these concerns, Congress passed the Medicare, Medicaid, and SCHIP Extension Act of 2007 (MMSEA), which placed a three year moratorium on new LTCHs entering the Medicare program (CMS, 2012c). As amended by the American Recovery and Reinvestment Act of 2009 (ARRA) and the Patient Protection and Affordable Care

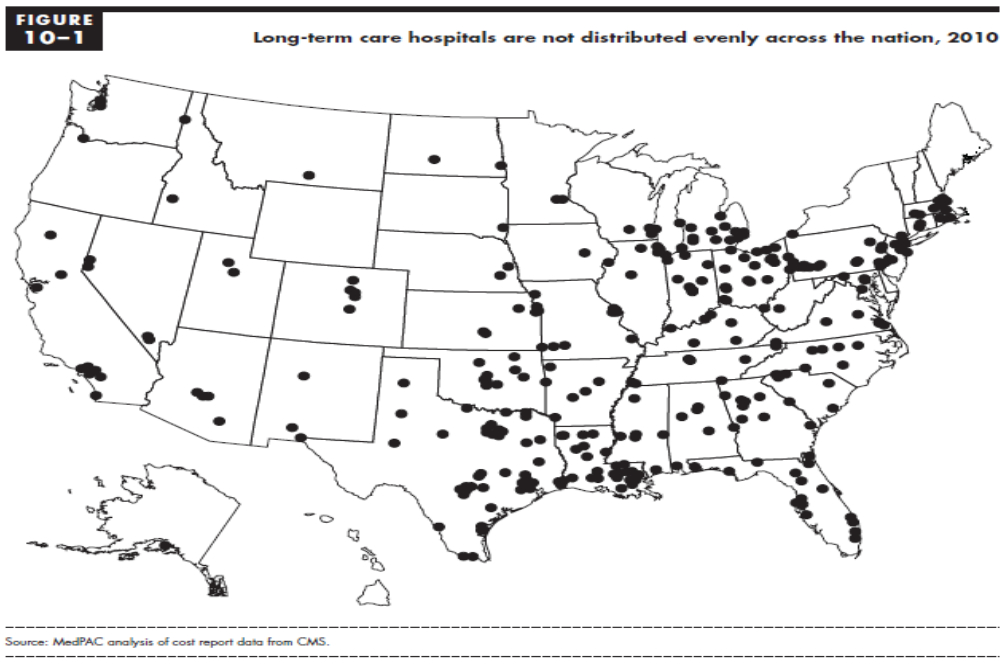
Act of 2010 (PPACA), this provision has been revised to impose a moratorium on new LTCHs and new beds in existing LTCHs until December 29, 2012 (MedPAC, 2012b).

Rapid Growth in LTCHs

As noted by MedPAC, the number of LTCHs, roughly 436 as of 2011, has continued to grow over the years (MedPAC, 2012a). A recent study conducted on long-term acute care hospital utilization after critical illness, utilizing Medicare Provider Analysis and Review (MedPAR) data from 1997 through 2006, found that the number of LTCHs doubled over this period of time (Kahn et al., 2010). This study further noted that the number of transfers to LTCHs tripled over this same time period (Kahn et al., 2010). Similarly, MedPAC, in a 2012 report, noted that in terms of critically ill patients, there has been a marked increase in the number of beneficiaries treated in LTCHs over the last decade (MedPAC, 2012b).

As it concerns the aforementioned increase in LTCHs in the U.S., and the subsequent increase in the utilization of these hospitals for the treatment of Medicare beneficiaries, these hospitals only exist in certain markets, with new LTCHs often located in areas already serviced. Since there is a limited population of Medicare beneficiaries diagnosed with medically complex problems, it would be expected that LTCHs are evenly distributed across the nation, instead of localized, with a high density, in certain areas (Kahn et al., 2010). Per the MedPAC 2012 *Report to the Congress: Medicare Payment Policy* (Figure 1) (MedPAC, 2012b):

Figure 1. Long-term care hospitals are not distributed evenly across the nation, 2010



Medicare Reimbursement

As such, the rapid growth in LTCHs, their lack of variance in market location(s), and the rising number of patients treated in these facilities have led to concerns surrounding Medicare reimbursement. As recently as 2010, it was found that Medicare spent $5.2 billion on care furnished in roughly 412 LTCHs nationwide (MedPAC, 2012b). This is a continuance of the increase in Medicare payments made to LTCHs seen over the last two decades, with $398 million paid for submitted claims in 1993, $1.9 billion in 2001, and an estimated $2.8 billion in 2004 (MedPAC, 2004). Based on these numbers, yearly payments made to LTCHs have more than doubled since 2001 with little evidence substantiating this rise in expenditures. Per 2010 data, long term acute care-related costs were also found to have tripled between 1997 and 2006 (Kahn et al., 2010).

Concerning the payment differences between Part A hospitals/facilities, LTCHs receive higher payments than SNFs and/or IRFs in an effort to better reflect the extra

costs associated with treating a higher proportion of medically complex beneficiaries. Unfortunately, based on data from fiscal year 2004, for patients with the most common LTCH diagnoses, "Medicare rates for LTCHs range from 0.9 to 4.4 times as much as estimated rates for inpatient rehabilitation facilities (IRFs), and about 3 to almost 12 times as much as estimated rates for SNFs" (MedPAC, 2004, p. 122). As it relates to this study, MedPAC found that the per case payment for post-acute cases with a principal diagnosis of 'respiratory system with ventilator' in 2004 was $115,463 for LTCHs, $26,051 for IRFs, and $10,051 for SNFs (MedPAC, 2004).

Clinical Criteria

Since LTCHs are receiving higher payments for providing care to beneficiaries characterized as medically complex, the type of patients treated by LTCHs versus SNFs and/or IRFs serves as an additional concern. Specifically, when LTCHs provide care to patients unlikely to need a high level of care, Medicare sees higher costs than it would have if the patient was treated in another setting such as a SNF or IRF. However, concerning the treatment of medically complex beneficiaries, those severely ill patients who are in the top 5% probability of using a LTCH, LTCHs were still found to cost Medicare more than other settings, though the results were not statistically significant. In certain situations however, in support of the current higher payment rates for LTCHs, such as among patients with tracheostomies, treatment provided in a LTCH versus another hospital/facility was found to save Medicare dollars (MedPAC, 2004).

Unfortunately, the majority of payments made to LTCHs continue to be higher than those made to other facilities for treating similar patients, as often measured by DRG classification. This is concerning due to the fact that SNFs and/or IRFs may provide care

to patients otherwise qualified for treatment in a LTCH. In fact, a recent analysis of medically complex Medicare ICU patients receiving mechanical ventilation found that, in 2006, only 16 percent of patients discharged alive were discharged to LTCHs, while 46 percent were discharged to skilled nursing facilities (SNFs) or inpatient rehabilitation facilities (IRFs) (Kahn et al., 2010). Furthermore, post-acute settings other than LTCHs, such as SNFs and IRFs, are not only treating medically complex beneficiaries, but based on the absence of LTCHs in many markets throughout the U.S., these facilities often substitute for LTCHs in those markets without a LTCH presence. Attributing to the need to further study the costs and benefits of LTCHs providing treatment to medically complex beneficiaries, versus SNFs and/or IRFs, research has also shown that the outcomes for patients treated in a LTCH are similar to those for patients treated in acute care hospitals (MedPAC, 2012b).

MS-DRG 207: Mechanical Ventilation

Recently, there have been numerous concerns surrounding the reimbursement of LTCHs for services that may be otherwise provided at a lower cost in SNFs and/or IRFs. For the purposes of data analysis, this study will utilize claims information for inpatient hospital stays classified under MS-DRG 207, "respiratory system diagnosis with ventilator support for 96 or more hours." MS-DRG 207, serving as a proxy for all DRGs and/or services rendered under Medicare Part A, will be utilized due to its public health significance, through the impact of CLRDs on health outcomes, the associated costs to hospitals/facilities for treating these diseases, and the variations in reimbursement, by Medicare, to Part A hospitals/facilities based on the applicable PPS.

Primarily, as part of the treatment regimen for individuals diagnosed with CLRDs, especially those with severe lung conditions such as chronic bronchitis, intensive, invasive, and costly medical procedures, such as mechanical ventilation over an extended period of time, may be warranted. Especially in those cases where these respiratory diseases lead to inefficient spontaneous ventilation by the patient, mechanical ventilation is utilized to assist an individual to breathe while their underlying condition(s) is/are treated.

Concerning actual hospital/facility costs and Medicare expenditures, MS-DRG 207 consumes substantial resources. Based on the FY 2011 IPPS Final Rule, *CMS-1498-F*, published in the August 16, 2010 Federal Register, MS-DRG 207 has a high DRG weight, 5.2068, compared to the average MS-DRG weight, 2.0782, which reflects a severe condition with a high cost of treatment. Also, the long duration of treatment associated with this MS-DRG, an arithmetic mean length of stay (ALOS) of 14.7 days, as compared to the ALOS of 6.3 days for all DRGs, may indicate more comorbidities and/or complications (Medicare Program, 2010).

Furthermore, MS-DRG 207 will be utilized in order to obtain a large sample size for the study, especially concerning discharges to and from LTCHs. Specifically, among the top 25 MS-LTC-DRGs which made up two-thirds of LTCH discharges in 2010, MS-LTC-DRG 207, or MS-DRG 207 under the IPPS, accounted for the most LTCH discharges as of 2010, with 16,024 (11.9%) discharges (MedPAC, 2010).

Proposed Study

Recently, studies have been focusing on the differences in Medicare reimbursement for the treatment of Medicare beneficiaries with similar conditions within

LTCHs as compared to other Part A hospitals/facilities (MedPAC, 2012b). However, this particular study, while analyzing actual hospital/facility costs and the associated Medicare payments, also aims to discern any similarities and/or differences among the patients discharged to and treated within these various settings. Regarding the stated objective(s) of this study, the MedPAC has suggested that criteria be developed by Medicare in order to accurately define the type of long-term acutely ill patient(s) who are eligible for admission to LTCHs versus those who should be otherwise treated in a separate hospital/facility, such as in a SNF or an IRF (MedPAC, 2012b).

To this end, this study aims to discern whether or not higher Medicare payments to LTCHs are appropriate based on analyses examining potential variations in beneficiary demographic and clinical characteristics, actual hospital/facility costs, and Medicare payments across provider types. These analyses will be conducted both in terms of the discharge location of patients following an acute inpatient hospitalization under MS-DRG 207 and the discharge status of these patients upon discharge from the follow-on stays. As aforementioned, a key focus is placed on discerning any demographic or clinical differences between patients discharged to and from these hospitals/facilities for purposes of policy development. Furthermore, this study's findings may help influence policy change(s) focusing on adjusting the applicable PPS to better align Medicare payments with the actual cost of providing services, especially concerning services rendered to medically complex beneficiaries. Additionally, the findings may support the development of criteria guiding the discharge of medically complex patients for treatment in one hospital/facility over another based on the aforementioned variables.

Research Design and Methods

Overall Study Design

This paper presents a retrospective cohort study entailing secondary data analysis of Medicare Provider Analysis and Review (MedPAR) File data collected by CMS for FY 2011, October 1, 2010 through September 30, 2011.

Data source (Secondary Data Analysis)

The MedPAR File, developed by CMS for the purpose of studying inpatient hospital and SNF care provided to Medicare beneficiaries, will be utilized for this study. Publically available for each calendar and fiscal year since 1991, the MedPAR File enables researchers to track inpatient history and patient outcomes, over a specified time period, for various purposes ranging from chronic disease research and mortality studies to time-trend analysis of hospital utilization and Medicare expenditures (CMS, 2012b).

In order to carry out these analyses, claims submitted for services provided to Medicare beneficiaries by certified inpatient hospitals, SNFs, and related hospitals/facilities are accumulated based on a fiscal or calendar year. The MedPAR File is created by aggregating each beneficiary's claims information, which may consist of one or multiple claims over a specified period of time, to one stay record. Specifically, each stay record consists of claims accumulated from the date of a beneficiary's admission through to their discharge. Furthermore, these stay records represent final action claims data whereby all adjustments have been previously resolved (CMS, 2012b).

As obtained from the claims submitted to Medicare by hospitals/facilities, the MedPAR File consists of numerous fields. These fields comprise data on beneficiary demographics such as age, race, and sex, clinical characteristics including length of stay,

diagnosis codes, and number of comorbidities, payment related information, such as hospital charges and Medicare payments, and additional fields such as provider number(s), MS-DRGs, and entitlement data.

Description of the Participants and Criteria for Selection

As aforementioned, Medicare is a health insurance program which provides health insurance coverage to individuals aged 65 or older, individuals under the age of 65 with certain disabilities, and/or those individuals who have ESRD. Based on 2011 data, Medicare currently provides coverage for roughly 48.7 million Americans, 40.4 million aged 65 or older and 8.3 million disabled individuals (The Boards of Trustees, 2012).

Utilizing MedPAR data, a primary dataset will be created which consists of all Part A claims, subsequently aggregated to stay records, submitted by inpatient hospitals, both short stay and long stay, SNFs, and related hospitals/facilities for FY 2011. This dataset will then be pared down to include only those stay records for beneficiaries with an acute inpatient hospitalization, as defined by their stay in an acute short-stay inpatient hospital. Subsequently, this dataset will be limited to only those acute inpatient hospitalizations classified under MS-DRG 207. Then, per the scope of the study, this dataset will be pared down to include only those stay records for beneficiaries with follow-on stays in a LTCH, SNF, and/or IRF. As it concerns the collection of this data, only those stay records, for a follow-on stay in these specific Part A hospitals/facilities, with a date of discharge prior to September 30, 2011, will be included.

Currently, there is an increased focus on health outcomes among the U.S. population, especially older adults, and rising concerns surrounding Medicare expenditures associated with the provision of services to these individuals. Therefore, for

purposes of generalizability to the U.S. older adult population, patients (i.e. beneficiaries) younger than 65 years of age on the date of admission to the acute inpatient hospital will be excluded from this study. Specifically, patients in this age group may be enrolled in Medicare due to either disability or diagnosis with ESRD and therefore may not be representative of the U.S. older adult population. As such, patients classified as disabled or diagnosed with ESRD will also be excluded from this study. Per these exclusions, the sample size for this study will include roughly 7,500 stay records.

Description of Dependent Variables

Per the specific aims, there are two dependent variables, as obtained from the FY 2011 MedPAR File, for the purpose of data analysis. Concerning the first of these dependent variables, this study aims to conduct a comparative analysis of beneficiary demographic and clinical characteristics, actual hospital/facility costs, and Medicare payments based on patient discharge location following a prior acute inpatient hospitalization under MS-DRG 207.

The discharge location, either a LTCH, SNF, or IRF, will be determined by matching the health insurance claim number (HICN) and discharge date present on each stay record, for the acute inpatient hospitalization under MS-DRG 207, to the HICNs and admission dates present in the LTCH, SNF, and IRF MedPAR Files, each file of which contains only those stay records for the respective provider type. As will be examined in the data analysis section, a follow-on LTCH, SNF, or IRF stay record will include an admission date on, or one day following, the acute inpatient hospitalization discharge date. In summary, claims information will be analyzed for those patients who are discharged for a subsequent, follow-on, stay in a LTCH, SNF, or IRF following a

previous acute inpatient hospitalization under MS-DRG 207. Per the MedPAR data dictionary (Appendix IV) and National Claims History (NCH):

No.	MedPAR Field	Len.	Loc.	Type	Description
18	Provider Number Group	6	49-54	Group	_ _ # # # # = State # # _ # # # = Prov. Category # # # _ _ _ = Serial No.
22	Provider Number Special Unit Code	1	55	Char	Numbering system for units of hospitals excluded from PPS or hospitals w/ SNF swing-bed designation

Provider Types		Provider Numbers	Unit Code
Acute Inpatient Hospitals		##0###	‘ ’
Long-Term (Acute) Care Hospitals	(LTCHs)	##2000 - ##2299	‘ ’
Skilled Nursing Facilities	(SNFs)	##5000 - ##6499	‘U’,’Z’
Inpatient Rehabilitation Facilities	(IRFs)	##3025 - ##3099	‘T’,’R’

Regarding the second dependent variable, after determining whether or not a beneficiary had an acute inpatient hospitalization under MS-DRG 207, and their discharge location for a follow-on stay, the MedPAR File will be utilized to determine the patient’s discharge status upon discharge from this follow-on stay. Primarily, a patient’s status upon discharge from a follow-on stay will be confirmed using the ‘Beneficiary Discharge Status Code’ which is derived from the claim status code that is present on the last claim record included in the stay. Per the MedPAR data dictionary:

No.	MedPAR Field	Len.	Loc.	Type	Description
14	Beneficiary Discharge Status Code	1	36	Char	Code used to identify the status of the patient as of the CLM_THRU_DT
137	Discharge Destination Code	2	940-941	Num	Code primarily indicating the destination of the beneficiary upon discharge from a facility; also denotes death or SNF/still patient situations

The ‘Beneficiary Discharge Status Code’ includes the following information:

MedPAR Beneficiary Discharge Status Code

Code	Sex
A	Discharged alive
B	Discharged dead
C	Still a patient

Next, the 'Discharge Destination Code' (Appendix IV) will be utilized to determine whether the patient was discharged alive to their home or another hospital/facility, or discharged/transferred for further treatment and/or designated as still a patient in the applicable hospital/facility. This field will also confirm whether the patient had been discharged as dead from the follow-on stay.

