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Chronically Critically Ill Population Payment Recommendations (CCIP-PR)

Final Report

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CHRONICALLY CRITICALLY ILL POPULATION PAYMENT RECOMMENDATIONS (CCIP-PR)

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EXECUTIVE SUMMARY

E.1 Introduction and Purpose

A number of concerns have been raised about how to best treat and pay for Medicare patients who are chronically critically ill (CCI) or medically complex (MC) and who need extended periods of hospital-level care. This population, which we refer to as the CCI/MC population, is often treated in both general acute care hospitals (ACHs) and in specialized long-term acute care hospitals (LTCHs). One concern is that Medicare costs and payments are not properly aligned for these types of patients leading to transfer patterns that are inappropriate or inefficient. A second concern is that patient transfers may be inappropriately influenced by payment considerations, rather than clinical factors, due to Medicare's current payment structures for ACHs and LTCHs. A third concern is whether CMS payment rates are consistent with the characteristics of patients and independent of the type of setting.

Given these concerns, this project had three goals. The first goal was to determine whether a CCI/MC population could be identified. A second goal was to describe the settings in which the CCI/MC receive care and to determine whether the Medicare payment rates for CCI/MC patients are appropriate relative to the costs for these patients across their episode of care. The third goal of the project was to simulate payment changes suggested by CMS to reform provider payments for the CCI/MC and the non-CCI/MC populations and to estimate the impact on LTCHs and ACHs. The results of these analyses are designed to allow CMS to reduce or eliminate provider incentives to alter sites of care based on financial rather than clinical needs and to build a payment approach for CCI/MC populations that is less site specific.

E.2 The CCI/MC Population

The ***chronically critically ill (CCI)*** population is commonly associated with extended hospital stays in high-acuity units. It is often identified by extended intensive care unit (ICU) stays, presence of sepsis, prolonged mechanical ventilation (PMV), and multiple organ failures. It is a population that is clinically variable in the presentation of its underlying disorders, yet definable in its final patterns of intensive service needs.

There are also many patients who may require hospitalization over several weeks or even months and whose level of medical complexity requires acute-level nursing but who have progressed from intensive to routine care needs. These patients may require extended hospitalizations to deal with continuing acute needs as well as rehabilitation services to deal with complications such as decreased body mass, decreased strength and reduced mobility, that accompany long hospitalizations. We refer to these patients as the ***chronically medically complex (MC)***; they are generally medically compromised (due, for example, to multiple co-morbidities) and they may have prolonged care needs for surgical after-care, wounds or infections, but they do not require long periods of mechanical ventilation and do not have the physiologic derangements leading to severe sepsis, multiple organ failure, PMV, or other conditions associated with CCI. Both the CCI and the MC, however, have a need for continued hospital care that can be met either from continued stays in the initial hospital or from transfer to an LTCH or other specialized long-term care setting.

E.3 Developing a Definition of the CCI/MC to Use in Medicare Payment

If CMS wanted to implement specific payment policies for the CCI/MC, it would first need to be able to define this population in its payment systems. As part of this project, we worked with CMS to develop four criteria to guide a definition of the CCI/MC that could be used in CMS reimbursement systems. First, the definition would have to be one that could be defined using clinical criteria, such as diagnoses, procedure codes, or MS-DRGs. Second, the definition would also need to identify a high-resource use population, as defined by an expectation of long hospital stays or high Medicare payments. Third, the population should be one that has Medicare payment problems, as evidenced by low/high margins or Medicare payments that differ markedly by site of service. Fourth, the population must be able to be identified through claims data or readily-available assessment data so that the definition can be implemented in CMS payment systems.

As a first step towards defining the CCI/MC, we reviewed the CCI literature which identified a number of clinical conditions associated with the CCI as well as the use of critical care services, such as extended ICU stays. We then expanded our review of the literature and consulted with clinicians to add conditions common to the medically complex. Based upon those initial activities we then developed a range of preliminary definitions of the CCI/MC. We asked clinical consultants to review this range of preliminary definitions and to suggest refinements to eliminate patients with expected low resource use and to add conditions that were expected to require long hospital stays and require high levels of resources. The combination of the literature review and clinician input led to the identification of the CCI/MC based on two factors: 1) patients who had received care in an ICU or CCU during their ACH stay and 2) patients who had one or more of five broad conditions during their ACH stay:

- tracheostomy
- prolonged mechanical ventilation (96 or more hours)
- multiple organ failure
- sepsis or other severe infections
- severe wounds

High-resource use of the CCI/MC. We then used Medicare claims data to analyze resource use, such as length of stay and Medicare payments, for the patients who had one of these five conditions and who had received care in the ICU/CCU. To analyze resource use, we created an FY09 episode file which grouped patients into episodes of hospital care so that we could analyze their use of both Medicare acute and post-acute care. For each condition, we then used the FY09 Medicare claims episode file to identify the average lengths of stay and Medicare payments in both ACHs and LTCHs.

Using the FY09 episode file, we found that about 2.6 percent of all ACH discharges would meet a CCI/MC definition based on one of the five clinical conditions and eight or more ICU/CCU days. Using the FY09 episode file, we found that over 200,000 patients met the

CCI/MC definition and that almost one-half of the CCI/MC patients had multiple organ failure and that about one-half had sepsis or another severe infection (note that a patient could qualify under multiple conditions such as having both multiple organ failure and sepsis). About 30,000 patients had tracheostomies and about 70,000 required prolonged mechanical ventilation (96 or more hours). About 20,000 patients had severe wounds that met the CCI/MC criteria.

We found that CCI/MC patients had much longer episode lengths of stay and much higher Medicare episode payments than the non-CCI/MC (episodes included both ACH and LTCH inpatient stays). For example, almost one-quarter of the CCI/MC had episode lengths of stay of 40 days or more in comparison to only two percent of the non-CCI/MC (see ***Figure ES-1***). Thus, the CCI/MC definition which required one of the five conditions and eight or more ICU days identified long-staying patients.

An important question in defining the CCI/MC is whether the definition should be based on clinical condition or a combination of clinical condition and the number of critical care days. The CCI literature finds that extended ICU/CCU stays are related to being chronically critically ill, but there is no consensus about the appropriate number of critical care days. In this project we analyzed the impact of critical care days on resource use. We divided Medicare patients who met one or more of the five clinical CCI/MC conditions into three critical care groups: 1) those with 0-4 critical care days; 2) those with 5-7 critical care days; and 3) those with 8 or more critical care days. We found that resource use differed by the number of critical care days (see ***Figure ES-2***):