Description of Independent Variables

As aforementioned, this study aims to conduct a comparative analysis of beneficiary demographic and clinic characteristics, actual hospital/facility costs, and Medicare payments. These analyses will be performed once upon the patients' discharge to a LTCH, SNF, or IRF for a follow-on stay following an acute inpatient hospitalization under MS-DRG 207 and again following the patients' discharge from this follow-on stay. As noted above, these patients may be discharged alive (home/self-care), discharged for further treatment (or still a patient), or discharged dead.

Primarily, beneficiary demographic and clinical characteristics will be analyzed. Specifically, variables representing demographic characteristics were recorded in fields including 'Beneficiary Age Count', a continuous variable indicating the beneficiary's age as of the date of admission, 'Beneficiary Sex Code', a categorical variable indicating the sex of a beneficiary, and 'Beneficiary Race Code', a categorical variable indicating the race of a beneficiary. 'Beneficiary Sex Code' has two categories, male and female, while

'Beneficiary Race Code' includes categories for white, black, Asian, Hispanic, North American Native, other, and unknown. An unknown race was noted on those stay records where race was not reported.

Meanwhile, variables representing clinical characteristics will be obtained from fields including 'Length of Stay Day Count', a continuous variable recording a count in days of the total length of a beneficiary's stay in a hospital or SNF and 'Diagnosis Code Count' (i.e. comorbidities), a continuous variable reporting a count of the number of diagnosis codes included in the stay. Information will also be collected from the 'Diagnosis Code' field, a categorical variable, on the top primary diagnosis codes among patients whose stay records were classified under MS-DRG 207. Finally, continuous variables including actual hospital/facility costs, total charges, and Medicare payments will also be analyzed within this study.

Regarding actual hospital/facility costs, the charges submitted to Medicare by Part A hospitals and/or facilities do not reflect the actual cost to providers for rendering these services (AHRQ, 2011). Therefore, in order to conduct analyses surrounding actual hospital/facility costs, the applicable cost-to-charge ratios (CCRs) will be appended to the datasets utilized within this study. Specifically, actual hospital/facility costs can be calculated through an adjustment of the provider charges by the applicable provider specific CCR from the most recent cost report. For the purposes of this study, the total charges submitted by each LTCH, SNF, and/or IRF for services provided was utilized to calculate the actual cost to each provider.

Utilizing the MedPAR data dictionary, the 'Total Charge Amount' field was utilized to obtain the charges submitted to Medicare by each hospital/facility. This field

contains the total amount (rounded to whole dollars) of all charges, including non-covered charges, for all services provided to the beneficiary for the stay. For the purpose of calculating actual hospital/facility costs, the aforementioned total charges will be adjusted by the applicable CCRs. As such, the most recent CCRs for each hospital/facility during FY 2011 will be utilized.

As it applies to these calculations, CCRs are generated from the most recent, settled, cost report for each provider. Utilizing a year's worth of cost report accounting data, these CCRs are intended to be utilized to proxy the percent of charges that actually represent the true costs to the applicable hospital/facility for providing services to Medicare beneficiaries. For example, the higher the CCR percentage, such as an operating CCR of 0.333 versus 0.111, the less implied profit to the hospital/facility in question. These CCRs may change over a given twelve month time period based on revisions of each provider's cost reports based on appeals and related adjustments. As such, CCRs for inpatient hospitals, LTCHs, and IRFs will be obtained from the April 2011 update of the provider-specific file (PSF), which contains information about each provider to enable the pricing software to calculate the payment amount, is updated on a flow basis per this cost report data, though only a snap shot of this data is obtained quarterly. The April, or third quarter, update is often utilized during the yearly rule-making (i.e. Final Rule (FR) 2011) for purposes of setting payment rates for the subsequent fiscal year. As CCRs for SNFs are not required reportable data for the PSF, the CCRs for these facilities or units will be obtained from the cost report data utilized during the development of the FY 2011 Final Rule.

Finally, Medicare payments refer to the actual reimbursement of hospitals/facilities by Medicare for the provision of services to beneficiaries. Concerning the Medicare payments made to LTCHs, SNFs, and IRFs, this information will be obtained using the 'DRG Price Amount' and 'DRG Outlier Approved Payment Amount' fields which, combined, account for the entire payment amount, made from the Medicare trust fund, for services covered during the stay. For purposes of statistical analysis, the Medicare payment amounts will be standardized to allow comparison across hospital/facility types on a national scale.

Data analysis

The FY 2011 MedPAR File will be utilized for the purposes of data analysis. Primarily, the first part of this study entails the manipulation of this data in order to obtain a working dataset of inpatient stay records for those beneficiaries who had a follow-on stay in a LTCH, SNF, or IRF following an acute inpatient hospitalization under MS-DRG 207 (Appendix V).

First, stay records for all acute inpatient hospitalizations under MS-DRG 207 will be broken out of the FY 2011 MedPAR File based on the presence of a provider number associated with an acute inpatient hospital and a classification of the stay record under MS-DRG 207. Following the creation of this dataset, the beneficiary's HICN, discharge date, and related fields from each stay record will be utilized to create a finder file composed of beneficiaries with a prior acute inpatient hospitalization under MS-DRG 207. Concerning the use of discharge dates, discharges to a LTCH, SNF, or IRF for a follow-on stay will be defined as temporally adjacent hospitalizations (i.e. discharge from the inpatient hospital on day *n* and admission to the LTCH, SNF, or IRF on day *n* or

n + 1). This finder file will then be applied against the LTCH, SNF, and IRF MedPAR Files which have been created based on the provider numbers for each hospital/facility type. All relevant claims data from both the acute inpatient hospitalization dataset and the individual LTCH, SNF, and/or IRF datasets will be appended accordingly. The applicable cost-to-charge ratios will also be appended to this dataset.

Following the creation of the study datasets, descriptive statistics shall be calculated. For the purpose of these calculations, all patient-level demographic and clinical data, actual hospital/facility costs, and Medicare payments will be obtained directly, or indirectly through separate calculations, utilizing Medicare claims data compiled in the aforementioned datasets. For this study, both the distribution of patients discharged to each hospital/facility and the distribution of patients, based on discharge status, discharged from each hospital/facility will be summarized through the calculation of sample means and standard deviations (s) for continuous variables and frequencies and relative frequencies (%) for categorical variables.

Concerning analytical statistics, for categorical variables, Pearson's chi-square test, or Fisher's exact test when expected values are less than five, will be utilized to compare these distributions. Then, pairwise comparisons will be conducted if overall significant difference is detected. For continuous variables, distributions will first be examined for normality. If the normality assumption is violated, Kruskal-Wallis analysis of variance (ANOVA) will be utilized, instead of the parametric one-way ANOVA, to compare the medians for the three groups. Following the determination of statistical significance, or non-significance, pairwise comparisons will be conducted utilizing the Mann-Whitney U test (Mann–Whitney–Wilcoxon (MWW)). As it relates, for the initial

analyses, all tests are two-tailed and a p-value of ≤ 0.05 is considered significant. Regarding the subsequent pairwise comparisons, a Bonferroni correction will be utilized to adjust the significance level to 0.017 to account for multiple comparisons. Then, multinomial logistic regression will be utilized to analyze the impact/effect of certain predictor variables, including sex, race, diagnosis code, age, length of stay, diagnosis count, and actual hospital/facility costs, controlling for every other variable, on the likelihood of discharge to a particular hospital/facility following an acute inpatient hospitalization under MS-DRG 207. For the purpose of the multinomial logistic regression, patients discharged to LTCHs shall serve as the reference group.

In order to create the required datasets and perform the above analyses, this study shall utilize SAS version 9.3 (SAS Institute Inc., Cary, NC, USA). All tests are two-tailed, and a p-value of ≤ 0.05 is considered significant.

Human Subjects

The data utilized for this study will be obtained from the FY 2011 MedPAR File. Though MedPAR data, covering each calendar and fiscal year since 1991, is publically available on the CMS website, the six month run-out of FY 2011 data, made available in March 2012, will be obtained directly from the CMS shared systems.

As such, a Data Use Agreement (DUA), an agreement required prior to the disclosure of data from CMS' Systems of Records, was submitted, though eventually deemed unnecessary due to the investigator's security clearance in CMS, in order to ensure compliance with the various requirements of the Privacy Act, the Privacy Rule, and CMS data release policies. Specifically, this agreement stipulates that the user may not disclose direct findings, listings, or information which contains protected health

information (PHI), personally identifiable information (PII), and/or other information which may be utilized to deduce an individual's identity.

For the purpose of this study, no individual identifiers will be provided in the study results/findings. Furthermore, all data utilized will be retained by CMS and securely stored on-site at the CMS Baltimore Data Center (BDC). As such, the CMS BDC meets the appropriate administrative, technical, and physical safeguards required to both protect the confidentiality of the data and prevent the unauthorized use of or access to said data. The applicable security requirements are established by the Office of Management and Budget (OMB) and laid out in OMB Circular No. A-130, Appendix III – Security of Federal Automated Information Systems and the Federal Information Processing Standard (FIPS) 200.

Additionally, the methodology for this study was submitted to, and subsequently approved by, the University of Maryland, College Park (UMCP) Institutional Review Board (IRB) prior to the completion of the data analysis. The applicable Collaborative Institutional Training Initiative (CITI) training for Social & Behavioral Research was also completed.

Results/Findings

Per the FY 2011 MedPAR data, there were a total of 15,219,329 stay records with 10,815,100 associated with inpatient hospitals, 160,482 with LTCHs, and 423,100 with IRFs. An additional, separate, MedPAR dataset contained 2,790,832 SNF stay records. For this study, there were 23,893 inpatient stay records classified under MS-DRG 207 for beneficiaries aged 65 or older. Per the limitations detailed in the methodology, the final datasets created for this study comprised a total of 7,823 inpatient stay records with follow-on stays (Appendix V). There were 1,933 matches for follow-on stays in LTCHs (24.7%), 5,126 matches for follow-on stays in a SNF (65.5%), and the associated swing-bed hospitals, and 764 matches for follow-on stays in an IRF (9.8%), and the associated rehabilitation units.

For purposes of the data analysis, for categorical variables, Pearson's chi-square test or Fisher's exact test were utilized. Concerning the descriptive statistics, frequencies and relative frequencies (%) were examined. For continuous variables, as the distributions of all the continuous variables were not normally distributed, Kruskal-Wallis ANOVA was utilized to compare the medians for the three groups. Additionally, pairwise comparisons were conducted utilizing the Mann-Whitney U test (Mann–Whitney–Wilcoxon (MWW)). For the descriptive statistics, for continuous variables, instead of examining means and standard deviations (s), this study utilized the medians and interquartile ranges (IQR) (Q1-Q3). As aforementioned, for the initial analyses, all tests were two-tailed and a p-value of ≤ 0.05 was considered significant. Regarding the subsequent pairwise comparisons, a Bonferroni correction was utilized to adjust the significance level to 0.017 to account for multiple comparisons.

Table 1. Analysis of demographic and clinical variables and costs associated with patients discharged to Long-Term Care Hospitals, Inpatient Rehabilitation Facilities, and Skilled Nursing Facilities following an acute inpatient hospitalization under MS-DRG 207

Categorical Variables	Long-Term Care Hospital (N=1,933)		Inpatient Rehab. Facility (N=764)		Skilled Nursing Facility (N=5,126)		p-value	Pairwise Comparisons		
	Frequency (%)		Frequency (%)		Frequency (%)			L x I	L x S	I x S
Sex							< 0.0001*	0.0019*	0.0991*	< 0.0001*
Male	879	(45.5%)	398	(52.1%)	2,219	(43.3%)				
Female	1,054	(54.5%)	366	(47.9%)	2,907	(56.7%)				
Race							< 0.0001*	< 0.0001*	0.0085*	< 0.0001*
White	1,450	(75.0%)	649	(84.9%)	3,999	(78.0%)				
Black	324	(16.8%)	73	(9.6%)	798	(15.6%)				
Other	159	(8.2%)	42	(5.5%)	329	(6.4%)				
Diagnosis Codes							< 0.0001*	< 0.0001*	0.0013*	0.0008*
486^	230	(11.9%)	95	(12.4%)	567	(11.1%)				
49121^	95	(4.9%)	42	(5.5%)	273	(5.3%)				
5070^	145	(7.5%)	43	(5.6%)	429	(8.4%)				
51881^	691	(35.7%)	347	(45.4%)	2,053	(40.1%)				
51884^	385	(19.9%)	91	(11.9%)	848	(16.5%)				
Other	387	(20.0%)	146	(19.1%)	956	(18.7%)				

* p-values obtained utilizing Pearson's chi-square test

^ See Table 2 for Disease/Disorder names associated with these ICD-9 codes

Continuous Variables	Long-Term Care Hospital (N=1,933)		Inpatient Rehab. Facility (N=764)		Skilled Nursing Facility (N=5,126)		p-value	Pairwise Comparisons		
	Median (IQR)		Median (IQR)		Median (IQR)			L x I	L x S	I x S
Age (years)	75	(70-82)	74	(69-80)	77	(71-83)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
LOS (days)	13	(9-18)	16	(12-20)	15	(11-21)	< 0.0001*	< 0.0001*	< 0.0001*	0.0055*
Diag. Count	17	(10-20)	16	(11-20)	17	(11-19)	0.8464*	0.9574*	0.5792*	0.7859*
Costs (Std.+)	$1,932.00	($1,574.00 - $2,373.00)	$1,836.00	($1,502.50 - $2,234.00)	$1,718.00	($1,389.00 - $2,111.00)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*

* p-values obtained utilizing Kruskal-Wallis ANOVA

+ Std. = standardized

This first part of the study entailed a comparative analysis of the patients discharged to a LTCH, SNF, or IRF following an acute inpatient hospitalization under MS-DRG 207. First, the age of those patients whose stay records were utilized ranged from 65 to 108 years. Concerning 'Beneficiary Race Code', this field was limited to white, black, and 'other'. The 'other' race field contains the records for Asian, Hispanic, Native American, other, and unknown due to the limited number of stay records categorized into these groups. Meanwhile, length of stay, the number of days associated with the stay record, ranged from 2 to 127 days.

Additionally, the top five primary diagnosis codes were examined (Table 2), with an additional category for 'other' diagnoses, so as to compare discharges on this variable.

Table 2. Primary Diagnosis Codes – Discharge to LTCH, SNF, or IRF

ICD-9-CM	MDC 4 Diseases & Disorders	Notes
486	Pneumonia, organism NOS	Pneumonia: Organism not otherwise specified (NOS)
49121	Obs Chr Bronc w(ac) Exac	Obstructive chronic bronchitis with (acute) exacerbation
5070	Food/vomit pneumonitis	Pneumonitis due to inhalation of food or vomit
51881	Acute Respiratory Failure	Can be acute (short-term) or chronic (ongoing). Occurs due to failure of the lungs to pass oxygen into the blood or remove carbon dioxide from the blood.
51884	Acute & Chronic Respiratory Failure	

The above chart is based on the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). The ICD-9-CM is the current system utilized by hospitals within the U.S. in order to assign codes to diagnoses and procedures associated with patient treatment. As it relates, concerning the primary diagnosis and related diagnoses for each patient, as indicated within the stay record, the diagnosis code count represents the total number of comorbidities associated with each patient. Stay records

for beneficiaries within this study had diagnosis code counts ranging from 2 to 25 comorbidities.

For patients discharged from an inpatient hospital for a follow-on stay in a LTCH, SNF, or IRF, there were statistically significant differences in sex, race, diagnosis codes, age, length of stay, and actual hospital/facility costs, but no statistically significant differences in diagnosis count. Concerning sex, there was a higher percentage of females than males among those patients discharged to LTCHs. Per the applicable pairwise comparisons, this was comparable to discharges to SNFs ($p = 0.0991$), but statistically different from discharges to IRFs ($p = 0.0019$), which comprised a higher percentage of males than females. For race, discharges to LTCHs were statistically different from discharges to both IRFs ($p < 0.0001$) and SNFs ($p = 0.0085$). Specifically, discharges to LTCHs comprised a higher percentage of black and other minority patients than those discharged to IRFs or SNFs, although the lowest percentage of white patients. Concerning diagnosis code(s), there were statistically significant differences in all three groups ($p < 0.0001$) and each group's distribution was significantly different from each other group. While the most common primary diagnosis code was '51881', and '49121' the least common, among all provider types, discharges to LTCHs accounted for the highest percentage of code '51884', with '51881' for discharges to IRFs and '5070' for discharges to SNFs.

Additionally, the median age at discharge for those discharged to LTCHs, 75 years, was significantly older than the median age of patients discharged to IRFs, 74 years ($p < 0.0001$), but younger than the median age of patients discharged to SNFs, 77 years ($p < 0.0001$). The median length of stay for those patients discharged to LTCHs,

13 days, was significantly shorter than the median length of stay for patients discharged to IRFs, 16 days ($p < 0.0001$), and the median length of stay for patients discharged to SNFs, 15 days ($p < 0.0001$). Regarding actual hospital/facility costs, the median cost of patients discharged to LTCHs, $1,932.00, was significantly higher than the median cost of patients discharged to IRFs, $1,836.00 ($p < 0.0001$), and the median cost of patients discharged to SNFs, $1,718.00 ($p < 0.0001$).

Multinomial logistic regression was then utilized to analyze the impact of applicable variables on the likelihood of discharge to a particular hospital/facility following an inpatient hospitalization under MS-DRG 207. Specifically, multinomial logistic regression was utilized for modeling a nominal outcome variable, discharge location, whereby the log odds of the outcomes were modeled as a linear combination of predictor variables such as age and length of stay. Per the above statistical analyses, numerous predictor variables were examined including sex, race, age, diagnosis code, length of stay, and actual hospital/facility costs. For the purpose of the multinomial logistic regression, two models were tested. These models can be expressed as below:

$$\ln\left(\frac{P(type = IRF)}{P(type = LTCH)}\right) = \begin{array}{l} b_0 + b_1\,(\text{sex} = \text{male}) + b_2\,(\text{race} = \text{black}) + b_3\,(\text{race} = \text{other}) + \\ b_4\,(\text{diag} = 486) + b_5\,(\text{diag} = 49121) + b_6\,(\text{diag} = 5070) + \\ b_7\,(\text{diag} = 51884) + b_8\,(\text{diag} = \text{other}) + b_9\,\text{age} + b_{10}\,\text{LOS} + b_{11}\,\text{Costs} \end{array}$$

$$\ln\left(\frac{P(type = SNF)}{P(type = LTCH)}\right) = \begin{array}{l} b_{20} + b_{21}\,(\text{sex} = \text{male}) + b_{22}\,(\text{race} = \text{black}) + b_{23}\,(\text{race} = \text{other}) + \\ b_{24}\,(\text{diag} = 486) + b_{25}\,(\text{diag} = 49121) + b_{26}\,(\text{diag} = 5070) + \\ b_{27}\,(\text{diag} = 51884) + b_{28}\,(\text{diag} = \text{other}) + b_{29}\,\text{age} + b_{30}\,\text{LOS} + b_{31}\,\text{Costs} \end{array}$$

where b's are the regression coefficients.

The following table (Table 3) consists of the odds ratio estimates obtained from the multinomial logistic regression analyses:

Table 3. Multinomial logistic regression: Odds ratio estimates of the impact of applicable variables on the likelihood of discharge to a particular hospital/facility following an inpatient hospitalization under MS-DRG 207

* All data utilized in the regression analysis was compiled from the stay records for patients prior to their discharge for a follow-on stay in a LTCH, SNF, or IRF

Effect	Type	Odds Ratio (OR)	95% Wald Confidence Limit (CI)	
Sex (Male vs. Female)	IRF	1.24	1.05	1.48
Sex (Male vs. Female)	SNF	0.93	0.83	1.03
Race (Black vs. White)	IRF	0.49	0.37	0.64
Race (Black vs. White)	SNF	0.83	0.72	0.96
Race (Other vs. White)	IRF	0.61	0.43	0.88
Race (Other vs. White)	SNF	0.68	0.55	0.84
Diagnosis Code* (486 vs. 51881)	IRF	0.76	0.58	1.00
Diagnosis Code* (486 vs. 51881)	SNF	0.75	0.63	0.90
Diagnosis Code* (49121 vs. 51881)	IRF	0.70	0.47	1.04
Diagnosis Code* (49121 vs. 51881)	SNF	0.87	0.68	1.12
Diagnosis Code* (5070 vs. 51881)	IRF	0.55	0.38	0.80
Diagnosis Code* (5070 vs. 51881)	SNF	0.90	0.72	1.11
Diagnosis Code* (51884 vs. 51881)	IRF	0.44	0.34	0.57
Diagnosis Code* (51884 vs. 51881)	SNF	0.76	0.65	0.88
Diagnosis Code* (Other vs. 51881)	IRF	0.68	0.54	0.86
Diagnosis Code* (Other vs. 51881)	SNF	0.81	0.69	0.94
Age	IRF	0.97	0.96	0.98
Age	SNF	1.01	1.00	1.02
Length of Stay (LOS)	IRF	1.04	1.03	1.05
Length of Stay (LOS)	SNF	1.04	1.03	1.05
Diagnosis Count	IRF	0.99	0.98	1.01
Diagnosis Count	SNF	0.99	0.98	1.00
Costs ($)	IRF	1.00	1.00	1.00
Costs ($)	SNF	0.99	0.99	1.00

* Concerning the diagnosis codes noted above, please reference Table 2)

Men were somewhat more likely than women to be discharged to an IRF versus a LTCH (odds ratio (OR): 1.24, 95% confidence interval (CI): 1.05 - 1.48) while men and women had comparable odds of discharge to a SNF versus a LTCH. Blacks were less likely than whites to be discharged to an IRF (OR: 0.49, 95% CI: 0.37 - 0.64) or a SNF (OR: 0.83, 95% CI: 0.72 - 0.96) versus a LTCH. Similarly, individuals from other races, such as those of Asian or Native American origin, were less likely than whites to be

discharged to an IRF (OR: 0.61, 95% CI: 0.43 - 0.88) or a SNF (OR: 0.68, 95% CI: 0.55 - 0.84). Individuals diagnosed with pneumonia, organism not otherwise specified (NOS), were less likely than those with acute respiratory failure to be discharged to a SNF (OR: 0.75, 95% CI: 0.63 - 0.90) versus a LTCH. Individuals diagnosed with pneumonitis due to inhalation of food or vomit, were less likely than those with acute respiratory failure to be discharged to an IRF (OR: 0.55, 95% CI: 0.38 - 0.80) versus a LTCH. Individuals diagnosed with acute & chronic respiratory failure were less likely than those with acute respiratory failure to be discharged to an IRF (OR: 0.44, 95% CI: 0.34 - 0.57) or a SNF (OR: 0.76, 95% CI: 0.65 - 0.88) versus a LTCH. Individuals diagnosed with an 'other' diagnosis code were less likely than those with acute respiratory failure to be discharged to an IRF (OR: 0.68, 95% CI: 0.54 - 0.86) or a SNF (OR: 0.81, 95% CI: 0.69 - 0.94) versus a LTCH.

Age was inversely associated with discharge to an IRF versus a LTCH; each one year increase in age was associated with 0.97 times the odds of discharge to an IRF versus a LTCH (95% CI: 0.96 - 0.98). Meanwhile, each one year increase in age was associated with 1.01 times the odds of discharge to a SNF versus a LTCH (95% CI: 1.00 – 1.02). An increased length of stay, in days, was associated with an increased likelihood of discharge to an IRF or a SNF versus a LTCH. Specifically, every extra day spent in the hospital was associated with 1.04 times the odds of discharge to an IRF (95% CI: 1.03 - 1.05) and 1.04 times the odds of discharge to a SNF (95% CI: 1.03 - 1.05). Neither diagnosis counts nor cost of the acute inpatient hospitalization were associated with discharge location.

Next, datasets were stratified, based on each beneficiary's discharge status and discharge location (Table 4) for the purpose of a comparative analysis of the patients discharged alive (Table 5), discharged/transferred for further treatment (or still a patient) (Table 6), or discharged dead (Table 7) from a follow-on stay in a LTCH, SNF, or IRF. By provider type, for LTCHs, 81 of the 1,933 patients were discharged alive (4.2%), 1,344 were transferred (69.5%), and 508 were discharged dead (26.3%). For IRFs, 170 of the 764 patients were discharged alive (22.3%), 593 were transferred (77.6%), and 1 was discharged dead (0.1%). For SNFs, 1,422 of the 5,126 patients were discharged alive (27.7%), 3,350 were transferred (65.4%), and 354 were discharged dead (6.9%).

Table 4. Breakdown of stay records by discharge status upon discharge from follow-on stays in Long-Term Care Hospitals, Inpatient Rehabilitation Facilities, and Skilled Nursing Facilities

Categorical Variables	Long-Term Care Hospital (N=1,933)		Inpatient Rehab. Facility (N=764)		Skilled Nursing Facility (N=5,126)		p-value	Pairwise Comparisons		
	Frequency (%)		Frequency (%)		Frequency (%)			L x I	L x S	I x S
Discharge Status							< 0.0001**	< 0.0001**	< 0.0001*	< 0.0001**
Alive	81	(4.2%)	170	(22.3%)	1,422	(27.7%)				
Transfer	1,344	(69.5%)	593	(77.6%)	3,350	(65.4%)				
Dead	508	(26.3%)	1	(0.1%)	354	(6.9%)				

* p-value obtained utilizing Pearson's chi-square test

** p-value obtained utilizing Fisher's exact test

Concerning patients discharged alive, discharged/transferred for further treatment (or still a patient), or discharged dead from their follow-on stay, there was a statistically significant difference in discharge status by provider type ($p < 0.0001$). Following the pairwise comparisons, discharges from LTCHs had a significantly different distribution than both discharges from IRFs ($p < 0.0001$) and discharges from SNFs ($p < 0.0001$). Per the above table, discharges from LTCHs accounted for the lowest percentage of patients discharged alive, 4.2%, from the follow-on stay, while discharges from SNFs had the highest percentage, 27.7%. Comparatively, discharges from LTCHs had the highest percentage of patients discharged dead, 26.3%, from the follow-on stay, while discharges from IRFs had the lowest percentage, 0.1%.

Table 5. Analysis of demographic and clinical variables associated with patients discharged alive from follow-on stays in Long-Term Care Hospitals, Inpatient Rehabilitation Facilities, and Skilled Nursing Facilities

Categorical Variables	Long-Term Care Hospital (N=81)		Inpatient Rehab. Facility (N=170)		Skilled Nursing Facility (N=1,422)		p-value	Pairwise Comparisons		
	Frequency (%)		Frequency (%)		Frequency (%)			L x I	L x S	I x S
Sex							0.1725*	0.1469*	0.6457*	0.0755*
Male	34	(42.0%)	88	(51.8%)	634	(44.6%)				
Female	47	(58.0%)	82	(48.2%)	788	(55.4%)				
Race							0.1632**	0.0399**	0.1289**	0.3956*
White	66	(81.5%)	144	(84.7%)	1,179	(82.9%)				
Black	14	(17.3%)	15	(8.8%)	170	(12.0%)				
Other	1	(1.2%)	11	(6.5%)	73	(5.1%)				

* p-values obtained utilizing Pearson's chi-square test
** p-values obtained utilizing Fisher's exact test

Continuous Variables	Long-Term Care Hospital (N=81)		Inpatient Rehab. Facility (N=170)		Skilled Nursing Facility (N=1,422)		p-value	Pairwise Comparisons		
	Median (IQR)		Median (IQR)		Median (IQR)			L x I	L x S	I x S
Age (years)	71	(68-78)	72	(69-78)	75	(70-81)	< 0.0001*	0.3627*	0.0011*	0.0007*
LOS (days)	24	(18-32)	11	(8-15)	22	(14-39)	< 0.0001*	< 0.0001*	0.4559*	< 0.0001*
Diag. Count	13	(9-18)	12	(9-16)	8	(5-9)	< 0.0001*	0.3342*	< 0.0001*	< 0.0001*

* p-values obtained utilizing Kruskal-Wallis ANOVA

For patients discharged alive, there were statistically significant differences in age, LOS, and diagnosis count by provider type, but no statistically significant differences in sex or race. Specifically, by way of the pairwise comparisons, SNF discharges were found to be statistically different in age and diagnosis count while IRFs were statistically different in length of stay ($p < 0.0001$). Among patients who were discharged alive, the median age at discharge among those discharged from LTCHs, 71 years, was comparable to the median age of those discharged from IRFs, 72 years ($p = 0.3627$), though younger than the median age of patients discharged from SNFs, 75 years ($p = 0.0011$). Meanwhile, the median length of stay for those patients discharged from LTCHs, 24 days, was comparable to the median length of stay for those discharged from SNFs, 22 days ($p = 0.4559$), and longer than the median length of stay for patients discharged from IRFs, 11 days ($p < 0.0001$). Concerning diagnosis counts, or comorbidities, patients discharged from LTCHs had a comparable median number of comorbidities to patients discharged from IRFs ($p = 0.3342$) with a median count of 13 and 12 respectively. However, this median number of comorbidities for patients discharged from LTCHs, 13, was significantly higher than the median number of comorbidities for patients discharged from SNFs, 8 ($p <0.0001$).

Table 6. Analysis of demographic and clinical variables associated with patients discharged/transferred for further treatment (or still a patient) from follow-on stays in Long-Term Care Hospitals, Inpatient Rehabilitation Facilities, and Skilled Nursing Facilities

Categorical Variables	Long-Term Care Hospital (N=1,344)		Inpatient Rehab. Facility (N=593)		Skilled Nursing Facility (N=3,350)		p-value	Pairwise Comparisons		
	Frequency (%)		Frequency (%)		Frequency (%)			L x I	L x S	I x S
Sex							< 0.0001*	0.0022*	0.0888*	< 0.0001*
Male	599	(44.6%)	309	(52.1%)	1,402	(41.9%)				
Female	745	(55.4%)	284	(47.9%)	1,948	(58.1%)				
Race							< 0.0001*	< 0.0001*	0.0376*	< 0.0001*
White	994	(74.0%)	504	(85.0%)	2,547	(76.0%)				
Black	230	(17.1%)	58	(9.8%)	576	(17.2%)				
Other	120	(8.9%)	31	(5.2%)	227	(6.8%)				

* p-values obtained utilizing Pearson's chi-square test

Continuous Variables	Long-Term Care Hospital (N=1,344)		Inpatient Rehab. Facility (N=593)		Skilled Nursing Facility (N=3,350)		p-value	Pairwise Comparisons		
	Median (IQR)		Median (IQR)		Median (IQR)			L x I	L x S	I x S
Age (years)	75	(70-81)	75	(69-80)	77	(71-83)	< 0.0001*	0.1233*	< 0.0001*	< 0.0001*
LOS (days)	26	(20-36)	13	(8-18)	17	(7-37)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Diag. Count	16	(10-18)	13	(9-18)	7	(5-9)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*

* p-values obtained utilizing Kruskal-Wallis ANOVA

Among patients discharged/transferred for further treatment (or still a patient), there were statistically significant differences in sex, race, age, length of stay, and diagnosis count by provider type. Regarding the sex of patients, a higher percentage of females than males were discharged from LTCHs, which was comparable to discharges to SNFs ($p = 0.0888$), but different than discharges to IRFs ($p = 0.0022$), which comprised more males than females. Similarly, discharges from LTCHs had a comparable distribution of patients, by race, to those patients discharged to SNFs ($p = 0.0376$). This distribution was significantly different from discharges to IRFs ($p < 0.0001$), whereby discharges from LTCHs had less white patients but a higher percentage of black and other minority patients. Concerning age, the median age at discharge among those discharged from LTCHs, 75 years, was comparable to the median age of those discharged from IRFs, 75 years ($p = 0.1233$), though younger than the median age of patients discharged from SNFs, 77 years ($p < 0.0001$). For length of stay, discharges from LTCHs had the longest median length of stay, 26 days, as compared to both discharges to IRFs and SNFs ($p < 0.0001$), with a median length of stay of 13 days and 17 days respectively. Finally, patients discharged from LTCHs had the highest median diagnosis count, 16, as compared to the median diagnosis count of patients discharged from IRFs, 13 ($p < 0.0001$), and the median diagnosis count of patients discharged to SNFs, 7 ($p < 0.0001$).