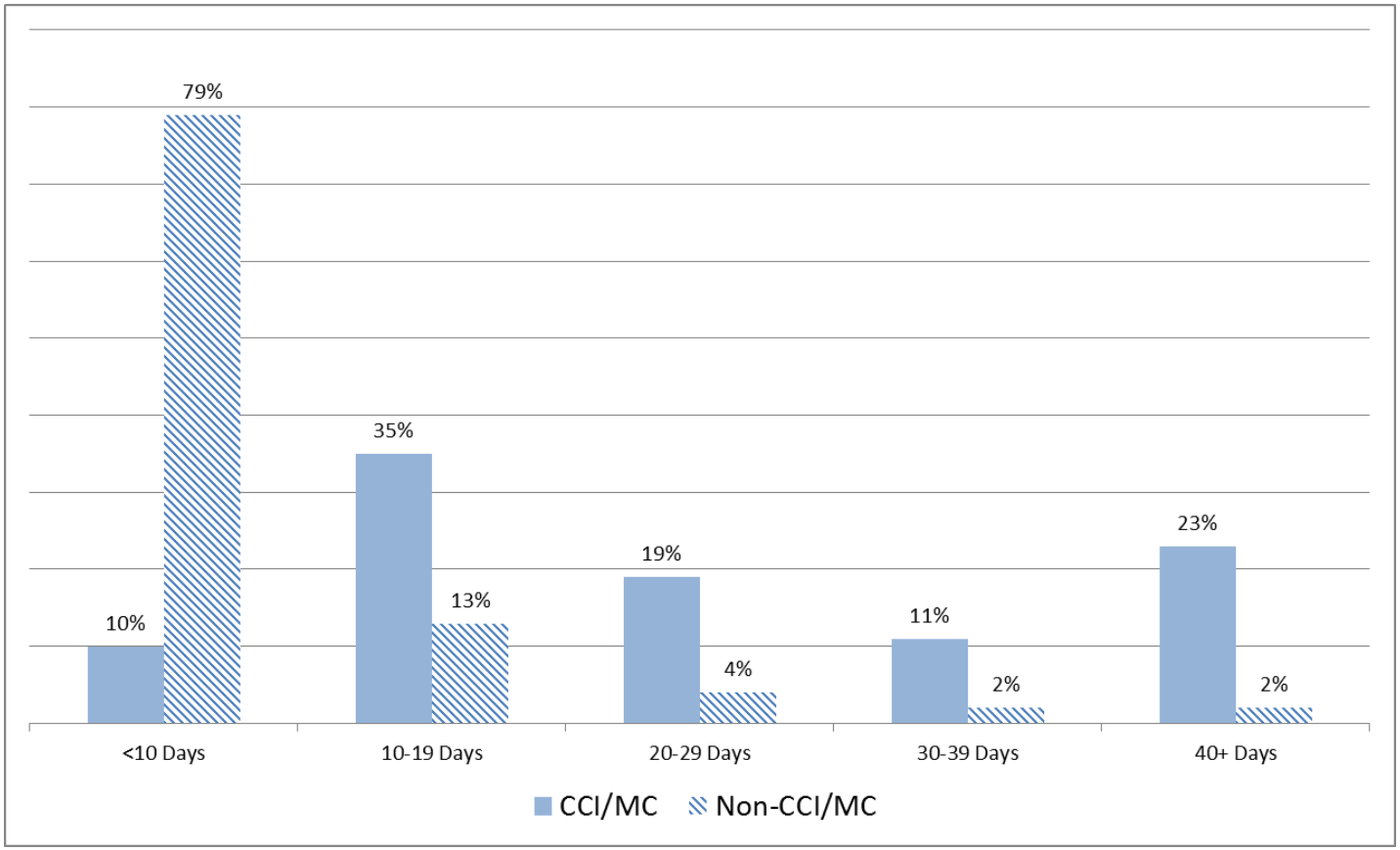
- The median number of inpatient hospital days (ACH and LTCH) was slightly higher for patients with 5-7 critical care days compared to patients with 0-4 critical care days, but it was more than twice as high for those with 8 or more critical care days compared to patients with 0-4 critical care days.

- The median Medicare hospital payment (ACH plus LTCH) was also twice as high for those with 8 or more critical care days than those with 5-7 critical care days.

- The LTCH transfer rate was three times higher for those with 8 or more critical care days.

Thus, those patients with 8 or more critical care days and one or more of the five clinical conditions had much higher resource use, as evidenced by their longer lengths of stay and higher Medicare payments as indicated by both their outlier status and their much higher transfer rate to LTCHs.

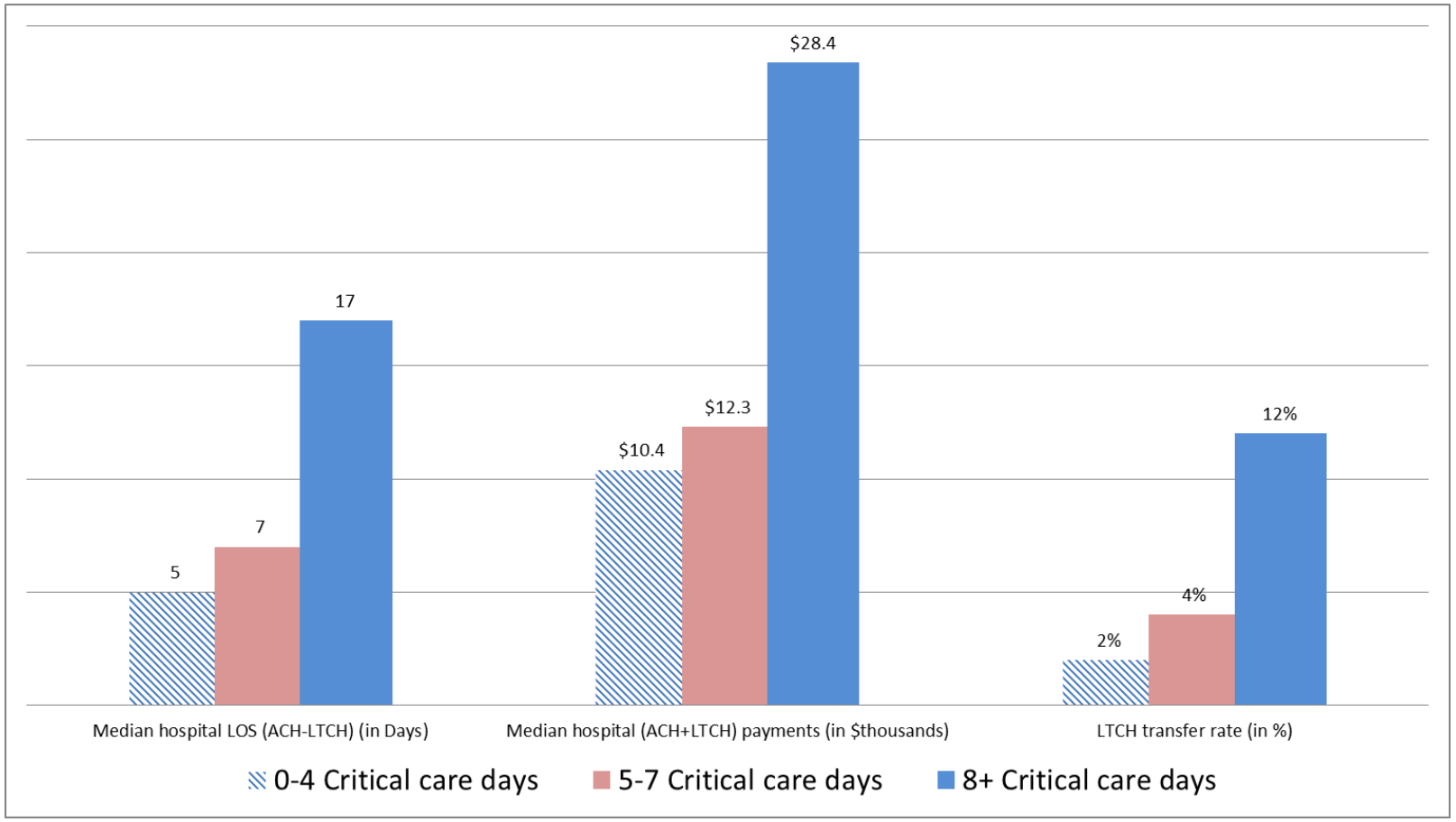
Figure ES-1
The CCI/MC have much longer hospital stays than the non-CCI/MC
(Percentage distribution of episode days for each group)



NOTE: CCI/MC, chronically critically ill or medically complex. Episode days include both ACH and LTCH days.

SOURCE: Medicare Provider Analysis and Review (MedPAR) episode files.

Figure ES-2
Resource use measures for discharges meeting the CCI/MC clinical factors, by critical care days



NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care inpatient hospital; LTCH, long-term care hospital; LOS, length of stay.

SOURCE: Kennell/RTI International analysis of matched FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims

We also wanted to determine whether including the clinical factors in the final definition excluded high-resource use patients who would otherwise be appropriate to include. We found that the patients with 8 or more critical care days who did *not* meet the clinical criteria had a median total (ACH + LTCH) LOS of 11 days, which is much less than the median LOS for the CCI/MC condition patients (17 days). Thus, we believe that the combination of the clinical criteria and 8 or more critical care days is a good measure of predictably long hospital stays. Second, the discharges with 8 or more critical care days who did not meet the CCI/MC clinical conditions had median payments of $11,400, which is about 60 percent less than the discharges with 8 or more critical care days who met the CCI/MC conditions. Third, the discharges with 8 or more critical care days who did not meet the CCI/MC clinical criteria had a much lower LTCH transfer rate (about 75 percent less than the transfer rate for the discharges with 8 or more critical care days who did meet the CCI/MC clinical criteria). Thus, we think that the CCI/MC clinical condition definitions are appropriate in defining a high-resource use population.

Because Medicare claims data only capture diagnosis and procedure codes, we also evaluated whether CARE assessment data, which have additional information on patient conditions and services, could make a significant contribution to the identification of the CCI/MC. We found that CARE data did not add significantly to the CCI/MC population as defined using claims and used only claims data in the identification of the CCI/MC.