Table 7. Analysis of demographic and clinical variables associated with patients discharged dead from follow-on stays in Long-Term Care Hospitals, Inpatient Rehabilitation Facilities, and Skilled Nursing Facilities

Categorical Variables	Long-Term Care Hospital (N=508)		Inpatient Rehab. Facility (N=1)		Skilled Nursing Facility (N=354)		p-value	Pairwise Comparisons		
	Frequency (%)		Frequency (%)		Frequency (%)			L x I	L x S	I x S
Sex							0.3503**	0.4853**	0.3449*	1.0000**
Male	246	(48.4%)	1	(100.0%)	183	(51.7%)				
Female	262	(51.6%)	0	(0.0%)	171	(48.3%)				
Race							0.9274**	1.0000**	0.8999*	1.0000**
White	391	(77.0%)	1	(100.0%)	277	(78.2%)				
Black	80	(15.7%)	0	(0.0%)	52	(14.7%)				
Other	37	(7.3%)	0	(0.0%)	25	(7.1%)				

* p-values obtained utilizing Pearson's chi-square test
** p-values obtained utilizing Fisher's exact test

Continuous Variables	Long-Term Care Hospital (N=508)		Inpatient Rehab. Facility (N=1)		Skilled Nursing Facility (N=354)		p-value	Pairwise Comparisons		
	Median (IQR)		Median (IQR)		Median (IQR)			L x I	L x S	I x S
Age (years)	77	(72-84)	71	N/A˜	79	(74-85)	0.0161*	0.3408*	0.0074*	0.2705*
LOS (days)	16	(8-30)	4	N/A˜	8	(3-23)	< 0.0001*	0.1467*	< 0.0001*	0.5319*
Diag. Count	17	(11-18)	17	N/A˜	8	(5-9)	< 0.0001*	0.9588*	< 0.0001*	0.0912*

* p-values obtained utilizing Kruskal-Wallis ANOVA
˜ Only one stay record in dataset

Based on the lack of data for patients discharged dead from an IRF, due to a sample size of 1, the final comparison of patients discharged dead from a follow-on stay focused on LTCH and SNF discharges. As such, there were no statistically significant differences in sex or race, but there were significant differences in age, length of stay, and diagnosis count. Among these patients, the median age at discharge among those discharged from LTCHs, 77 years, was younger than the median age of patients discharged from SNFs, 79 years ($p = 0.0074$). Next, the median length of stay for those patients discharged from LTCHs, 16 days, was longer than the median length of stay for patients discharged from SNFs, 8 days ($p < 0.0001$). Finally, patients discharged from LTCHs had a higher median diagnosis count, 17, than the median diagnosis count for patients discharged from SNFs, 8 ($p <0.0001$).

Finally, a comparative analysis of non-standardized and standardized actual hospital/facility costs, total charges, and Medicare payments was conducted. In creating the applicable datasets for this study, non-standardized data was obtained directly from MedPAR while also using CCRs in the case of hospital/facility costs. In order to more accurately analyze the study data by provider type, the data was standardized so as to account for geographical differences in total charges, and therefore actual hospital/facility costs, and Medicare payments through various adjustments, such as for wage index and various add-on and/or outlier payments. Furthermore, the non-standardized and standardized data has been presented side-by-side with sample medians and interquartile ranges (Q1-Q3), 'by day'. In order to account for differences between the distributions based on length of stay, 'by day' amounts were calculated by dividing the total costs, charges, and payments associated with each stay record by the respective 'Length of Stay Day Count' so as to allow comparison of the distributions by provider type

Additionally, in an effort to more accurately discern the differences in actual hospital/facility costs and total charges by provider type, for discharges to, and from, LTCHs, SNFs, and IRFs, we intended to adjust these costs and charges by controlling for the effects of age, race, and sex. Specifically, we attempted to transform the applicable study data, in order to obtain normal distributions, to allow for analysis of covariance (ANCOVA). As such, we tested natural log, logarithm with base 10 (log base 10), and square root transformations of actual hospital/facility costs, total charges, and age

data. Unfortunately, the applicable distributions required for subsequent analyses did not become uniformly normally distributed, as discerned from the various tests for normality, such as the Shapiro-Wilk test, whose statistically significant p-value(s) indicated the rejection of the null hypothesis that the distribution(s) is/are normally distributed. As such, the subsequent analyses of costs, charges, and payments utilize data which has accounted for geographic variations in payments, differences in reimbursement based on the applicable prospective payment systems, and length of stay. However, as noted above, the costs and charges were not further adjusted through controlling for the effects of age, race, and sex.

Subsequently, comparative analyses were conducted for patients discharged for a follow-on stay after a prior acute inpatient hospitalization under MS-DRG 207 (Table 8). These analyses were also conducted for patients discharged alive (Table 9), discharged/transferred for further treatment (or still a patient) (Table 10), or discharged dead (Table 11) from a follow-on stay in a LTCH, SNF, or IRF. The subsequent analyses focus on the standardized data.

Table 8. Analysis of costs, charges, and payments associated with patients discharged to Long-Term Care Hospitals, Inpatient Rehabilitation Facilities, and Skilled Nursing Facilities following an acute inpatient hospitalization under MS-DRG 207

Continuous Variables	Long-Term Care Hospital (N=764)		Inpatient Rehab. Facility (N=1,933)		Skilled Nursing Facility (N=5,126)		p-value	Pairwise Comparisons		
	Median (IQR)		Median (IQR)		Median (IQR)			L x I	L x S	I x S
Costs (N. Std. [+])	$2,216.00	($1,819.00 - $2,703.00)	$2,051.00	($1,684.00 - $2,533.00)	$1,972.00	($1,618.00 - $2,427.00)	<0.0001*	< 0.0001*	< 0.0001*	0.0009*
Charges (N. Std. [+])	$9,444.00	($6,929.00 - $13,259.00)	$8,314.50	($6,085.00 - $11,669.50)	$7,614.50	($5,504.00 - $10,857.00)	<0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Payments (N. Std. [+])	$2,612.00	($2,019.00 - $3,030.00)	$2,231.50	($1,773.50 - $2,675.00)	$2,372.00	($1,801.00 - $2,903.00)	<0.0001*	< 0.0001*	< 0.0001*	0.0002*
Costs (Std. [+])	$1,932.00	($1,574.00 - $2,373.00)	$1,836.00	($1,502.50 - $2,234.00)	$1,718.00	($1,389.00 - $2,111.00)	<0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Charges (Std. [+])	$8,299.00	($6,221.00 - $11,263.00)	$7,479.50	($5,472.00 - $10,041.50)	$6,679.50	($4,861.00 - $9,363.00)	<0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Payments (Std. [+])	$2,381.00	($1,678.00 - $2,625.00)	$1,931.00	($1,464.00 - $2,441.00)	$2,003.00	($1,480.00 - $2,550.00)	<0.0001*	< 0.0001*	< 0.0001*	0.0007*

* p-values obtained utilizing Kruskal-Wallis ANOVA

[+] Std. = standardized / N. Std. = non-standardized

For patients discharged from an inpatient hospital for a follow-on stay in a LTCH, SNF, or IRF, there were statistically significant differences in actual hospital/facility costs, total charges, and Medicare payments. Concerning actual hospital/facility costs, the median cost of patients discharged to LTCHs, $1,932.00, was significantly higher than the median cost of patients discharged to IRFs, $1,836.00 ($p < 0.0001$), and the median cost of patients discharged to SNFs, $1,718.00 ($p < 0.0001$). For total charges, the median charge amount submitted for patients discharged to LTCHs, $8,299.00, was significantly higher than the median charge amount submitted for patients discharged to IRFs, $7,479.50 ($p < 0.0001$), and the median charge amount submitted for patients discharged to SNFs, $6,679.50 ($p < 0.0001$). Finally, the median payment made for discharges to LTCHs, $2,381.00, was significantly higher than the median payment made for discharges to IRFs, $1,931.00 ($p < 0.0001$), and the median payment made for discharges to SNFs, $2,0003.00 ($p < 0.0001$).

Table 9. Analysis of costs, charges, and payments associated with patients discharged alive from follow-on stays in Long-Term Care Hospitals, Inpatient Rehabilitation Facilities, and Skilled Nursing Facilities

Continuous Variables	Long-Term Care Hospital (N=81)		Inpatient Rehab. Facility (N=170)		Skilled Nursing Facility (N=1,422)		p-value	Pairwise Comparisons		
	Median (IQR)		Median (IQR)		Median (IQR)			L x I	L x S	I x S
Costs (N. Std. [+] ***)***	$1,340.00	($1,068.00 - $1,705.00)	$1,357.00	($1,054.00 - $1,733.00)	$385.50	($311.00 - $488.00)	< 0.0001*	0.9711*	< 0.0001*	< 0.0001*
Charges (N. Std. [+] ***)***	$4,278.00	($3,008.00 - $5,907.00)	$2,620.50	($2,118.00 - $3,386.00)	$585.00	($479.00 - $740.00)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Payments (N. Std. [+] ***)***	$1,631.00	($1,162.00 - $2,135.00)	$1,511.50	($1,192.00 - $1,922.00)	$529.50	($444.00 - $621.00)	< 0.0001*	0.4741*	< 0.0001*	< 0.0001*
Costs (Std. [+] ***)***	$1,396.00	($1,124.00 - $1,816.00)	$1,195.50	($1,007.00 - $1,534.00)	$387.00	($318.00 - $490.00)	< 0.0001*	0.0080*	< 0.0001*	< 0.0001*
Charges (Std. [+] ***)***	$4,557.00	($3,179.00 - $6,040.00)	$2,402.00	($1,930.00 - $3,132.00)	$583.00	($482.00 - $745.00)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Payments (Std. [+] ***)***	$1,641.00	($1,181.00 - $2,045.00)	$1,354.00	($1,101.00 - $1,704.00)	$527.00	($468.00 - $634.00)	< 0.0001*	0.0090*	< 0.0001*	< 0.0001*

* p-values obtained utilizing Kruskal-Wallis ANOVA

[+] Std. = standardized / N. Std. = non-standardized

Concerning, patients discharged alive from a follow-on stay in a LTCH, SNF, or IRF, there were statistically significant differences in actual hospital/facility costs, total charges, and Medicare payments. Specifically, the median cost of patients discharged from LTCHs, $1,396.00, was significantly higher than the median cost of patients discharged from IRFs, $1,195.50, ($p = 0.0080$), and the median cost of patients discharged from SNFs, $387.00 ($p < 0.0001$). For total charges, the median charge amount submitted for patients discharged from LTCHs, $4,557.00, was significantly higher than the median charge amount submitted for patients discharged from IRFs, $2,402.00, ($p < 0.0001$), and the median charge amount submitted for patients discharged from SNFs, $583.00 ($p < 0.0001$). Last, the median payment made for discharges from LTCHs, $1,641.00, was significantly higher than the median payment made for discharges from IRFs, $1,354.00 ($p = 0.0090$), and the median payment made for discharges from SNFs, $527.00 ($p < 0.0001$).

Table 10. Analysis of costs, charges, and payments associated with patients discharged for further treatment (or still a patient) from follow-on stays in Long-Term Care Hospitals, Inpatient Rehabilitation Facilities, and Skilled Nursing Facilities

Continuous Variables	Long-Term Care Hospital (N=1,344)		Inpatient Rehab. Facility (N=593)		Skilled Nursing Facility (N=3,350)		p-value	Pairwise Comparisons		
	Median (IQR)		Median (IQR)		Median (IQR)			L x I	L x S	I x S
Costs (N. Std. [+]***)***	$1,495.50	($1,184.00 - $1,865.00)	$1,374.00	($1,111.00 - $1,784.00)	$395.00	($293.00 - $569.00)	< 0.0001*	0.0007*	< 0.0001*	< 0.0001*
Charges (N. Std. [+]***)***	$4,554.50	($3,465.00 - $6,167.50)	$2,754.00	($2,142.00 - $3,965.00)	$603.00	($449.00 - $869.00)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Payments (N. Std. [+]***)***	$1,641.00	($1,300.50 - $2,155.50)	$1,379.00	($1,171.00 - $1,683.00)	$506.00	($386.00 - $640.00)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Costs (Std. [+]***)***	$1,544.00	($1,224.00 - $1,926.00)	$1,247.00	($1,036.00 - $1,553.00)	$398.00	($294.00 - $562.00)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Charges (Std. [+]***)***	$4,762.50	($3,626.50 - $6,298.50)	$2,490.00	($1,966.00 - $3,468.00)	$604.00	($451.00 - $862.00)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*
Payments (Std. [+]***)***	$1,685.50	($1,322.00 - $2,206.50)	$1,210.00	($1,071.00 - $1,416.00)	$513.00	($403.00 - $636.00)	< 0.0001*	< 0.0001*	< 0.0001*	< 0.0001*

* p-values obtained utilizing Kruskal-Wallis ANOVA

[+] Std. = standardized / N. Std. = non-standardized

Among patients discharged/transferred for further treatment (or still a patient), there were statistically significant differences in actual hospital/facility costs, total charges, and Medicare payments. The median cost of patients discharged from LTCHs, $1,544.00, was significantly higher than the median cost of patients discharged from IRFs, $1,247.00 ($p < 0.0001$), and the median cost of patients discharged from SNFs, $398.00 ($p < 0.0001$). For total charges, the median charge amount submitted for patients discharged from LTCHs, $4,762.50, was significantly higher than the median charge amount submitted for patients discharged from IRFs, $2,490.00 ($p < 0.0001$), and the median charge amount submitted for patients discharged from SNFs, $604.00 ($p < 0.0001$). Last, the median payment made for discharges from LTCHs, $1,685.50, was significantly higher than the median payment made for discharges from IRFs, $1,210.00 ($p < 0.0001$), and the median payment made for discharges from SNFs, $513.00 ($p < 0.0001$).

Table 11. Analysis of costs, charges, and payments associated with patients discharged dead from follow-on stays in Long-Term Care Hospitals, Inpatient Rehabilitation Facilities, and Skilled Nursing Facilities

Continuous Variables	Long-Term Care Hospital (N=508)		Inpatient Rehab. Facility (N=1)		Skilled Nursing Facility (N=354)		p-value*	Pairwise Comparisons		
	Median (IQR)		Median (IQR)		Median (IQR)			L x I	L x S	I x S
Costs (N. Std. [+])	$2,001.00	($1,640.00 - $2,443.50)	$1,581.00	N/A[~]	$361.00	($244.00 - $526.00)	< 0.0001*	0.3463*	< 0.0001*	0.0913*
Charges (N. Std. [+])	$6,428.00	($4,814.00 - $8,421.50)	$3,029.00	N/A[~]	$543.50	($387.00 - $773.00)	< 0.0001*	0.1111*	< 0.0001*	0.0951*
Payments (N. Std. [+])	$1,885.50	($1,424.00 - $2,296.00)	$2,550.00	N/A[~]	$451.00	($320.00 - $618.00)	< 0.0001*	0.1908*	< 0.0001*	0.0859*
Costs (Std. [+])	$2,061.50	($1,701.00 - $2,593.00)	$1,550.00	N/A[~]	$361.50	($254.00 - $518.00)	< 0.0001*	0.2722*	< 0.0001*	0.0932*
Charges (Std. [+])	$6,807.50	($5,309.50 - $8,708.50)	$2,970.00	N/A[~]	$532.00	($398.00 - $777.00)	< 0.0001*	0.1081*	< 0.0001*	0.0970*
Payments (Std. [+])	$1,910.00	($1,464.00 - $2,442.50)	$2,500.00	N/A[~]	$440.50	($342.00 - $636.00)	< 0.0001*	0.3360*	< 0.0001*	0.0859*

* p-values obtained utilizing Kruskal-Wallis ANOVA

[+] Std. = standardized / N. Std. = non-standardized

[~] Only one stay record in dataset

Per the aforementioned lack of stay records for patients discharged dead from an IRF, this analysis will focus on discharges from LTCHs and SNFs. As such, among patients discharged dead, there were statistically significant differences in actual hospital/facility costs, total charges, and Medicare payments. The median cost of patients discharged from LTCHs, $2,061.50, was significantly higher than the median cost of patients discharged from SNFs, $361.50 ($p < 0.0001$). For total charges, the median charge amount submitted for patients discharged from LTCHs, $6,807.50, was significantly higher than the median charge amount submitted for patients discharged from SNFs, $532.00 ($p < 0.0001$). Finally, the median payment made for discharges from LTCHs, $1,910.00, was significantly higher than the median payment made for discharges from SNFs, $440.50 ($p < 0.0001$).

Discussion

This study aimed to conduct a comparative analysis of beneficiary demographic and clinical characteristics, actual hospital/facility costs and charges, and Medicare payments. This analysis was primarily conducted for patients discharged to LTCHs, SNFs, and/or IRFs for a follow-on stay following a prior acute inpatient hospitalization under MS-DRG 207, "respiratory system diagnosis with ventilator support for greater than 96 hours." Analyses were also conducted based on the beneficiary's discharge status, representing patient outcomes, upon discharge from the follow-on stays in a LTCH, SNF, or IRF.

For the purpose of these analyses, as noted in the findings, out of the original 23,893 inpatient stay records classified under MS-DRG 207, for beneficiaries aged 65 or older, only 7,823 records matched follow-on stays in a LTCH, SNF, or IRF and/or their associated units. As such, regarding this study population, despite the expectation that LTCHs would be primarily responsible for the treatment of these medically complex patients, designated as such per the grouping of the patient's stay record under MS-DRG 207, due to the potentially long duration and costliness of treatment, only a quarter of the discharges in this study went to LTCHs for follow-on stays. Though this proportion is high in comparison to the proportion discharged to IRFs, 9.8%, the majority of patients, 65.5%, actually received treatment in a SNF. These findings are similar to those of a previous study conducted, which contained an analysis of patients discharged following previous treatment in an ICU, whereby more patients designated as critically ill were discharged to SNFs and/or IRFs than LTCHs (Kahn et al., 2010).

As aforementioned, demographic and clinical characteristics, actual hospital/facility costs, total Medicare charges, and Medicare payments were analyzed among patients discharged to a follow-on stay in a LTCH, SNF, or IRF, following an inpatient hospitalization, and again upon subsequent discharge from these hospitals/facilities. Regarding a patient's sex, it was observed that a higher percentage of patients discharged to LTCHs were female, consistent with findings of previous studies, which was similar to the distribution of patients discharged to SNFs, as compared with discharges to IRFs (Kahn et al., 2010; MedPAC, 2011c). Multinomial logistic regression supports this finding in that males had greater odds of discharge to IRFs versus LTCHs. The non-regression findings were also consistent among patients discharged/transferred for further treatment (or still a patient) after these follow-on stays. This difference in distributions based on sex may be explained by the greater ratio of females to males, roughly 55:45, in the overall study population. Otherwise, this finding may indicate that females are more likely to receive medical treatment, survive the original inpatient stay, and/or be diagnosed with more complex conditions requiring LTCH or SNF care.

Concerning race, a higher percentage, though not a higher number, of those patients discharged to LTCHs were black or another racial minority than those patients discharged to SNFs or IRFs. Regression analysis confirmed that blacks and other minorities had lower odds of discharge to SNFs and IRFs versus LTCHs. These results, consistent with the findings by discharge status, supported findings of a prior study on discharges from ICUs, whereby discharges to LTCHs comprised a higher percentage of black patients than discharges to other types of hospitals/facilities (Kahn et al., 2010). MedPAC also found that beneficiaries admitted to LTCHs are more likely to be black

(MedPAC, 2011c). The higher percentage of minorities, and their representation among the total discharges to and from LTCHs, may be solely based on the current distribution of LTCHs throughout the U.S. Specifically, the higher percentage of black and other minority discharges to LTCHs may be reflective of the high prevalence of LTCHs in urban areas (Kahn et al., 2010).

Concerning age, patients discharged to LTCHs had a significantly older median age than those discharged to IRFs, though a significantly younger median age than those discharged to SNFs. As such, multinomial logistic regression analysis indicated that the odds of discharge to IRFs versus LTCHs decreased with age while the odds of discharge to SNFs versus LTCHs increased with age. Furthermore, for discharges from each of these provider types after the follow-on stays in these hospitals/facilities, discharges from LTCHs had a significantly lower median age than SNFs and a comparable median age to IRFs. This finding is important as medically complex patients are often discharged to LTCHs. These findings go against the premise that LTCHs treat more complex patients, as compared to SNFs or IRFs, as age has been found to be associated with a patient's comorbidities, (Yancik, 1997; Akker, Buntinx, Metsemakers, Roos, & Knottnerus, 1998). Additionally, in a MedPAC study, it was found that beneficiaries admitted to LTCHs are "disproportionately under age 65, over age 85, disabled, and diagnosed with end-stage renal disease" (MedPAC, 2011c, p. 239). As this study focused on non-disabled, non-ESRD beneficiaries who were 65 years of age or older, the finding that a younger age was associated with discharge to IRFs versus LTCHs, while an older age was associated with discharge to SNFs versus LTCHs, may indicate a need to focus on age when developing policy guiding the discharge of patients (MedPAC, 2011c).

Regarding length of stay, discharges to LTCHs accounted for the shortest median length of stay upon discharge for a follow-on stay. In fact, we found that the length of stay prior to discharge was a significant correlate of the type of hospital/facility to which an individual was discharged; those who were hospitalized longer were more likely to be discharged to a SNF or an IRF than to a LTCH. Per the regression analyses, the odds of discharge to IRFs or SNFs, versus LTCHs, increased as the length of stay increased. Furthermore, discharges from LTCHs accounted for the longest median length of stay for patients discharged alive, though comparable to discharges from SNFs, discharged/transferred for further treatment (or still a patient), and discharged dead. Except in the case of patients discharged dead, these lengths of stay support the definition of an LTCH in that they are hospitals which must maintain an average inpatient length of stay which is greater than 25 days (CMS, 2012c). This further supports LTCHs in that beneficiaries with medically complex problems were provided hospital-level care over an extended period of time. Unfortunately, based on the analyses conducted, it cannot be inferred whether, for those patients discharged following an inpatient hospitalization, the shorter length of stay indicates that patients were discharged to LTCHs earlier in order for them to receive more specialized treatment or the more complex patients required additional treatment in the inpatient hospital prior to discharge to SNFs or IRFs for additional care, in lieu of LTCHs.

Regarding the principal diagnosis codes associated with the stay records for discharges to LTCHs, SNFs, and/or IRFs, there were variations in the distribution of diagnoses by discharge location. Foremost, upon examining discharges to each provider type by diagnosis code, it was found that the top five diagnosis codes for patients grouped

under MS-DRG 207, and subsequently discharged to each provider type, were the same. These diagnoses included acute & chronic respiratory failure, acute respiratory failure, pneumonia (organism not otherwise specified), obstructive chronic bronchitis with (acute) exacerbation, and pneumonitis due to inhalation of food and vomit. Although LTCHs accounted for the highest percentage of patients with acute and chronic respiratory failure, both SNFs and IRFs accounted for the highest percentage of patients with such conditions as acute respiratory failure, IRFs, and pneumonitis, SNFs. Additionally, though regression analysis indicated that patients with these diagnosis codes, especially acute & chronic respiratory failure, had lower, or comparable odds, of discharge to SNFs and IRFs, the findings still show that patients with these conditions were treated in these facilities. Though the distributions were significantly different, these findings indicate that patients with these medically complex conditions were discharged to and treated by all three provider types.

As it relates to the analysis of diagnosis codes, the median diagnosis code count, the number of comorbidities associated with each patient, for discharges to LTCHs was not significantly different than the median counts for patients discharged elsewhere following an acute inpatient hospitalization. However, patients discharged alive from LTCHs, though comparable to discharges from IRFs, had the highest median diagnosis count. Discharges from LTCHs also had the highest diagnosis counts among those discharged/transferred for further treatment (or still a patient) and those discharged dead. Regarding discharges from the inpatient hospitalization for further treatment, this finding requires further analysis as LTCHs are intended to provide care to beneficiaries with medically complex problems, such as chronic respiratory failure, as compared to SNFs,

IRFs, and related hospitals/facilities (MedPAC, 2011c; MedPAC, 2012b). These diagnosis counts could also indicate that many patients considered medically complex may require no more than the services provided by SNFs or IRFs versus LTCHs. Concerning the subsequent discharge, LTCH discharges had higher diagnosis counts than other discharges, though similar counts to those discharged alive from IRFs. This may have been due to reasons including the development of more comorbidities/conditions as the patient's health worsened, billing differences between hospital/facility types, and/or nosocomial infections.

Regarding a main focus of this study, discharges to LTCHs had significantly higher median actual hospital/facility costs, total charges, and Medicare payments than those discharged to SNFs or IRFs. Additionally, these findings indicated that discharges from LTCHs were more costly, with higher total charges submitted to Medicare and total payments received from Medicare, than those patients discharged from SNFs or IRFs. The above findings line up with MedPAC findings whereby Medicare rates for LTCHs ranged from about 1.1 to 1.4 times as much as the rates for IRFs and about 3 to 4 times the rates for SNFs (MedPAC, 2004). However, the regression analysis indicated that actual hospital/facility costs were not associated with discharge to SNFs or IRFs versus LTCHs. As such, these findings solely indicate that the median cost of patients subsequently discharged to LTCHs is significantly higher than the median cost of patients discharged to SNFs or IRFs.

Furthermore, regardless of the analyses conducted, per the intended analysis of the costs of treating medically complex patients in LTCHs versus SNFs and/or IRFs, this study did not analyze actual hospital/facility costs or total charges while controlling for

variables including age, race, and sex. By controlling for these characteristics, the study could better infer whether LTCHs have higher actual hospital/facility costs and/or total charges than other hospitals/facilities which provide care to medically complex patients (MedPAC, 2012b). Further research may discern whether LTCHs are rendering services to medically complex patients not otherwise available in SNFs or IRFs, thereby resulting in higher actual hospital/facility costs and total charges to Medicare.

Finally, focusing strictly on the patients discharged alive, discharged/transferred for further treatment (or still a patient), or discharged dead, there were significant differences in distributions by provider type. Specifically, as a proportion of the total number of discharges to LTCHs, discharges from LTCHs accounted for the lowest percentage of patients discharged alive, but the highest percentage of patients discharged dead. Meanwhile, discharges from SNFs accounted for the highest percentage of patients discharged alive versus discharges from IRFs which accounted for the lowest percentage of patients discharged dead. As such, these numbers may result from differences in medical complexity between patients discharged to each provider type, whereby more patients discharged to LTCHs are unlikely to get better and discharges to SNFs have less complex conditions. Comparatively, they may also indicate, based on the above findings concerning differences in medical complexity among patients by discharge location, that LTCHs have more negative outcomes for potentially clinically similar patients across provider types. As it supports LTCHs, though there was a difference in sample sizes and statistically significant results, the findings showed that the majority of patients for each provider type were discharged/transferred for further treatment (or still a patient) upon discharge from the follow-on stay, indicating that the health status of the patients grouped

under MS-DRG 207 and discharged to a follow-on stay in any one of these hospitals/facilities are unlikely to improve, even with treatment. Though these findings do not provide sufficient means to evaluate the effectiveness of treatment provided by one provider type over another, the analyses may spawn further research. Based on the findings in this study, concerning clinical similarity between patients discharged to LTCHs, SNFs, or IRFs, it is important to note that patients discharged to LTCHs, assumed to be the most medically complex, did not account for the oldest patients, the most complex diagnoses, nor the highest length of stay or diagnosis code counts.

This retrospective cohort study, utilizing secondary data analysis, has multiple strengths and limitations. Foremost, this study utilized MedPAR data collected by CMS for FY 2011, October 1, 2010 through September 30, 2011. A key strength of this study is that MedPAR contains all Part A claims, combined into individual patient stay records, submitted by hospitals/facilities for services provided to Medicare beneficiaries. These stay records contain all claims submitted for each inpatient stay, from the beginning of a beneficiary's date of admission through to their discharge, in a LTCH, SNF, or IRF, following an acute inpatient hospitalization under MS-DRG 207 (CMS, 2012b).

For the purposes of this study, a focus was specifically placed on stay records grouped under MS-DRG 207 in an attempt to analyze patients specifically defined as medically complex, versus patients grouped under other MS-DRGs or the entire beneficiary population, so as to best evaluate differences in patients and costs associated with discharges to LTCHs versus other hospitals/facilities. Furthermore, numerous stay records were excluded, such as those involving 'interrupted stays', lack of standardization data, and/or the patient having left care against medical advice (or

discontinued care), in an effort to provide the most accurate data for analysis of clinical similarities among patients and overall hospital/facility costs, among other analyses.

Additionally, this study analyzed all stay records, grouped under MS-DRG 207, for Medicare beneficiaries aged 65 or older at the date of admission to the inpatient hospital/facility. By removing those individuals under the age of 65, who were already on Medicare due to disability and/or are diagnosed with ESRD, the population of this study will be more representative of, and the study findings more generalizable to, the U.S. older adult population, including Medicare beneficiaries. Subsequently, the study findings may be utilized for purposes of policy development regarding discharges to certain provider types, especially in the interest of effectively treating medically complex beneficiaries while keeping costs, and subsequently Medicare payments, down.

In order to address 'interrupted stays', defined as those patient stays whereby numerous days elapse between a discharge from one hospital/facility and admission to another, discharges to a LTCH, SNF, or IRF for a follow-on stay were defined as temporally adjacent hospitalizations whereby admission to the LTCH, SNF, or IRF occurred on day '*n'*, the date of discharge from the inpatient hospital, or '$n + 1$', the day after the date of discharge from the inpatient hospital. This was done to address concerns surrounding 'interrupted stays' including the lack of follow-up during and/or reasoning behind the elapsed period.

Regarding data standardization, in an effort to create datasets that would have the fields necessary to standardize total charges and Medicare payments, and thereby calculate standardized actual hospital/facility costs, stay records were removed if they did not have the applicable data required. Specifically, data was obtained from Public Use

Files (PUFs), created for the FY 2011 Final Rule, for each provider type within the study. By excluding those stay records without the applicable data needed for standardization, the data obtained from the subsequent analyses should not be skewed due to incorrect calculations based on formulas involving missing data. Unfortunately, a potential limitation to the standardization of LTCH data presented with LTCH payment data based on 'short-stay outlier' (SSO) payment adjustments, whereby payment is not based on the LTCH federal payment rate, but instead is more cost based. Also, there is no way to remove or 'back out' the SSO payment adjustment because this amount is substituted in the MedPAR pay amount. As such, due to the geographic variation in these payment adjustments, the same standardization methods used on data for other LTCH stay records were applied.

Additionally, stay records were removed from the applicable datasets used in this study based on the presence of a 'Discharge Destination Code' of '7', indicating the patient left against medical advice or discontinued care. These stay records were removed due to the inability to follow the patient from the beginning to the end of their follow-on stay. Specifically, stay records categorized under this discharge destination code may have introduced incomplete data into fields such as the length of stay, total charges, and Medicare payments, among other fields, which may have adversely affected the study analyses.

Concerning limitations, there are no limitations due to complications such as the time requirements of cohort follow-up over a long period of time, the costs associated with providing incentives to participate in the study, obtaining and maintaining the data over time, and/or funding investigator and staff salaries. Loss to follow-up, which may

affect the generalizability or validity of a study, is also not a concern in this study as all claims were recorded and aggregated within the MedPAR File. However, since this study involves secondary data analysis, a potential limitation includes that the number and types of variables upon which analyses may be performed were limited to those present in the MedPAR File. Specifically, regardless of the methods utilized to control for confounding and improve the generalizability and validity of the study, residual confounders, those confounders of which the investigators are unaware, may exist and potentially affect the findings. Additionally, though each primary diagnosis under MDC 4, along with the presence of procedure code 8672, leads to classification of the inpatient stay under MS-DRG 207, the interaction of multiple comorbidities may adversely affect patient outcomes in immeasurable ways.

Furthermore, concerning the MedPAR dataset used in this study, the six month run-out of FY 2011 data, made available in March 2012, was obtained as this data was utilized for the 2013 Final Rule (FR) for the prospective payment systems. However, per claims processing, MedPAR datasets do not contain the 100% universe of claims for the applicable fiscal year until the eighteenth month of run-out (i.e. March 2013 for FY 2011 data). Fortunately, though this dataset did not contain these extra stay records, the extra records only account for a very small percentage of those analyzed within this study. Second, though MedPAR only includes data on Medicare fee-for-service (FFS) beneficiaries, this is the only national dataset of long-term acute care hospitalizations (Kahn et al., 2010). In fact, as of 2001, Medicare was the primary payer for roughly 70% of these hospitalizations (Liu, Baseggio, Wissoker, Maxwell, Haley & Long, 2001).