Medicare payment problems. We also analyzed Medicare costs, payments, and margins for the CCI/MC to determine if there are systematic Medicare payment problems for CCI/MC patients. CMS is concerned about both systematic underpayments (low margins) for certain types of patients and/or facilities and overpayments (high margins) for other patients and facilities. CMS is also interested in whether there are inconsistencies in payments for patients with similar characteristics but who receive care in different settings. We analyzed the ACH margins of the CCI/MC. For each patient we computed margins, which were defined as:

$$\frac{\text{Medicare payments} - \text{Medicare costs}}{\text{Medicare payments}}$$

where Medicare payments included the basic MS-DRG payment, any outlier payments, and any deductibles or coinsurance that were the responsibility of the patient. We calculated the ACH, LTCH, and combined median margins for the CCI/MC by type of condition and found that all conditions, except tracheostomy, had negative median ACH margins (see ***Table ES-1***). Excluding tracheostomy patients, we found that the CCI/MC population had median ACH margins ranging from -28 to -63 percent. The positive (9 percent) median ACH margins for tracheostomy patients suggest that ACH payments may be too high for this group that has a distinct set of MS-DRGs defined by this procedure.

In contrast to the negative ACH margins for the non-tracheostomy CCI/MC patients, we found that the LTCH margins were generally positive. The LTCH margins were particularly high for tracheostomy patients. In summary, we found that:

- For tracheostomy patients, both the ACH and LTCH margins are generally positive and the LTCH margins are somewhat higher.

- For the other four clinical conditions, the ACH margins are quite negative.
- For each condition, the LTCH margins are higher than the ACH margins.

Table ES-1
Comparison of the median ACH, LTCH, and combined margins for the CCI/MC

CCI/MC condition	Median ACH margins	Median LTCH margins	Median ACH and LTCH combined margins
Tracheostomy	9%	13%	13%
PMV	-28%	5%	-12%
MOF	-63%	1%	-21%
Sepsis	-56%	1%	-19%
Wounds	-49%	0%	-16%

NOTE: Patients were classified according to the following hierarchy: tracheostomy, PMV, MOF, sepsis and other severe infections, and wounds. The number of LTCH admissions used in the calculations is much smaller than the number of ACH admissions because not all ACH admissions are transferred to LTCHs. CCI/MC, chronically critically ill or medically complex; ACH, acute care inpatient hospital; LTCH, long-term care hospital; PMV, prolonged mechanical ventilation; MOF, multiple organ failure.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode file.

These findings indicate that there are systematic payment concerns for the CCI/MC population.

In summary, we found that a definition of the CCI/MC based on ACH patients having: 1) eight or more days of ICU/CCU care AND 2) one or more of the five clinical conditions (PMV, tracheostomy, multiple organ failure, wounds or sepsis and other severe infections) meets four important criteria: 1) clinical coherence; 2) it identifies patients with high-resource use; 3) it includes patients who typically have systematic Medicare payment problems; and 4) it is a definition that could be used by CMS in its payment systems.

E.4 Characteristics of the CCI/MC

Who are the CCI/MC? Using the FY10 MedPAR data on all Medicare discharges, we found that among the 10.9 million ACH discharges in 2010, less than three percent of ACH discharges met the CCI/MC criteria (see ***Table ES-2***).

Table ES-2
ACH discharges by CCI/MC status, 2010

CCI/MC status	Number of ACH discharges in 2010 (in thousands)	Percent of discharges
CCI/MC	268	2.5%
Non-CCI/MC	10,658	97.5%
Total	10,926	100.0%

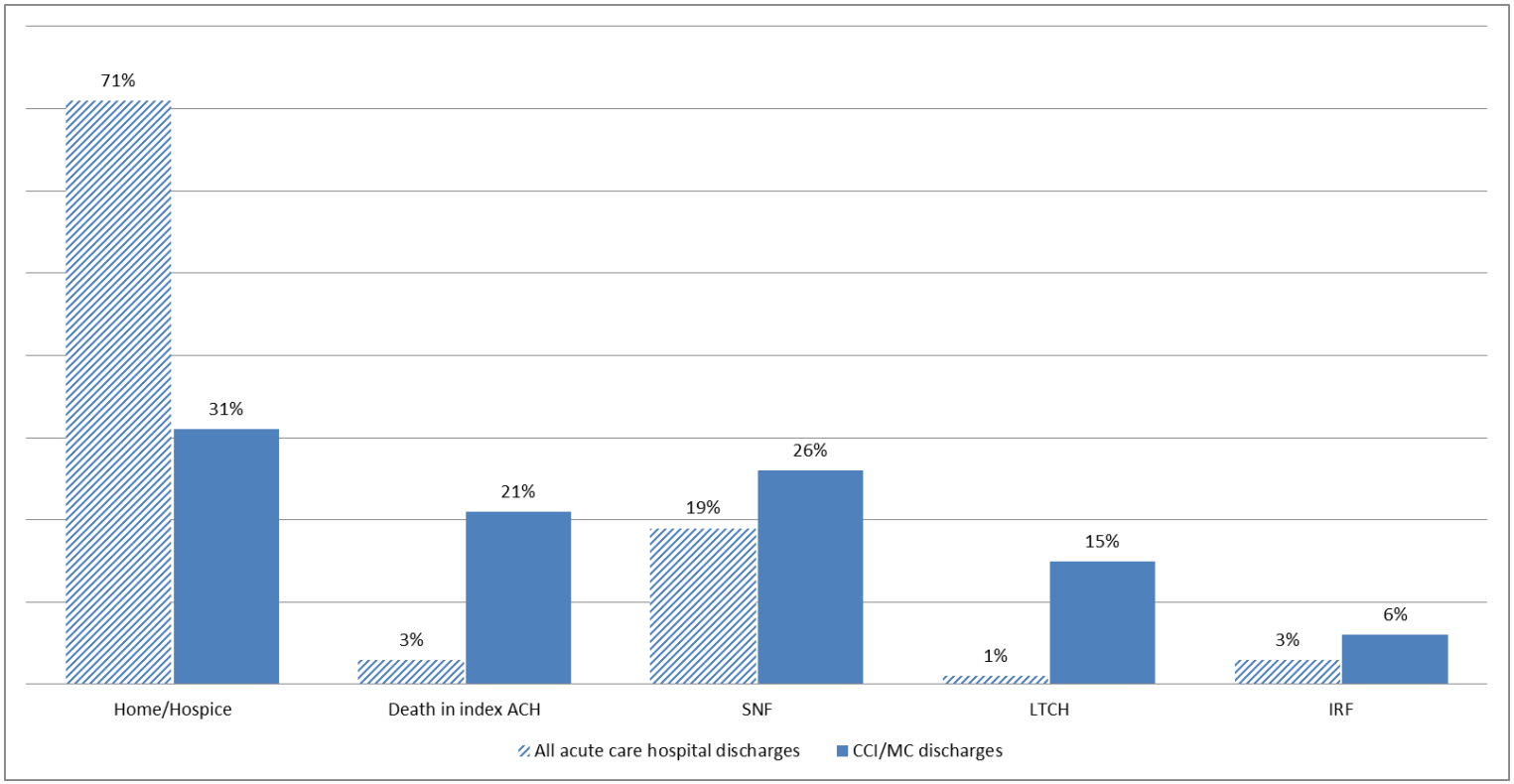
NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Where are CCI/MC patients discharged? We found that the discharge destinations for the CCI/MC are markedly different from other ACH discharges. Only 31 percent of the CCI/MC were discharged home (versus 71 percent of all ACH patients), 21 percent of the CCI/MC died in the hospital (versus 3 percent), and 49 percent were transferred to other facility-based settings (versus 25 percent) (see ***Figure ES-3***). The large proportion of CCI/MC discharges that continue to receive further facility-based care is an indication of the severity of illness among these patients.

How do those transferred to LTCH differ? Among the 212,577 CCI/MC who were discharged *alive* in 2010 from an ACH, we found that 18.3 percent were discharged to an LTCH (***Table ES-3***). On average, the CCI/MC discharged to LTCH have longer ACH lengths of stay (22.5 days compared to 18.9 days) and longer critical care unit (CCU) stays prior to discharge (19.8 days v. 14.8 days) compared to those not discharged to LTCH. These differences vary by type of condition, however, as does the likelihood of being discharged to an LTCH. For example, respiratory cases tend to be discharged earlier to an LTCH. While both tracheostomy and ventilator cases have shorter ACH LOS if they are discharged to an LTCH, ventilator cases tend to have longer critical care unit stays while trach cases have shorter critical care stays. In contrast, the non-respiratory CCI/MC cases transferred to LTCHs tend to have longer ACH LOS and more critical care days prior to discharge to an LTCH.

Figure ES-3
Discharge destination for the CCI/MC and all discharges, 2010
(percent of ACH discharges to each setting)



NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care hospital; SNF, skilled nursing facility; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table ES-3
Differences in characteristics between CCI/MC discharged alive to LTCHs and those not discharged to LTCH

Discharge characteristics	CCI/MC discharged from ACH to LTCH	CCI/MC discharged alive from ACH but not to LTCH
Number	38,989	173,588
Percent of live discharges	18.3%	81.7%
Mean LOS (days)	22.5	18.9
Mean CCU (days)	19.8	14.8
Mean ACH payment	$61,822	$34,849

NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care inpatient hospital; LTCH, long-term care hospital; LOS, length of stay; CCU, critical care unit.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

How do these patterns differ by state? The discharge patterns for the CCI/MC differ in areas with high numbers of LTCH hospitals. We defined 11 states as "high-LTCH states" (TX, LA, OK, MA, ID, CO, UT, MS, NV, CT, and DC) because they had a high number of LTCHs per capita and at least 100 LTCH beds. As expected, we found that high LTCH areas tend to have higher proportions of the CCI/MC population discharged to LTCHs (32 percent of the CCI/MC cases compared to only 15 percent in the other states). We found this higher rate of LTCH transfer for all five of the CCI/MC conditions. The LTCH transfer rates are higher by a factor of three for sepsis, MOF, and wound cases, and about 2.5 times higher for vent cases. In both high and low LTCH states, the transfer rate for trach cases was at least 60 percent. Further, the CCI/MC cases in high LTCH areas tend to have shorter ACH stays than those in the other states (20.4 days compared to 23.5 days, respectively) suggesting that patients are transferred to an LTCH earlier in their episode in the high LTCH areas. In part due to these shorter average lengths of stay and lower outlier payments, the average ACH Medicare payments were also lower in the high LTCH states for the CCI/MC patients transferred to LTCHs. The average differences ranged from about 4 percent lower for trach patients to 17 percent lower for sepsis patients.

Differences in LTCH use. We analyzed the LTCH population by whether or not they met the CCI/MC criteria based upon their diagnoses and ICU use in their prior acute care hospitalization. We found that among the 121,909 LTCH admissions in 2010, only 32 percent met the CCI/MC definition. The CCI/MC LTCH users had much longer ACH lengths of stay than the non-CCI/MC LTCH users (22.5 days vs. 9.5 days) and much longer ICU/CCU stays (18.5 days vs. 3.6 days). The LTCH stays for the CCI/MC were about 25 percent longer than for the non-CCI/MC (31.8 days vs. 25.5 days) and their Medicare payments were about 60 percent higher due primarily to differences in case mix (more tracheostomy patients). The readmission rates were similar and the death rates were higher for the CCI/MC. This suggests that the

CCI/MC definition does distinguish between LTCH cases in terms of expected length of stay and Medicare payments. Not only do the CCI/MC have longer lengths of stay and higher Medicare payments in ACHs, but they also have longer stays and higher payments in LTCHs, due to differences in case mix.

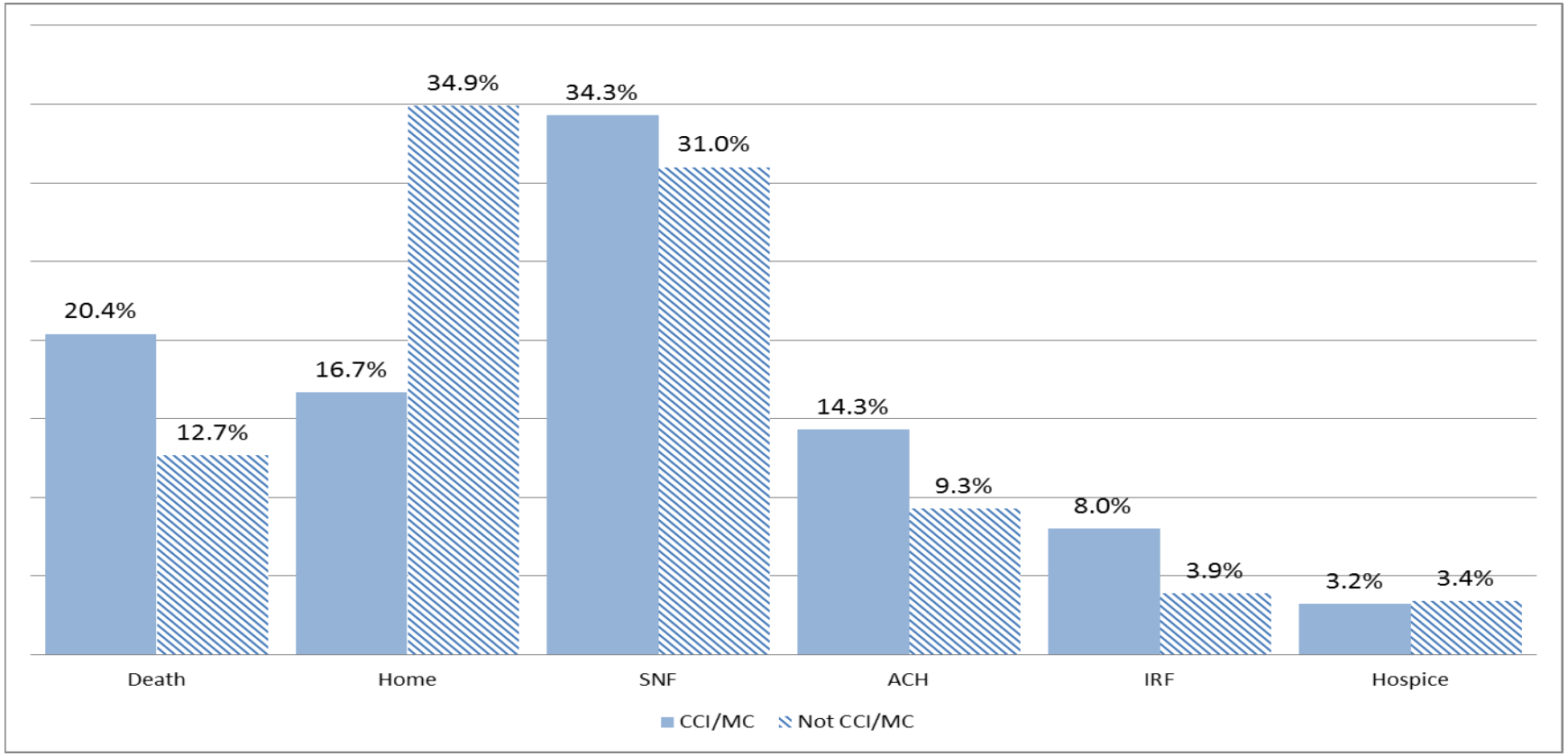
Where are the CCI/MC LTCH patients discharged? The CCI/MC and non-CCI/MC LTCH patients differ in terms of their discharge destinations from the LTCH. CCI/MC LTCH patients are less than half as likely to be discharged home relative to the non-CCI/MC LTCH users (16.7 percent vs. 34.9 percent). Similarly, while 20.4 percent of the CCI/MC are discharged dead, only 12.7 percent of the non-CCI/MC die in the LTCH (see ***Figure ES-4***). A much higher proportion of the CCI/MC continue to need some type of inpatient care after discharge from the LTCH. About 34 percent of the LTCH CCI/MC discharges need continued SNF care, about 14 percent return to an ACH, and 8 percent continue in an Inpatient Rehabilitation Facility (IRF). In total, over half of the LTCH CCI/MC continue to receive facility-based care. By comparison, only 44 percent of the non-CCI/MC continue to receive facility-based care. In addition, 14 percent of the CCI/MC LTCH patients are discharged to ACHs compared to only 9 percent for non-CCI/MC LTCH patients. This is another indication that the CCI/MC definition distinguishes between the most severely ill LTCH patients.

In summary, the CCI/MC definition identifies high-resource users in ACH. It also captures patients that are more likely to need further high-level inpatient care upon discharge from the ACH. The CCI/MC who are transferred to LTCHs have longer lengths of stay in the LTCH, and upon leaving the LTCH, the CCI/MC are less likely to return home and more likely to need continued inpatient care than the non-CCI/MC.