Additionally, this study specifically focused on those patients discharged to LTCHs, SNFs, and/or IRFs for follow-on stays after a prior acute inpatient hospitalization under MS-DRG 207. This method did not account for those Medicare beneficiaries admitted directly into LTCHs under MS-LTC-DRG 207 or those admitted to LTCHs for primary or follow-on stays through other means. However, this method enabled a comparison of discharges to LTCHs to those discharged to other hospitals/facilities, such as SNFs and IRFs, on the basis of demographic and clinical characteristics and actual hospital/facility costs. Furthermore, based on the limitations on the study population, such as by age and beneficiary status, the final sample size for the study included 7,823 stay records. Though the overall number of stay records in the study is large, the individual datasets, as broken out by provider type, were not similar in size. If the three datasets were roughly equal (or equal) in size or if each dataset was larger, there may have been potentially more statistically significant results, through increased power, when conducting the statistical analyses across provider types in terms of discharge location and discharge status. Finally, concerning these stay records, some beneficiaries had multiple inpatient stays during FY 2011. As this population of stay records was very small, 3 records for discharges to IRFs (0.4%), 28 records for discharges to LTCHs (1.4%), and 138 records for discharges to SNFs (2.7%), or 2.2% of the study population, this study did not account for repeated measures utilizing a robust variance estimator. As there was very little clustering of data, the estimates obtained through multinomial logistic regression were not likely to have been affected very much.

The treatment of individuals with chronic disease(s) will remain at the forefront of political and economic discussions for years to come with the continued aging of the U.S.

population and the growing costs of Medicare. As it may assist future policy analyses, this study examined patients grouped under MS-DRG 207, which is associated with numerous medically complex conditions, in an attempt to evaluate the cost-effectiveness and overall clinical similarity of patients receiving care from LTCHs, SNFs, and/or IRFs following an inpatient hospitalization. As discerned from the analysis of discharges to follow-on stays in these hospitals/facilities, discharges to LTCHs were not, on average, the oldest nor did they have the highest length of stay. Furthermore, these patients were diagnosed with conditions, and had diagnosis counts (i.e. comorbidities), similar to those discharged to SNFs/IRFs. Finally, in support of previous research, discharges to LTCHs, and from the subsequent follow-on stays, regardless of discharge status, accounted for the highest median actual hospital/facility costs and Medicare charges/payments among all hospitals/facilities, though these costs were not associated with discharge to any particular hospital/facility. Further research in this area should look at the treatment of medically complex patients in the context of related DRGs, treatment in other hospitals/facilities including CAHs and HHAs, and state-by-state breakdowns to better analyze these patients in states with a high density versus a low density of LTCHs. As aforementioned, a focus should be placed on actual hospital/facility costs by provider type while controlling for beneficiary demographic and clinical characteristics in order to make inferences concerning the treatment of clinically similar patients. Finally, this study supports MedPAC's recommendation that criteria be developed by Medicare in order to more accurately define medically complex, or the type of long-term acutely ill patient(s), eligible for admission and/or treatment by certain provider types (MedPAC, 2012b).

Public Health Significance

Medicare currently provides health insurance coverage for around 48.7 million Americans. Unfortunately, since the inception of the program, expenditures for the provision of services to this population have continually risen to the current estimated amount of $549.1 billion for FY 2011. As such, there is an increased focus on controlling costs and improving the solvency of the Medicare program. Under Part A, LTCHs have come under increased scrutiny due to concerns regarding the rapid growth of, and transfers to, LTCHs, the levels of Medicare reimbursement to LTCHs, and the clinical criteria guiding which hospitals/facilities should treat medically complex patients. Though LTCHs provide essential services, questions abound concerning their necessity, as compared to SNFs/IRFs which may be able to provide similar services to beneficiaries for lower costs with similar quality of care and patient outcomes.

This research shall contribute to the existing literature concerning the utilization and impact of LTCHs in treating medically complex patients. By analyzing the cost-effectiveness of treating medically complex patients, especially concerning the costs to the hospitals/facilities providing treatment and the Medicare program itself, benefits may be realized, following the potential development of policy aimed towards adjusting the prospective payment systems, such as lower healthcare expenditures. Further savings may also be realized following the provision of analyses which support the development of clinical criteria guiding the discharge of patients to one hospital/facility over another. By improving the long-term solvency of Medicare, the federal government, and the nation as a whole, will be able to better secure the continued provision of affordable, quality care to beneficiaries going forward.

Appendix I

Major Diagnostic Category (MDC) 4 & Chronic Lower Respiratory Diseases (CLRDs)

Diseases and Disorders of the Respiratory System

Among the many conditions treated in Part A hospitals/facilities and paid for under Medicare Part A, CLRDs not only account for significant morbidity and mortality among the Medicare population, but they also contribute to the increasing levels of Medicare expenditures. CLRDs, or diseases that affect the lungs, include chronic obstructive pulmonary disease (COPD), those diseases that fall under the scope of COPD and which may have asthmatic components, such as emphysema and chronic bronchitis, and other respiratory conditions. As it affects an individual's health, these diseases are characterized by airflow limitation and/or airway obstruction, both events of which inhibit the ability of the affected individual(s) to breathe by way of proper spontaneous ventilation. Concerning the exposures which put individuals at risk of these diseases, risk factors include tobacco use, second-hand tobacco smoke, and various forms of indoor/outdoor air pollution (WHO, 2012).

Foremost, as a public health issue, data collected by the Centers for Disease Control and Prevention (CDC) indicates that CLRDs are the third leading cause of death in the U.S (CDC, 2012b). Specifically, among Medicare eligible individuals, those aged 65 or older, the CDC found that these individuals accounted for 117,098 out of the total 137,353 (85.2%) deaths from CLRDs in 2009 (CDC, 2012a). The CDC's National Center for Health Statistics (NCHS) also notes that CLRDs account for a considerable level of morbidity within the U.S. population (CDC, 2012c). In Oklahoma's State of the State's Health (SOSH) Report for 2008, the high morbidity and mortality associated with

the older adult population has been attributed to the fact that the likelihood of developing CLRDs increases as an individual's age increases (OSDH, 2008). In fact, CLRD risk primarily increases with age as the cumulative lifetime exposure to tobacco use, second-hand tobacco smoke, and/or air pollution increases (OSDH, 2008).

Health Expenditures & CLRDs

The treatment of these CLRDs, classified under Major Diagnostic Category (MDC) 4, Diseases and Disorders of the Respiratory System, also constitutes a substantial proportion of Medicare expenditures. In fact, the Medicare Payment Advisory Commission (MedPAC) found that these diseases accounted for 14% of all discharges from hospitals paid under the acute inpatient prospective payment system (IPPS) in FY 2009, the second highest among all MDCs (MedPAC, 2011a). Also, using extrapolated Medicare payments associated with the services provided by a sample of non-Federal, short-term, acute care hospitals, data collected by the Agency for Healthcare Research and Quality (AHRQ), as part of the Healthcare Cost and Utilization Project (HCUP), indicates that diseases classified under MDC 4 accounted for $23 billion (13.9%) in Part A expenditures for stays in 2009, the third highest amount among all MDCs (AHRQ, 2012). Furthermore, in terms of total national health expenditures, the National Institutes of Health (NIH) found, in 2010, that the cost to the U.S. for CLRDs was approximately $173.4 billion, with $108.9 billion in direct health care expenditures, primarily due to the costs of hospital care (NIH, 2009).

Appendix II

Medicare Payments & Prospective Payment Systems (PPS)

In exchange for the provision of healthcare services, Part A acute care (inpatient) hospitals and related Part A hospitals/facilities, such as LTCHs, SNFs, and IRFs, are reimbursed through Medicare payments which involve a predetermined, fixed amount based on the applicable PPS. Concerning the IPPS, payments made to acute inpatient hospitals for services provided are adjusted based on MS-DRGs. Meanwhile, LTCHs are paid under the LTCH PPS which adjusts payments based on higher MS-LTC-DRG weights. Other PPS, such as the SNF PPS or IRF PPS, utilize their own unique classification systems for the purpose of Medicare reimbursement for services provided.

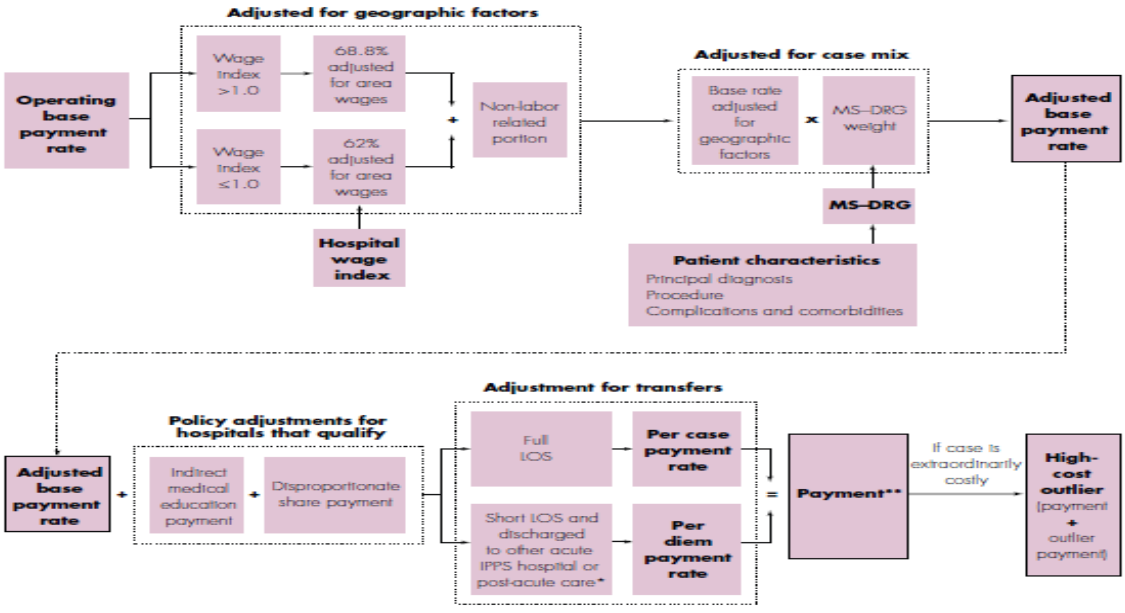
Medicare Prospective Payment Systems – Base Payment Rates

Foremost, Medicare payments are based on standardized payment amounts. For example, upon inception of the IPPS in 1983, base payment rates were established for labor share and non-labor share payments, reflecting operating and capital costs respectively, using the average cost per discharge for those providers subject to the IPPS. The average cost per discharge is determined utilizing Medicare cost report data trended forward, standardized, and adjusted to remove regional differences and additional statistically significant differences, such as payments for disproportionate share (of low income patients) hospitals (DSH) and direct graduate medical education (DGME). Once set, these standardized payments amounts are inflated in each subsequent year (i.e. updated annually) by the market basket, which measures the increase in the price of goods and services hospitals purchase to provide patient care (MedPAC, 2011b). Base rates were also established for the LTCH, SNF, and IRF PPS upon their inception.

As such, under the IPPS, these base payment rates, or standardized payment amounts, are subsequently adjusted to reflect market conditions, patient conditions, and related factors applicable under the IPPS. First, the labor-related portion of the base payment rate, the labor share, is adjusted by the applicable wage index, used to reflect geographic differences in labor costs. Following the addition of the non-labor share to the adjusted labor share, the resulting base payment rate, previously adjusted for geographic factors, is then adjusted for case mix, through multiplication by the weight for the particular MS-DRG into which the patient was classified. Subsequently, this DRG-adjusted base payment rate is further adjusted by percentage add-on payments for DSH payments, percentage add-on payments for indirect medical education (IME) payments, and additional payments for outliers. The LTCH, SNF, and IRF PPS base payment rates are also adjusted according to their respective payment system (MedPAC, 2011b).

Please see below (Figure A1) for the IPPS (MedPAC, 2011b):

Figure A1. Acute inpatient prospective payment system

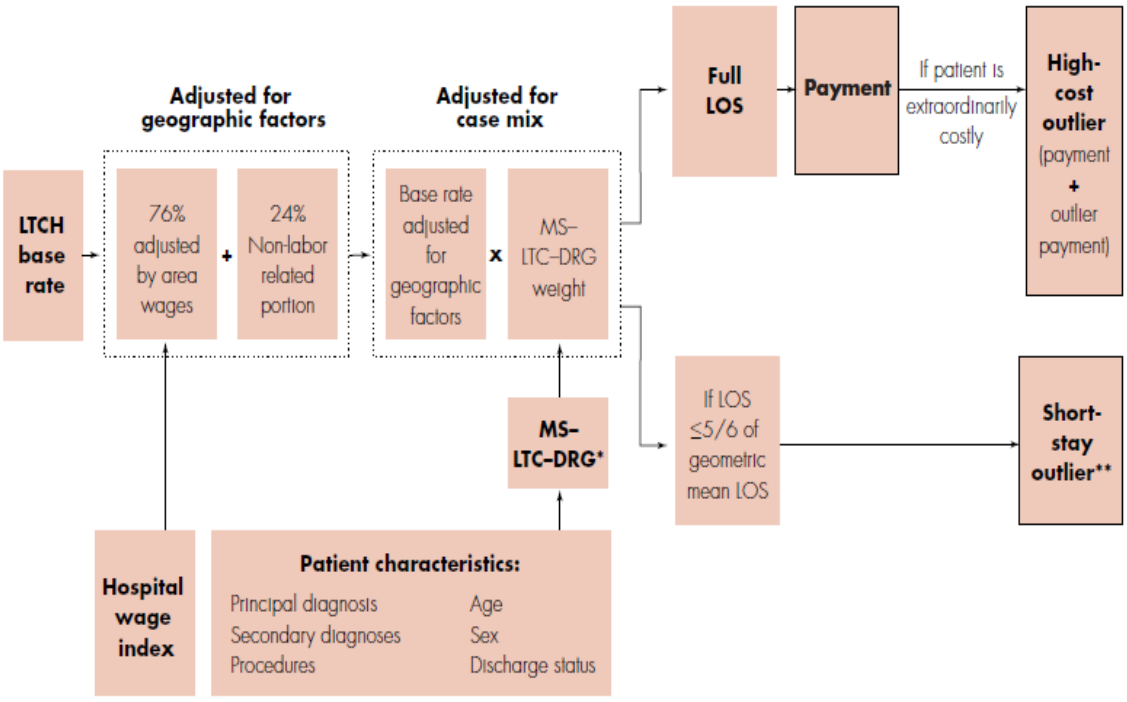


Long-Term Care Hospital Prospective Payment System (LTCH PPS)

Regarding Medicare payments to LTCHs, the LTCH PPS, effective as of 2002, is a per discharge system whereby the MS-LTC-DRG based patient classification system, as compared to the MS-DRG system for inpatient hospitals, accounts for differences in costs and resource utilization (CMS, 2012c). In fact, the MS-LTC-DRGs have higher relative weights which reflect the average relative costliness of those cases in a particular MS-LTC-DRG as compared with the cost(s) for the average LTCH case (MedPAC, 2012b).

Please see below (Figure A2) for the LTCH PPS (MedPAC, 2009):

Figure A2. Long-term care hospital prospective payment system



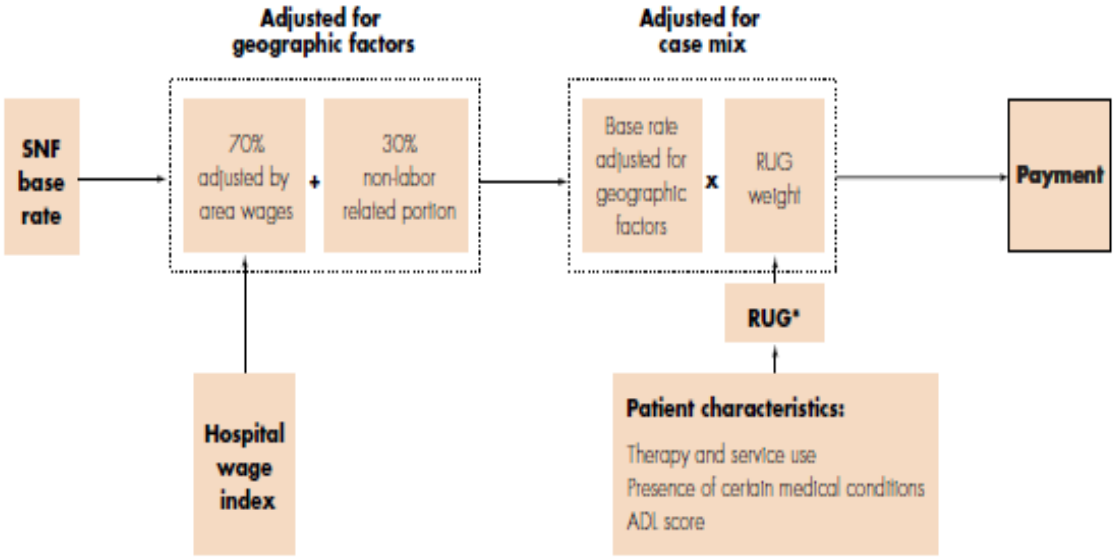
Note: LTCH (long-term care hospital), MS–LTC–DRG (long-term care diagnosis related group), LOS (length of stay).
* MS–LTC–DRGs comprise base DRGs subdivided into one, two, or three severity levels.
** Payments generally are reduced for short-stay patients.