E.5 Impact of Alternative CCI/MC Payment Model on LTCHs

We simulated the impacts on both LTCHs and ACHs of the alternative CCI/MC payment model for LTCHs described by CMS in the May 10, 2013 Notice of Proposed Rulemaking (78 FR 27485). CMS did not formally propose this alternative payment model, but rather presented it for discussion. Under this alternative LTCH payment model, LTCH patients who are identified as CCI/MC would continue to receive payments under the current LTCH-PPS policies. However, patients who are not identified as CCI/MC—either because their clinical characteristics in their referring ACH claim did not meet the CCI/MC criteria or because there was no referring ACH claim—would receive an "IPPS-comparable" payment which is the payment that would have been made by Medicare under the IPPS payment system if that hospitalization had occurred in an ACH (based on the MS-DRG that would be assigned based on the patient's LTCH diagnoses). The alternative CCI/MC LTCH payment model that we simulated has the following characteristics:

Figure ES-4
CCI/MC LTCH patients were more likely to die in the LTCH or be sent to another hospital upon LTCH discharge, 2010



NOTE: CCI/MC, chronically critically ill or medically complex; SNF, skilled nursing facility; ACH, acute care hospital; IRF, inpatient rehabilitation facility; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

- the non-CCI/MC patients in LTCHs would receive a per diem payment based on the IPPS payment amount if their length of stay (LOS) was less than the IPPS average LOS for their MS-DRG and the full IPPS-comparable amount if their LOS was equal to or exceeded the IPPS average length of stay;

- current short-stay outlier (SSO) policies would remain in effect for the CCI/MC patients in LTCHs;

- current LTCH high-cost outlier policies would remain in effect for all patients; and

- the 25-day-average LOS requirement would apply to all Medicare LTCH patients, both the CCI/MC and the non-CCI/MC.

We conducted simulations of the impact of this alternative CCI/MC LTCH payment model on LTCHs by assuming that LTCH admissions of non-CCI/MC patients would decrease and that the admission of CCI/MC LTCH patients would increase. Because it would substantially reduce the payments for non-CCI/MC LTCH patients, making these patients unprofitable, LTCHs would likely change their admissions criteria and significantly reduce the number of non-CCI/MC patients they admit. These simulations incorporate both the changes due to the payment policy and behavioral changes expected from the LTCHs. We simulated the impact of the alternative LTCH payment model under two different behavioral assumptions about how LTCHs would reduce their non-CCI/MC patients:

- In the first set of simulations (Sim75), we assumed that LTCHs would reduce their non-CCI/MC admissions by 75 percent.

- In the second set of simulations (Sim90), we assumed that LTCHs would reduce their non-CCI/MC admissions by 90 percent.

In both simulations, we assumed that LTCHs would increase their CCI/MC patient admissions to offset the loss of non-CCI/MC patients. We assumed that the reduction in non-CCI/MC LTCH patients would not change the case mix of non-CCI/MC patients within each LTCH and that the CCI/MC patients added would also have the same case mix as the current LTCH CCI/MC case mix. We also assumed that 25 percent of CCI/MC patients discharged alive from IPPS hospitals and who are not currently transferred to LTCHs in each state would be available for transfer to LTCHs as long as the increase in CCI/MC patients did not exceed the decrease in non-CCI/MC patients within an LTCH and as long as the increase in CCI/MC patients did not exceed the LTCH's share of the CCI/MC patients in the state available for LTCH transfer. This allows a greater proportion of additional CCI/MC transfers to LTCHs to occur in states where current LTCH transfer rates are lower. We allocated the available CCI/MC patients across LTCHs based on the ratio of each LTCH's admissions to the total number of LTCH admissions within each state.

Compared to the current LTCH-PPS, the alternative CCI/MC LTCH payment model would reduce payments to LTCHs from $5.0 billion to $4.2 billion (Sim75) and $4.1 billion (Sim90), respectively (see ***Table ES-4***). Overall, payments to LTCHs would 17 percent lower under both simulations, with payments for CCI/MC patients approximately doubling and

payments for non-CCI/MC patients dropping by 90 percent or more. Aggregate average margins for all Medicare LTCH patients would fall from 8.1 percent to 0.1 percent under the Sim75 assumptions, and to 7.2 percent under Sim90. These simulations indicate that for LTCHs in aggregate to "break even" on their Medicare patients under the alternative CCI/MC LTCH payment model, LTCHs would need to reduce their non-CCI/MC patients by 75 percent and double their admission of CCI/MC patients. For LTCHs to return to roughly their current level of profitability, they would need to reduce their non-CCI/MC patients by 90 percent and more than double their number of CCI/MC patients.

Table ES-4
Summary of simulated impacts of the alternative CCI/MC LTCH payment model on LTCHs

LTCH payment system	LTCH payments	Reduction in payments from current LTCH payment system	LTCH margins
Current LTCH payment system	$5.0 billion	—	8.1%
Alternative CCI/MC LTCH payment model assuming behavioral changes 75% reduction in non-CCI/MC patients and increases in CCI/MC patients	$4.2 billion	17%	0.1%
90% reduction in non-CCI/MC patients and increases in CCI/MC patients	$4.1 billion	17%	7.2%

NOTE: LTCH, long-term care hospital; CMS, Centers for Medicare & Medicaid Services; CCI/MC, chronically critically ill or medically complex. LTCHpayments include CMS payments and beneficiary liabilities.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of LTCH claims.

We simulated the impact of the alternative CCI/MC LTCH payment model on different types of LTCHs (see ***Table ES-5***). We found that the smallest LTCHs (0-24 beds) have the lowest margins under the current payment system (3.6 percent) and would also have the lowest margins under the assumptions of Sim75 (-8.1 percent) and the assumptions of Sim90 (3.0 percent). In contrast, the largest LTCHs (200+beds) have the highest margins under the current payment system (16.4 percent) and would continue to have the highest margins under Sim75 (3.7 percent) and under Sim90 (11.0 percent). Urban LTCHs have the highest margins before and after the simulated implementation of the alternative LTCH payment model. Rural LTCHs have low margins though it should be noted that there are few rural LTCHs. We also found that proprietary LTCHs have higher margins than government and voluntary LTCHs under both the current LTCH payment system and under the alternative LTCH payment model.

Table ES-5
Simulated LTCH payments and margins under current payment system and alternative CCI/MC LTCH payment model with changes in LTCH admission patterns, subdivided by selected LTCH characteristics

State	Number of LTCHs	Current payment system		Alternative model, 75% reduction in non-CCI/MC		Alternative model, 90% reduction in non-CCI/MC	
		Payments ($ millions)	Margin, %	Payments ($ millions)	Margin, %	Payments ($ millions)	Margin, %
Bed size							
0-24 beds	37	214	3.6	138	-8.1	135	3.0
25-49 beds	195	1,617	7.8	1,389	1.9	1,398	8.9
50-74 beds	103	1,317	8.0	1,075	0.4	1,062	7.5
75-124 beds	49	832	5.4	744	-1.5	754	4.8
125-199 beds	20	511	7.2	409	-4.7	410	3.0
200+ beds	15	531	16.4	396	3.7	384	11.0
Urbanicity							
Large urban area	202	3,010	9.0	2,599	1.3	2,596	7.7
Other urban area	191	1,815	7.7	1,447	-0.6	1,448	7.2
Rural area	26	197	-1.2	106	-18.9	99	-5.8
Ownership							
Government	12	66	-8.3	74	-13.1	79	-6.6
Voluntary	77	702	-0.5	595	-6.3	601	1.3
Proprietary	300	3,989	10.3	3,256	2.0	3,232	9.0
Unknown	30	264	2.1	227	-5.6	231	1.6

NOTES: Data on bed size, urbanicity, and ownership from the RY 2009, RY 2010, FY 2011, and FY 2012 LTCH Impact Files.
LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex.
SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of LTCH claims

We also identified the states which would be most affected by the alternative CCI/MC LTCH payment model. The states that already have a high percentage of CCI/MC transfers from IPPS hospitals to LTCHs – Louisiana, Oklahoma, Texas, Massachusetts, Nevada, and Mississippi – would experience the largest declines in LTCH payments and Medicare margins.

E.6 Impact on Acute Care Hospitals

The payment changes potential by CMS for LTCHs would also affect ACHs. Because fewer non-CCI/MC patients would be transferred to LTCHs, ACHs would have to keep most, if not all, non-CCI/MC patients for the duration of their need for hospital-level care. This would lead to longer hospital stays and higher costs for these patients.