Skilled Nursing Facility Prospective Payment System (SNF PPS)

Comparatively, the SNF PPS, effective as of 1998, covers all of the costs of providing covered services to Medicare patients based on adjustments for the facility's case mix and geographic variation in wages (CMS, 2012e). Regarding the facility's case mix, patients are assigned to Resource Utilization Groups (RUGs) which have distinct nursing and therapy weights applied to the base payment rates based on therapy and service use, the presence of certain medical conditions, and their activity of daily living (ADL) score (MedPAC, 2008b).

Please see below (Figure A3) for the SNF PPS (MedPAC, 2008b):

Figure A3. Skilled nursing facility prospective payment system



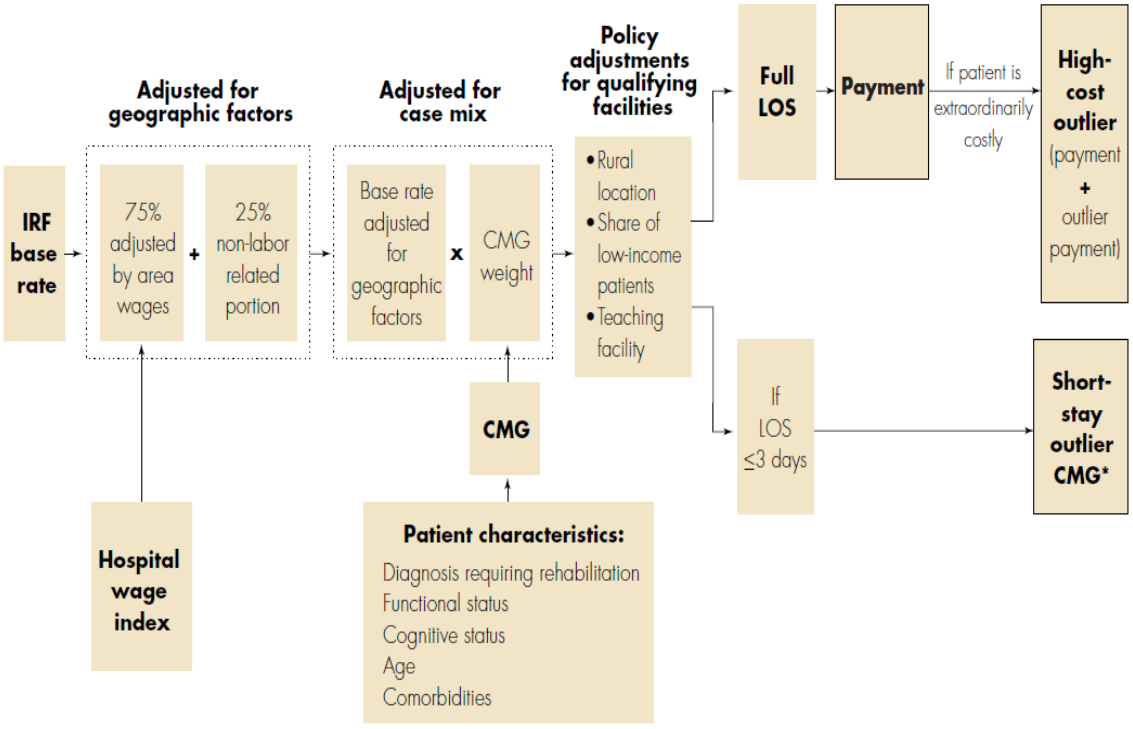
Note: SNF (skilled nursing facility), RUG (resource utilization group), ADL (activity of daily living).
*See Figure 2 for more detail on case-mix adjustment.

Inpatient Rehabilitation Facility Prospective Payment System (IRF PPS)

Meanwhile, the IRF PPS, effective as of 2002, utilizes the patient assessment instrument (IRF PAI) to assign patients to intensive rehabilitation categories, known as case-mix groups (CMGs), based on the diagnosis requiring rehabilitation, functional and cognitive status, age, and comorbidities (MedPAC, 2008a). IRF payments are based on adjustments for geographic variations in wages and the applicable CMG into which a patient is classified along with related case and facility level adjustments (CMS, 2012a).

Please see below (Figure A4) for the IRF PPS (MedPAC, 2008a):

Figure A4. Inpatient rehabilitation facility prospective payment system



Note: IRF (inpatient rehabilitation facility), CMG (case-mix group), LOS (length of stay).
*IRFs with a wage index of 1.0 are paid $1,913 for short-stay outliers.

Appendix III

Diagnosis-Related Groups (DRGs)

Developed at Yale University during the 1960s and 1970s, and subsequently mandated by Congress in the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 for use in the IPPS, DRGs are a patient classification system designed to provide a means for relating a hospital's case mix, the type of patients treated by the hospital, to its resource intensity, the cost incurred for providing services. As such, a DRG is assigned by a grouper algorithm which classifies a patient's hospital stay into an established DRG whereby patients in these DRGs are clinically similar and expected to utilize the same levels of hospital resources. Medicare claims information utilized for the purpose of DRG classification includes the principal and secondary diagnoses, procedure(s) performed, demographic information, and the presence of complications/comorbidities.

Concerning Medicare reimbursement to inpatient hospitals under the IPPS, each hospital is paid a fixed price, for services rendered to the beneficiary, based on the applicable MS-DRG. As such, only one MS-DRG, the highest severity MS-DRG that applies to each hospital case, is assigned based on the grouper algorithm. In establishing prospective payment rates, each MS-DRG is assigned a weight which reflects the average level of resources a hospital expends in treating the average Medicare patient in the particular MS-DRG, relative to the average level of resources expended for all Medicare patients. Specifically, as the weight of the MS-DRG increases, the cost, and often the severity, of the condition, increases accordingly. In FY 2011, a low weight included 0.5499 for chest pain (MS-DRG 313) while a lung transplant (MS-DRG 007) had a high weight at 9.3350, relative to the average weight of 2.0782 (HHS, 2001).

Appendix IV

Table A1. Medicare Provider Analysis and Review (MedPAR) Data Dictionary**:** Version J (3rd Iteration) - 1,000 Character Layout

No.	MedPAR Field	Len.	Beg.	Type	Description
1	NCH Claim Type Code	2	1-2	Char	Identify the type of claim record being processed in NCH
3	Claim Locator Number Group	9	3-11	Char	Number identifying the primary beneficiary under the SSA or RRB programs submitted
4	Category Equatable Beneficiary Identification Code	2	12-13	Char	Code with categorizes groups of BICs representing similar relationships between the beneficiary and the primary wage earner
5	Beneficiary Age Count	3	14-16	Num	Beneficiary's age as of date of admission
6	Beneficiary Sex Code	1	17	Char	The sex of a beneficiary
7	Beneficiary Race Code	1	18	Char	The race of a beneficiary
8	Beneficiary Medicare Status Field	2	19-20	Char	Common Working File (CWF) derived reason for a beneficiary's entitlement to Medicare benefits
14	Beneficiary Discharge Status Code	1	36	Char	Code used to identify the status of the patient as of the CLM_THRU_DT
15	GHO Paid Code	1	37	Char	Indication of whether or not a GHO has paid the provider
18	Provider Number Group	6	49-54	Group	_ _ # # # # = State # # _ # # # = Prov. Category # # # _ _ _ = Serial No.
22	Provider Number Special Unit Code	1	55	Char	Numbering system for units of hospitals excluded from PPS or hospitals w/ SNF swing-bed designation
29	Admission Date	4	75-78	Pack 7	The date the beneficiary was admitted for inpatient care or the date that care started
30	Discharge Date	4	79-82	Pack 7	The date on which the beneficiary was discharged or died
38	Length of Stay Day Count	3	97-99	Pack 5	Count in days of the total length of a beneficiary's stay in a hospital or SNF
48	DRG Outlier Approved Payment Amount	4	137-140	Pack 7	The amount of additional payment approved due to an outlier situation over the DRG allowance for the stay.
50	Indirect Medical Education (IME) Amount	4	145-148	Pack 7	Amount of additional payment made to teaching hospitals for IME for the stay
51	DRG Price Amount	4	149-152	Pack 7	Amount that would have been paid if no deductibles, coinsurance, primary payer, or outliers were involved
53	Total PPS Capital Amount	4	157-160	Pack 7	The total amount that is payable for capital PPS.
55	Total Charge Amount	4	173-176	Pack 7	Total amount of all charges for all services provided to the beneficiary for the stay

No.	MedPAR Field	Len.	Loc.	Type	Description
56	Total Covered Charge Amount	4	177-180	Pack 7	The portion of the total charges amount that is covered by Medicare for the stay
120	Diagnosis Code Count	2	387-388	Num	Count of the number of diagnosis codes included in the stay
122	Diagnosis Code	7	390-396	Char	Diagnosis code identifying the beneficiary's principal or other diagnosis
136	DRG Code	3	937-939	Num	Indicates the DRG to which the claims that comprise the stay belong
137	Discharge Destination Code*	2	940-941	Num	Code primarily indicating the destination of the beneficiary upon discharge from a facility; also denotes death or SNF/still patient situations

*See 'Patient Discharge Status Table'

Table A2. Patient Discharge Status Table (PTNT_DSCHRG_STUS_TB)

Code+	Discharge Destination Description
01	Discharged to home/self-care (routine charge).
02	Discharged/transferred to other short term general hospital for inpatient care.
03	Discharged/transferred to skilled nursing facility (SNF) with Medicare certification in anticipation of covered skilled care.
04	Discharged/transferred to a facility that provides custodial or supportive care (includes intermediate care facilities (ICF). Designates patients discharged/transferred to a nursing facility with neither Medicare nor Medicaid certification or to Assisted Living Facilities.
05	Discharged/transferred to a designated cancer center or children's hospital.
06	Discharged/transferred to home care of organized home health service organization in anticipation of covered skilled care.
07	Left against medical advice or discontinued care.
09	Admitted as an inpatient to this hospital.
20	Expired
30	Still patient.
43	Discharged/transferred to a federal hospital (includes government operated health facility).
50	Hospice – home
51	Hospice - medical facility (certified) providing hospice level of care
61	Discharged/transferred within this institution to a hospital-based Medicare approved swing bed.
62	Discharged/transferred to an inpatient rehabilitation facility including distinct parts units of a hospital.
63	Discharged/transferred to a Medicare certified long term care hospitals.
64	Discharged/transferred to a nursing facility certified under Medicaid but not certified under Medicare.
65	Discharged/Transferred to a psychiatric hospital or psychiatric distinct unit of a hospital (these types of hospitals were pulled from patient/discharge status code '05' and given their own code).
66	Discharged/transferred to a Critical Access Hospital (CAH).
70	Discharged/transferred to another type of health care institution not defined elsewhere in code list.

+ Discharge destination codes not present in the data include '08', '21', '40', '41', '42', '71', '72'

Appendix V

Creation of Master's Thesis Datasets

Step 1: Acute Inpatient Hospitalizations under MS-DRG 207

In order to create the datasets utilized for this study, the FY 2011 MedPAR File was manipulated through utilization of SAS on the IBM Mainframe. As of the six month run-out of FY 2011 data, this file contained 15,219,329 stay records for hospitals/facilities including acute care (inpatient) hospitals, LTCHs, and IRFs, and an additional 2,790,832 stay records for SNFs. The following fields were utilized, based on the National Claims History (NCH), to create a dataset of stay records for all acute inpatient hospitalizations:

No.	MedPAR Field	No.	MedPAR Field
1	NCH Claim Type Code	38	Length of Stay Day Count
15	GHO Paid Code	50	Indirect Medical Education (IME) Amount
18	Provider Number Group	51	DRG Price Amount
22	Provider Number Special Unit Code	55	Total Charge Amount

First, stay records for all acute inpatient hospitalizations were broken out of this dataset based on the applicable provider numbers for inpatient hospitals and the exclusion of providers not paid under the IPPS. Specifically, stay records were limited to those with an 'NCH Claim Type Code' of '60', indicating an 'inpatient claim', and a '0' in the third position of the 'Provider Number Group', indicating a short-term inpatient (general and specialty) hospital. Additionally, a blank 'Provider Number Special Unit Code' (e.g. '_') was utilized to ensure no special designation for these hospitals. Subsequently, stay records were excluded if the 'GHO Paid Code' was not equal to '0', indicating the hospital was not paid under Medicare Part A, the 'Length of Stay Day Count' was equal

to ‘0’, the ‘Total Charge Amount’ was equal to ‘$0.00’, and/or the ‘IME Amount’ was equal to the ‘DRG Price Amount’, indicating payment for the IME/DGME portion of the inpatient stay though the rest of the bill is paid under Medicare Advantage (MA). Finally, stay records were excluded for those hospitals not paid under the IPPS, including those hospitals participating in demonstration projects, non-federal and federal emergency hospitals, cancer hospitals, and CAHs.

Upon removing the applicable stay records, the acute inpatient hospitalization dataset comprised a total of 10,815,100 inpatient stay records. This dataset was then limited to those stay records classified under MS-DRG 207, “respiratory system diagnosis with ventilator support for greater than 96 hours.” This was done by excluding all MS-DRGs not equal to ‘207’ within the ‘DRG Code’ field:

No.	MedPAR Field
136	DRG Code

The resulting dataset of all acute inpatient hospitalizations classified under MS-DRG 207, consisting of 33,686 stay records, was then limited per the ‘Beneficiary Medicare Status’ field:

No.	MedPAR Field
8	Beneficiary Medicare Status Field

In order to ensure that the results of the study are representative of, and generalizable to, the U.S. older adult population, the dataset was limited to those stay records for beneficiaries who were eligible for Medicare based upon meeting the requirement of being aged 65 or older at the date of admission for their acute inpatient hospitalization. Specifically, this dataset excluded those stay records for individuals who were younger than 65 years of age and/or enrolled in Medicare due to disability and/or

diagnosis with ESRD. Per the above 'Beneficiary Medicare Status' field, those stay records without a '10' were excluded:

CWF Beneficiary Medicare Status Table

Medicare Status Code (MSC)	Social Security	Disability	ESRD	Age
10	Yes	N/A	No	≥ 65
11	Yes	N/A	Yes	≥ 65
20	No	Yes	No	< 65
21	No	Yes	Yes	< 65
31	No	No	Yes	Any

Following all of the above exclusions, the dataset for acute inpatient hospitalizations classified under MS-DRG 207, for those beneficiaries aged 65 or older without disability or ESRD, consisted of 23,893 stay records.

Step 2: Creation of Provider Specific Datasets (LTCHs, SNFs, IRFs)

Following the creation of the dataset of stay records for acute inpatient hospitalizations under MS-DRG 207, it was necessary to create the individual datasets for follow-on stays in LTCHs, SNFs, and IRFs. The following fields were utilized in the creation of these datasets:

No.	MedPAR Field
18	Provider Number Group
22	Provider Number Special Unit Code

The dataset containing LTCH stay records was created by excluding all records except those with '2000' to '2299' in the third to sixth positions of the 'Provider Number Group'. In order to ensure these stay records were for services provided in LTCHs, the records were also checked for a blank 'Provider Number Special Unit Code' (e.g. '_'). Following these exclusions, there were 160,482 stay records representing LTCH stays in a LTCH.

Regarding SNFs, the 2,790,832 stay records representing stays in a SNF were already separated into their own MedPAR dataset. This dataset was comprised of those stay records with numbers ranging from '5000' to '6499', representing freestanding SNFs, in the third to sixth positions of the 'Provider Number Group'. Included under SNFs, stay records with a '0' in the third position of the 'Provider Number Group' and a 'U' in the 'Provider Number Special Unit Code' indicated a swing-bed short-term/acute care hospital stay record. Meanwhile, stay records with a '1' in the third position of the 'Provider Number Group' and a 'Z' in the 'Provider Number Special Unit Code', indicated a swing-bed rural primary care hospital stay records. These swing bed hospitals represent those hospitals participating in Medicare which have obtained approval to use their own beds, as needed, to provide skilled nursing care, instead of discharging a patient to a freestanding SNF.

For IRFs, the applicable dataset was created by excluding all stay records except for those with numbers ranging from '3025' to '3099', representing freestanding IRFs, in the third to sixth positions of the 'Provider Number Group'. Furthermore, for those IRFs which are not freestanding (i.e. IRF units in hospitals), stay records for those providers with either a '0' or a '1' in the third position of the 'Provider Number Group' were also kept based on the additional inclusion of a particular 'Provider Number Special Unit Code' in the stay record. Specifically, non-freestanding IRFs with a '1' in the third position of the 'Provider Number Group' had to have an 'R', indicating a PPS-exempt rehabilitation unit in a CAH, in the 'Provider Number Special Unit Code' field. Meanwhile, for non-freestanding IRFs with a '0' in the third position of the 'Provider Number Group', a 'T', indicating a PPS-exempt rehabilitation unit, was required in the

'Provider Number Special Unit Code' field. Following these exclusions, there were 423,100 stay records representing stays in an IRF.