We conducted two policy simulations to assess the potential impact of the alternative CCI/MC LTCH payment model on ACHs. Under both simulations, we assumed that 100 percent of non-CCI/MC patients who are currently transferred to LTCHs would remain at the ACH. We also assumed that:

- Under the first simulation (ACH-Sim50), 50 percent of the LTCH days would be added to the acute care stay for all non-CCI/MC patients currently discharged to LTCHs. For those LTCH stays that were LTCH short-stay outliers, we assumed that 100 percent of LTCH days would have been added to the ACH stay.

- In the second simulation (ACH-Sim100), we assumed that 100 percent of the LTCH days for all non-CCI/MC patients currently transferred to LTCHs would be added to the ACH stay.

We think that these two simulations represent extreme impact scenarios for ACHs. In particular, we think that assuming that 100 percent of non-CCI/MC patients would remain in the ACH and that their ACH length of stay would be increased by 100 percent of the days spent in the LTCH would be likely to overstate the length of the new ACH stay, for three reasons:

- First, current LTCH-PPS rules give LTCHs large financial incentives to keep patients longer than may be medically necessary. Previous research by Kennell/RTI International under contract to CMS (Dalton, Kandilov, Kennell, & Wright, 2012) has shown that, across all MS-LTC-DRGs, the average payment difference between discharging a patient a day or two before the SSO cut-off and a day or two after the SSO cut-off was $11,000 in 2010. As a result, this study found that LTCH discharges spike just after patients have reached the MS-LTC-DRG-specific SSO cut-off. It may have been medically appropriate to discharge many of those patients to a lower level of care after a shorter LTCH length of stay, but the LTCH kept the patients longer in order to receive the full LTCH-PPS payment. Under the CMS LTCH payment proposal, ACHs would have no such financial incentive to keep these patients longer, and so would be unlikely to keep these patients the full length of the LTCH stay if another level of post-acute care could meet the care needs of the patients.

- Second, LTCHs must also maintain a 25-day average length of stay for their Medicare patients in order to qualify for LTCH status and LTCH-PPS payments.

This would also tend to lengthen LTCH stays beyond what may be medically necessary. ACHs do not have to meet that 25-day average length of stay rule, and so would likely discharge their non-CCI/MC patients who were formerly transferred to LTCHs as soon as they were appropriate for a lower level of medical care, such as a skilled nursing facility (SNF).

- Third, some patients who are discharged to LTCHs could also be transferred to SNFs or other inpatient settings.

These payment simulations may also overstate the impact of the CMS proposal because they focus only on the non-CCI/MC patients who would remain in the ACH, and do not incorporate any positive impacts from the policy change on CCI/MC patients. We think that LTCHs would respond to the CMS-potential payment system by both reducing their admission of non-CCI/MC patients and increasing their admission of CCI/MC patients. Presumably, if increasing numbers of CCI/MC patients were completing their hospital-level care in LTCHs, these patients would incur fewer days and lower costs in the ACH and thus be more profitable (that is, have higher margins) than they currently are. Although we did not include this effect in the ACH payment simulations, it would likely offset some of the higher costs to ACHs that would occur when the non-CCI/MC patients complete their hospital care in the ACH instead of the LTCH.

By discouraging the transfer of non-CCI/MC patients from the ACH to the LTCH, we simulated that ACH costs would increase and that these cost increases would be only partly offset by increases in CMS payments. The simulation results shown in ***Table ES-6*** indicate that costs for all ACH discharges in FY 2010 would increase from $117.3 billion to $119.1 billion ($120.5 billion) under ACH-Sim50 (ACH-Sim100). The increased costs would cause more of the non-CCI/MC claims to qualify as high-cost outliers in the ACH, which would result in higher CMS payments for these claims. Under the current payment system, acute care hospitals receive $110.2 billion in payments, but under ACH-Sim50, those payments would increase to $110.6 billion and under ACH-Sim100, the payments would increase to $111.4 billion. Thus, while costs would increase by up to three percent, payments would increase about one percent.

Aggregate average margins for ACHs, simulated to be –6.4 percent under the current payment system, would fall to –7.7 percent (ACH-Sim50) or –8.2 percent (ACH-Sim100) under the CMS-potential payment system. These margins, averaged over all patients seen in ACHs, do not change dramatically, but we found that they would be much more negative for the approximately 80,000 non-CCI/MC patients who were discharged in FY 2010 and transferred to LTCHs.

The increased costs would not be evenly distributed across acute care hospitals. Those hospitals that have a larger proportion of non-CCI/MC patients discharged to LTCH would face the most significant increases in their costs. Non-CCI/MC patients discharged to LTCHs are not uniformly distributed across ACH facilities. Many ACHs transfer few or none of their non-CCI/MC patients to LTCHs, while others transfer many. We found that over one-quarter of all ACH hospitals transferred zero non-CCI/MC patients to LTCHs, and another quarter transferred just 1-4 non-CCI/MC patients (see ***Table ES-7***). Thus, over half of the ACHs will face minimal or no changes in their costs and payments under the alternative LTCH payment model.

Table ES-6
Simulated impact on acute care hospitals of the alternative CCI/MC LTCH payment model

LTCH payment system	Acute care hospital costs	Acute care hospital payments	Medicare inpatient margins
Current LTCH payment system	$117.3 billion	$110.2 billion	-6.4%
Alternative CCI/MC LTCH payment model assuming behavioral changes 75% reduction in non-CCI/MC patients and increases in CCI/MC patients	$119.1 billion	$110.6 billion	-7.7%
90% reduction in non-CCI/MC patients and increases in CCI/MC patients	$120.5 billion	$111.4 billion	-8.2%

NOTES: ACH, acute care hospital: LTCH, long-term care hospital; CMS, Centers for Medicare & Medicaid Services; CCI/MC, chronically critically ill or medically complex.

SOURCE: Kennell/RTI analysis for FY 2010 MedPAR data, 100 percent sample of ach claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

Table ES-7
Frequencies of non-CCI/MC transfers to LTCH among acute care hospitals

Number of non-CCI/MC discharges transferred to LTCH	Number of facilities	Percent of facilities
0	914	27.6%
1-4	809	24.5%
5-19	711	21.5%
20-99	645	19.5%
100+	229	6.9%
Total ACH facilities in sample	3,308	100.0%

NOTES: ACH, acute care hospital; LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

At the other end of the distribution, there are 229 ACH facilities that transferred 100 or more non-CCI/MC patients to LTCHs; these facilities are the ones which are likely to experience the largest impact of the alternative LTCH payment model.

We also found that the smallest ACHs (0-49 beds and 50-99 beds) have the lowest Medicare inpatient margins under the current payment system, with -14.4 percent and -13.4 percent margins under the assumptions of both of the simulations (see ***Table ES-8***). In contrast, the largest ACHs (500+beds) have the highest Medicare inpatient margins under the current payment system (-3.5 percent) and would have the highest margins under ACH-Sim50 (-4.6 percent) and under ACH-Sim100 (-5.0 percent). Smaller hospitals have a somewhat smaller proportion of non-CCI/MC patients transferred to LTCHs as a percent of the total. However, for all sizes of hospitals, the difference in margins between the current payment system and ACH-Sim100 is between 1.5 and 2 percentage points.

Almost 1 percent of patients in large urban hospitals are non-CCI/MC patients discharged to LTCHs, compared to just 0.5 percent in rural hospitals. As a result the decrease in margins under the simulations of the alternative CCI/MC LTCH payment model would be largest for the large urban ACHs.

Non-profit hospitals have both higher proportions of non-CCI/MC patients discharged to LTCHs and higher margins than either government or for-profit hospitals. The non-profit hospitals would have larger decreases in their margins, but even their lowest margins, at -4.3 percent under ACH-Sim100, would still be higher than the margins for government or for-profit hospitals.

We also found that hospitals that discharge the highest proportion of non-CCI/MC patients to LTCHs would face the most significant cost increases. These hospitals are concentrated geographically in areas with high availability of LTCH beds.

As discussed above, we think that the simulations represent an upper bound of the impact of the alternative CCI/MC LTCH payment model on ACHs. The majority of ACHs discharge fewer than five non-CCI/MC patients to LTCHs annually. Thus, for the majority of ACHs, even using the extreme assumptions in these simulations, the resulting impact will be negligible.