Step 3: Merge Acute Inpatient Hospitalizations w/ LTCH, SNF, IRF Datasets

Upon compilation of the stay records for acute inpatient hospitalizations classified under MS-DRG 207, and the additional compilation of stay records for each provider type of interest, the next step was to merge these datasets. For the purpose of this study, it was necessary to match an acute inpatient hospitalization under MS-DRG 207 to a follow-on stay in a LTCH, SNF, or IRF in order to conduct the required analyses. The following fields, per the MedPAR data dictionary, were utilized to complete the matching of stay records:

No.	MedPAR Field
3	Claim Locator Number Group
4	Category Equatable Beneficiary Identification Code
29	Admission Date
30	Discharge Date

First, utilizing the acute inpatient hospitalization dataset, the fields representing the beneficiary's HICN, the 'Claim Locator Number Group' and the 'Category Equatable Beneficiary Identification Code', and the discharge date from each stay record were utilized to create a finder file composed of beneficiaries with a prior acute inpatient hospitalization under MS-DRG 207. This finder file was then merged with the LTCH, SNF, and IRF datasets through matching on the beneficiary's HICN and the admission date provided on the stay records for each respective hospital/facility. Concerning the use of discharge dates, discharges to a LTCH, SNF, or IRF for a follow-on stay were defined as temporally adjacent hospitalizations. Specifically, temporally adjacent hospitalizations are those stays whereby admission to the LTCH, SNF, or IRF occurs on

day '*n'*, the date of discharge from the inpatient hospital, or '*n* + 1', the day after the date of discharge from the inpatient hospital.

Following the merge of these datasets, there were 2,010 matches for follow-on stays in LTCHs following an acute inpatient hospitalization under MS-DRG 207. Additionally, there were 5,181 matches for follow-on stays in a SNF and 795 matches for follow-on stays in an IRF.

During the creation of the datasets for this study, numerous variables were read in from MedPAR, and subsequently appended, for the purpose of statistical analyses concerning the discharge of medically complex patients to LTCHs, SNFs, or IRFs:

No.	MedPAR Field	No.	MedPAR Field
5	Beneficiary Age Count	53	Total PPS Capital Amount
6	Beneficiary Sex Code	55	Total Charge Amount
7	Beneficiary Race Code	56	Total Covered Charge Amount
14	Beneficiary Discharge Status Code	120	Diagnosis Code Count
18	Provider Number Group	122	Diagnosis Code
38	Length of Stay Day Count	136	DRG Code
48	DRG Outlier Approved Payment Amount	137	Discharge Destination Code
51	DRG Price Amount		

Step 4: Hospital/Facility Costs, Total Charges, and Medicare Payments

As analyzed within this study, a field concerning actual hospital/facility costs will be created through the utilization of CCRs. Foremost, however, as both standardized and non-standardized costs will be utilized during the analysis portion of this study, various fields needed to standardize total charges and Medicare payments will also be appended to the applicable datasets. Therefore, fields from publically available files created for the FY2011 Final Rule, for each provider type within the study, will be read-in accordingly.

First, concerning inpatient hospitals, paid under the IPPS, the FY 2011 FR IPPS Standardizing File, which is the file used to standardize charges for the rate building process, contains fields for the provider's wage index, teaching (IME) adjustment, DSH adjustment, and cost-of-living adjustment (COLA). Another required field, geographic adjustment factor (GAF), was calculated by raising the wage index to the 0.6848 power. These fields will be utilized according to the applicable standardization of operating or capital charges. Regarding LTCHs, the LTCH PPS FY 2011 FR Impact Data File, utilized for payment rate and policy determinations, among other functions, contained the necessary wage indices and COLAs for these providers. For IRFs, fields for the wage index, low income patients (LIP) (i.e. DSH) adjustment, and IME (teaching) adjustment were obtained from the FY 2011 IRF PPS Rate Setting File, which contains data for each of the 1,171 IRFs used to estimate the payment updates in the FY 2011 IRF PPS notice. Additionally, data was adjusted based on the 18.4% adjustment for rural IRFs. For SNFs, a dataset was created, comprised of wage indices and CCRs, utilizing each provider's FY 2010 cost reports. Finally, the following FY 2011 labor and non-labor shares were also utilized to standardize total charges and Medicare payments:

	Wage Index	Labor Share	Non-Labor Share
Inpatient	> 1	0.68800	0.31200
	≤ 1	0.62000	0.38000
SNF	Any	0.69311	0.30689
LTCH	Any	0.75271	0.24729
IRF	Any	0.75271	0.24729

As it concerns CCRs, for inpatient hospitals, LTCHs, and IRFs, the calculation of actual hospital/facility costs will utilize the CCRs, either the operating CCRs, capital CCRs, or both depending on the applicable provider type, recorded by Medicare in the April 2011 update of the PSF. So as to determine the actual hospital/facility costs for

those inpatient hospitals and LTCHs without the applicable CCRs present in the PSF, statewide averages will be appended using those CCRs obtained from Table 8 under the FY 2011 Final Rule. Under the FY 2011 IPPS Final Rule, Tables 8A and 8B contain the FY 2011 IPPS operating and capital statewide average CCRs as published in the Federal Register in August 2010. Concerning LTCHs, Table 8C contains the FY 2011 LTCH statewide average CCRs as also published in the Federal Register. For IRFs without the applicable CCRs in the PSF, the national average was utilized for operating CCRs with 0.48913 for urban areas and 0.62033 for rural areas. Meanwhile, for SNFs, the CCRs associated with swing bed hospitals, or hospitals with approval to use their own beds to provide skilled nursing care, will be appended to those stay records submitted by the associated SNF units, as represented by a 'Provider Number Special Unit Code' of 'U' or 'Z'. These represent those hospitals participating in Medicare which have obtained approval to use their own beds, as needed, to provide skilled nursing care, instead of discharging a patient to a freestanding SNF. Finally, for those stay records submitted by freestanding SNFs and swing-bed hospitals without CCRs, the national average of those providers with applicable operating CCRs will be appended for the purpose of calculating actual costs. For the purpose of this study, the national average for operating CCRs, utilizing the available dataset, was calculated to be 0.68821. Regarding the above data manipulation, those stay records submitted by providers without standardization information per the applicable FY 2011 Final Rule were removed from this study.

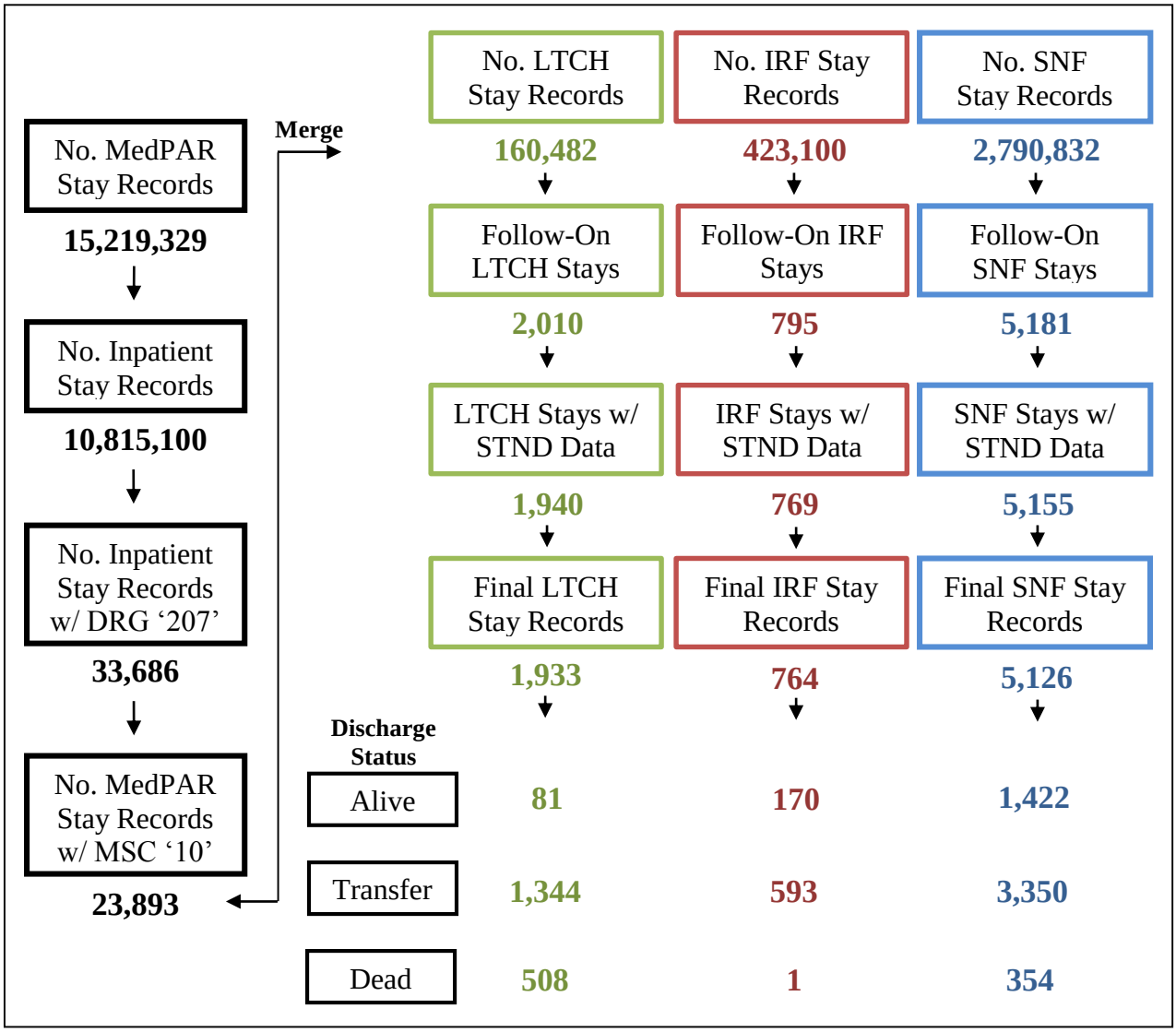
After appending all of the data necessary to standardize total charges and Medicare payments, there were 1,940 LTCH stay records, 5,055 SNF stay records, and 769 IRF stay records remaining for follow-on stays following an acute inpatient

hospitalization under MS-DRG 207. Subsequently, for the purpose of this study, the above datasets, one each for LTCHs, SNFs, and IRFs, were sorted according to the discharge location for the follow-on stay. Discharges were categorized based on the 'Discharge Destination Code' field whereby patients were grouped by whether they were discharged to their home/self-care ('1'), discharged or transferred to another hospital/facility for further treatment and/or if the individual was still a patient ('02', '03', '04', '05', '06', '09', '30', '43', '50', '51', '61', '62', '63', '64', '65', '66', '70'), or discharged as deceased ('20'). For this study, those patients with a 'Discharge Destination Code' of '7', indicating the patient left against medical advice or discontinued care, were removed from the applicable datasets due to the inability to follow the patient from the beginning to the end of their follow-on stay. Following the removal of the stay records, with the follow-on stay record having a 'Discharge Destination Code' of '7', there were 1,933 LTCH stay records, 5,026 SNF stay records, and 764 IRF stay records remaining for follow-on stays following an acute inpatient hospitalization under MS-DRG 207.

Subsequently, actual hospital/facility costs were calculated, using both standardized and non-standardized total charges, while standardized and non-standardized Medicare payments were also obtained for analytical purposes. To perform these calculations and the subsequent statistical analyses, this study utilized SAS version 9.3 (SAS Institute Inc., Cary, NC, USA). These calculations are separately examined in this document (Appendix VI).

As such, the below table was compiled so as to provide an overview of the data collection process and a summary of the applicable stay records:

Table A3. Medicare Provider Analysis Review (MedPAR) File: Fiscal Year (FY) 2011



Appendix VI

Standardization of Costs, Charges, and Payments

Non-Standardized Hospital/Facility Charges

= 'MedPAR Total Charge Amount'

Non-Standardized Hospital/Facility Payments

= 'MedPAR DRG Price Amount' + 'MedPAR DRG Outlier Approved Payment Amount'

Non-Standardized Hospital/Facility Costs

Inpatient Hospitals

```
IF COSTCHRG > 0.000 THEN DO;
        TOTCCHRG = (COSTCHRG+CPCSTCHG);
        OPCOST = ((COSTCHRG/TOTCCHRG)*CHARGE);
        CAPCOST = ((CPCSTCHG/TOTCCHRG)*CHARGE);
        ACTOP = (OPCOST*COSTCHRG);
        ACTCAP = (CAPCOST*CPCSTCHG);
        ACTTOT = (ACTOP+ACTCAP);
END;
```

LTCHs, SNFs, and IRFs

```
IF COSTCHRG1 > 0.000 THEN DO;
        TOTCCHRG1 = COSTCHRG1;
        OPCOST1 = (COSTCHRG1*CHARGE1);
        ACTTOT1 = OPCOST1;
END;
```

Standardized Inpatient Hospital Charges

```
OPCHG_ADJ = (OPCOST / (1 + INTCH + INDSH));
        IF INWIDX > 1 THEN
                OP_STDCHG = ((OPCHG_ADJ * 0.6880) / INWIDX) +
                                ((OPCHG_ADJ * 0.3120) / INCOLA);
                ELSE
                OP_STDCHG = ((OPCHG_ADJ * 0.6200) / INWIDX) +
                                ((OPCHG_ADJ * 0.3800) / INCOLA);

CPCHG_ADJ = ((CAPCOST / (1 + INTCHCP + INDSHCP)) / INGAF) /
                 (1 * (1 + (0.3152 * (INCOLACP - 1))));
        CP_STDCHG = CPCHG_ADJ;

TOT_STDCHG = OP_STDCHG + CP_STDCHG;
```

Standardized Inpatient Hospital Payments

```
OPPAY_ADJ = (OPPAY / (1 + INTCH + INDSH));
        IF INWIDX > 1 THEN
                OP_STDPAY = ((OPPAY_ADJ * 0.6880) / INWIDX) +
                                ((OPPAY_ADJ * 0.3120) / INCOLA);
                ELSE
                OP_STDPAY = ((OPPAY_ADJ * 0.6200) / INWIDX) +
                               ((OPPAY_ADJ * 0.3800) / INCOLA);
CPPAY_ADJ = ((CAPPAY / (1 + INTCHCP + INDSHCP)) / INGAF) /
        (1 * (1 + (0.3152 * (INCOLACP - 1))));
        CP_STDPAY = CPPAY_ADJ;

        TOT_STDPAY = OP_STDPAY + CP_STDPAY;
```

Standardized Inpatient Hospital Costs

```
OP_STDCOST = OP_STDCHG * COSTCHRG;
CP_STDCOST = CP_STDCHG * CPCSTCHG;

TOT_STDCOST = OP_STDCOST + CP_STDCOST;
```

Standardized LTCH Charges, Payments, and Costs

```
TOT_STDCHG1 = ((CHARGE1 * 0.75271) / LWIDX) + ((CHARGE1 * 0.24729) / LCOLA);

TOT_STDPAY1 = ((AMTPAY1 * 0.75271) / LWIDX) + ((AMTPAY1 * 0.24729) / LCOLA);

TOT_STDCOST1 = TOT_STDCHG1 * COSTCHRG1;
```

Standardized IRF Charges, Payments, and Costs

```
TOT_ADJCHG1 = (CHARGE1 / (1 + RURADJ + ITCH + IDSH));
        TOT_STDCHG1 = ((TOT_ADJCHG1 * 0.75271) / IWIDX) +
                        (TOT_ADJCHG1 * 0.24729);

TOT_ADJPAY1 = (AMTPAY1 / (1 + RURADJ + ITCH + IDSH));
        TOT_STDPAY1 = ((TOT_ADJPAY1 * 0.75271) / IWIDX) +
                       (TOT_ADJPAY1 * 0.24729);

TOT_STDCOST1 = TOT_STDCHG1 * COSTCHRG1;
```

Standardized SNF Charges, Payments, and Costs

```
TOT_STDCHG1 = ((CHARGE1 * 0.69311) / SWIDX) + (CHARGE1 * 0.30689);

TOT_STDPAY1 = ((AMTPAY1 * 0.69311) / SWIDX) + (AMTPAY1 * 0.30689);

TOT_STDCOST1 = TOT_STDCHG1 * COSTCHRG1;
```

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