Table ES-8
Simulated ACH payments and margins under current payment system and alternative CCI/MC LTCH payment model, subdivided by selected ACH characteristics

State	Number of ACHs	Non-CCI/MC discharged to LTCH as percentage of total	Current payment system		50 percent of LTCH days in ACH		100 percent of LTCH days in ACH	
			Payments ($ billions)	Margin, %	Payments ($ billions)	Margin, %	Payments ($ billions)	Margin, %
Bed size								
0-49 beds	625	0.63	2.3	-14.4	2.4	-15.8	2.4	-16.3
50-99 beds	645	0.58	6.5	-13.4	6.4	-14.5	6.5	-14.8
100-149 beds	563	0.84	10.5	-6.9	10.5	-8.4	10.6	-9.0
149-249 beds	642	0.82	21.9	-6.9	22.0	-8.2	22.2	-8.7
250-499 beds	638	0.79	41.6	-6.4	41.8	-7.5	42.0	-7.9
500+ beds	195	0.86	27.4	-3.5	27.5	-4.6	27.7	-5.0
Urbanicity								
Large urban area	1,262	0.93	56.9	-7.4	57.1	-8.7	57.5	-9.2
Other urban area	1,082	0.74	41.9	-5.4	42.1	-6.5	42.4	-6.9
Rural area	964	0.51	11.4	-5.2	11.4	-6.1	11.5	-6.4
Ownership								
Government	513	0.75	11.9	-4.3	11.9	-5.5	12.0	-5.9
Non-profit	787	1.17	18.6	-2.0	18.5	-3.7	18.7	-4.3
For profit	2,005	0.71	79.8	-7.7	80.1	-8.8	80.6	-9.2

NOTES: Data on bed size and urbanicity from the RY 2009, FY 2010, FY 2011, and FY 2012 ACH Impact Files. Data on ownership from the 2010 Provider of Service file. Three hospitals with unknown ownership excluded; these hospitals had no cost or payment changes.

ACH, acute care hospital; LTCH, long-term care hospital; CMS, Centers for Medicare & Medicaid Services; CCI/MC, chronically critically ill or medically complex.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

SECTION 1
DEFINING THE CCI/MC POPULATION

1.1 Purpose of the Project

A number of concerns have been raised about how to best treat and pay for Medicare patients who are chronically critically ill (CCI) or medically complex (MC) and who need extended periods of hospital-level care. This population, which we refer to as the CCI/MC population, is often treated in both general acute care hospitals (ACHs) and in specialized long-term acute care hospitals (LTCHs). One concern is that Medicare costs and payments are not properly aligned for these types of patients leading to transfer patterns that are inappropriate or inefficient. A second concern is that patient transfers may be inappropriately influenced by payment considerations, rather than clinical factors, due to Medicare's current payment structures for ACHs and LTCHs. A third concern is whether CMS payment rates are consistent with the characteristics of patients and independent of the type of setting.

An LTCH technical expert panel (TEP) that RTI conducted in 2007 recommended that CMS should consider payment options to deal specifically with the treatment needs and associated costs of a subset of complex populations commonly treated in LTCHs.[1] Further, the TEP suggested that payment rates should be consistent with the characteristics of the patient and independent of the type of setting treating these cases.

Given these concerns, this project had three goals. The first goal was to determine whether a CCI/MC population could be identified. A second goal was to describe the settings in which the CCI/MC receive care and to determine whether the Medicare payment rates for CCI/MC patients are appropriate relative to the costs for these patients across their episode of care. The third goal of the project was to simulate payment changes suggested by CMS to reform provider payments for the CCI/MC and the non-CCI/MC populations and to estimate the impact on LTCHs and ACHs. The results of these analyses are designed to allow CMS to reduce or eliminate provider incentives to alter sites of care based on financial rather than clinical needs and to build a payment approach for CCI/MC populations that is less site specific.

1.2 The CCI/MC Population

One group of patients that has received considerable attention in the clinical and academic literature is the chronically critically ill (CCI). While different researchers have used alternative approaches to identifying the CCI, this population is commonly associated with extended hospital stays in high-acuity units and generally has high Medicare payments. This population is often identified in claims by their extended ICU stays, presence of sepsis, prolonged mechanical ventilation (PMV), and multiple organ failures. *It is a population that is clinically variable in the presentation of its underlying disorders, yet definable in its final patterns of intensive service needs.*

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[1] CMS contracted with RTI to conduct two TEPs on the role of LTCHs and patients requiring prolonged mechanical ventilation and other medically complex conditions. The first was conducted on January 30, 2007 and the second on November 6, 2007.

A distinction can be drawn between CCI patients and patients who need extended acute care but do not require critical care nursing. The latter group, which we are calling chronically medically complex (MC), are generally medically compromised (due, for example, to multiple co-morbidities) and they may have prolonged care needs for surgical after-care, wounds or infections, but they do not require long periods of mechanical ventilation and do not otherwise fit the clinical profile of CCI. There are many patients who may require hospitalization over several weeks or even months and whose level of medical complexity requires acute-level nursing but who have progressed from intensive to routine care needs. These patients may require extended hospitalizations to deal with continuing acute needs as well as rehabilitation services to deal with complications that accompany long hospitalizations such as decreased body mass, decreased strength and reduced mobility. Medically complex patients can be clinically distinguished from CCI patients by the fact that they do not have the physiologic derangements leading to severe sepsis, multiple organ failure, PMV, or other conditions associated with the CCI. Both groups, however, have a need for continued hospital care that can be met either from continued stays in the initial hospital or from transfer to an LTCH or other specialized long-term care setting.

The literature on the CCI. We conducted a literature review on the CCI and MC populations to understand how past research could inform how the CCI/MC are identified for the purposes of this project. A preliminary version of this literature review was included in Appendix A of the CMS 2011 Report to Congress (entitled "Determining Medical Necessity and Appropriateness of Care for Medicare Long Term Care Hospitals).

Chronic critical illness has been described as a devastating condition subsequent to extended intensive care use, found in an aging population that is increasingly aggressively treated and able to survive, but not recover from, catastrophic illness (Nelson et al. 2006 and 2007). With technological advances in critical care, chronic critical illness affects a growing number of survivors, and can no longer be considered rare. Although the term "chronic critical illness," or CCI, was first identified in the academic literature in 1985 (Girard and Raffin 1985), rules for case identification are still being debated (Wiencek and Winkelman 2010). The CCI definition which is most frequently cited in the literature is that offered by Nierman and Nelson in 2002:

A growing population of patients survives acute critical illness only to become chronically critically ill, with profound debilitation and ongoing respiratory failure. Although prolonged dependence on mechanical ventilation is a defining characteristic, chronic critical illness (CCI) may be more appropriately viewed as a syndrome encompassing multiple characteristics including metabolic, endocrine, physiologic, and immunologic abnormalities. These derangements, initiated by an episode of sepsis, accompanied by dysfunction of various organ systems, and perpetuated by acquired morbidities, serve to slow or preclude recovery from a wide range of acute forms of medical, surgical, and neurologic critical illness. Care of the chronically critically ill is extremely challenging, protracted, and resource-intensive, requiring multidisciplinary expertise, substantial commitment on the part of caregivers, and weeks to months of hospitalization.

While the definition of CCI as a syndrome characterized by specific physiologic, metabolic and other derangements is generally accepted in the literature, it is the identification of patients through the associated resulting illnesses (e.g. organ failure and infection), service use

(e.g. critical care days and mechanical ventilation), or functional and behavioral status (e.g. extreme debilitation, delirium), that has yet to find a consensus. The syndrome has been defined for administrative, research and clinical purposes by as simple a criterion as the placement of tracheostomy for failure to wean (Nelson et al. 2006; Estenssoro et al. 2006). Others have identified the patient group based only on extended ICU stays (Daly et al. 1991) or prolonged mechanical ventilation after acute illness (MacIntyre, 2005).

Although there is not one accepted definition of the chronically critically ill, the recent literature identifies a number of common factors centered on what is "critical" and what is "chronic." Critically ill patients are those who have life-threatening conditions. For example, Thomas et al. (2002) states that "critical illness or injury has been defined as a medical condition that impairs one or more vital organ system, jeopardizing the patient's survival," and adds that those patients with critical illness are usually managed in the ICU. The Medicare program defines critical care for purposes of physician billing as an "illness or injury (that) acutely impairs one or more vital organ systems such that there is a high probability of imminent or life threatening deterioration in the patient's condition," going on to state that "critical care is usually, but not always, given in a critical care area such as a coronary care unit, intensive care unit, respiratory care unit, or the emergency department."[2] Donahoe (2012) notes that the chronically critically ill are a small but substantial population of critically ill patients who survive critical illness, only to suffer prolonged dependence on life support or need for long-term therapeutic interventions.

Wiencek and Winkleman (2010) define critical illness from the nursing perspective, as "a life-threatening condition that requires constant monitoring and comprehensive care," and identify chronic critical illness as that progressing from an acute status into chronicity while in the intensive care unit (ICU). Daly and Douglas (2009) also define CCI patients stressing both the life-threatening nature of their illnesses and the stay in the ICU, describing them as ICU patients who initially survive a period of life-threatening illness but who remain dependent upon the high tech services of the critical care unit. Carson (2005) uses a similar definition of CCI patients: "patients who remain dependent upon life support systems or other ICU services for prolonged periods are often referred to as the chronically critically ill." Other literature ties the definition of a CCI patient to ICU-level care (Nelson et al. 2010, Douglas et al. 2007, Nierman 2002, Carson and Bach 2002, and Nasraway et al. 2000). In fact, we have identified no instances in the literature where the definition of chronic critical illness was not in some way associated with a stay in the ICU.

The chronic component of CCI refers to the length of time that the patient experiences critical illness rather than the presence of chronic illness (although the latter are often identified as risk factors for progressing from critically ill to chronically critically ill) (Rudy et al. 1995, Wiencek and Winkleman, 2010). While the literature indicates that a chronically critically ill patient is one with a "prolonged," "extended" or "long-term" critical illness, there is little consensus over how much time – specifically how many days in critical care settings – constitute a good marker for identifying chronic critical illness. Carson and Bach (2002) state that the CCI

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2 Medicare Claims Processing Manual, Chapter 12 - Physicians/Nonphysician Practitioners. Critical care Services (CODES 99291-99292): A. Use of Critical care Codes.

"are loosely defined as patients who require continued care in an ICU setting for weeks to months." Nierman (2002) states that the CCI are those patients admitted to an ICU who usually require "weeks of critical care." Kahn et al. (2013) notes that admission to an ICU for at least 14 days identifies a subset of ICU patients with high costs and poor outcomes. The definition of the length of time in the ICU that is considered "extended" or "chronic" also varies in the literature. There is no precise point at which a critical illness becomes chronic.

Clinical conditions of the CCI/MC. A number of clinical conditions associated with the CCI/MC have been identified in the literature. These included tracheostomy patients and patients who required prolonged mechanical ventilation, patients with multiple organ failure, patients with sepsis or other severe infections, and patients with wounds.

Tracheostomy/Prolonged Mechanical Ventilation. While most of the research on CCI patients has focused on patients who need prolonged mechanical ventilation (PMV) as a marker for CCI, published studies defined "prolonged" as anywhere from 24 hours to 29 days of mechanical ventilation (MacIntyre et al. 2005). Carson and Bach (2002) indicate that by 21 days, most easily reversible conditions have been addressed, and continued requirement for mechanical ventilation usually signals a more persistent chronic condition. Kahn et al. (2009) state that 14 days of PMV is "close to the threshold prompting decisions to perform a tracheotomy to facilitate PMV." In May 2004, the National Association for Medical Direction of Respiratory Care (NAMDRC) sponsored a 2-day conference to establish a recommendation of a uniform operational definition of PMV. The NAMDRC recommended that PMV should be defined as the need for 21 or more consecutive days of mechanical ventilation for 6 or more hours per day (MacIntyre et al. 2005). Donahoe (2012) states that using 21 or more days of PMV as a definition specifically characterizes patients who are outliers in resource consumption and at risk for potentially ineffective hospital care. MacIntyre observes that the majority of patients who are transferred to the LTCH setting receiving mechanical ventilation had received ventilation for at least 21 days. Weincek and Winkelman (2010) comment that the 21 day-definition of PMV is often used as an indicator of chronic critical illness, but also note the following:

The need for mechanical ventilation is the universal feature of CCI. However, the length and timing of ventilator support vary between those patients who are weaned relatively quickly but still experience the pathophysiologic alterations and repeated complications of the syndrome and those patients who are never weaned from the ventilator and likely to either die in the ICU or be transferred to weaning or long-term care facilities. Likewise, the timing of mechanical ventilation is variable. Most chronically critically ill patients receive mechanical ventilation at the onset of the acute life-threatening event, whereas others require this support later as the outcome of a progressively deteriorating ICU course. Failure to wean from mechanical ventilation within 48 to 72 hours reflects severity of illness and underlying pathology and predicts higher mortality and need for institutionalization at ICU discharge.

The authors conclude that because many patients show the physiologic changes characteristic of CCI within one or two weeks of ventilator support, a screening definition of CCI for purposes of care management should be set as early as 72 to 96 hours.

The placement of an elective tracheostomy for continued mechanical ventilation is also used as a proxy indicator of CCI. Nierman (2002) indicates that no physician would want to perform a tracheostomy in patients who would have been successfully intubated in the near future. Carson and Bach (2002) indicate that tracheostomy placement is a rational choice when clinicians anticipate a patient's need for prolonged ventilation support. Nierman and Mechanick (1998) state that the performance of a tracheostomy was a clear indication that mechanical ventilation patients have passed from an acute illness to a more chronic state and thus can be used as an indicator of CCI patients. They defined a CCI patient as any ventilator-dependent ICU patient who had an elective tracheotomy performed specifically for failure to wean. Nelson et al. (2010) also arrive at a conclusion that tracheostomy placement is a good proxy for physician judgment that the patient is not expected to die, but is also not expected to be weaned from the ventilator in the immediate future.

Defining CCI patients by tracheostomy placement has the advantage of allowing claims-based studies to identify this population using MS-DRGs (MS-DRG 003 (tracheostomy with MV 96+ hours with major operating room procedure) and MS-DRG 004 (tracheostomy with MV 96+hours without a major operating room procedure).[3] This definition may include some patients who require less than a week of ventilation since tracheotomies are now being done earlier in the course of critical illness (Carson 2006). It may also exclude some patients who require weeks of mechanical ventilation where a tracheostomy is not placed because the team is still expecting the patient to wean soon, or because the patient is not expected to live.

Identifying CCI among non-ventilator patients. Carson and Bach (2002) note that it is much more difficult to identify the CCI among non-ventilator patients. They state that factors such as monitoring of homeostasis and continuous hemofiltration can require ICU care for long periods of time and they conclude that focusing on ICU length of stay is a more inclusive way to identify CCI patients than ventilator days, although the precise number of ICU days when one becomes a CCI patient is variable in the literature. The CCI literature discusses how lengthy stays in the ICU lead to pathophysiologic changes which can cause a need for PMV. As Kahn et al. (2009) note, multiple factors contribute to the need for PMV, including underlying disease, neuro-endocrine changes of critical illness, and ICU-neuromuscular disease.

Multiple Organ Failure (MOF). Many CCI patients reach a level of persistent organ failure or dysfunction including respiratory failure coupled with renal insufficiency, liver failure, or heart failure. Such multiple system failures can lead to a dependent state and many additional complications. Carson and Bach (2002) state those patients with acute failure of a single or multiple organ systems with prolonged recovery should be considered as CCI patients. Nelson, et al. (2004) state that dysfunction of multiple other organ systems is a characteristic of CCI. Van den Berghe (2002) indicates that critical illness is any condition requiring support of failing vital organ systems—and if the onset of recovery does not follow within a few days of intensive care, critical illness can become prolonged and organ system support can be needed for several weeks. The systems include respiratory, cardiovascular, renal, hepatic, gastrointestinal,

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[3] Patients with tracheostomies placed to maintain airways subsequent to trauma or specific procedures on the head or neck are grouped to MS-DRGs 011, 012 or 013 (Tracheostomies for face, mouth & neck diagnoses), and are generally excluded from CCI discussions.

hematological, endocrine, and central nervous systems (Mechanick and Brett 2002, Van den Berghe 2002). Most chronically critically ill patients plateau at a level of persistent organ dysfunction (such as renal insufficiency or failure, ventilator dependence, or reduced consciousness) leading to a dependent state with multiple complications (Wiencek and Winkelman 2010). Multiple organ dysfunctions occur after shock and may result in systemic inflammation (Johnson and Mayers 2001).

Sepsis and other severe infections. Several CCI-associated conditions are discussed in the literature that have ICD-9 diagnosis codes that are identifiable in claims, and if used in combination with evidence of longer ICU stays, can help to identify the CCI patient in administrative data files. The most important of these are related to sepsis and to vital organ failures. There are also less commonly coded conditions that are associated with, or acquired as a result of, extended critical care. Nierman and Nelson (2002) indicate that CCI is often initiated by an episode of sepsis and accompanied by dysfunction of various organ systems. Sepsis or sepsis-like physiology (in the absence of a specific identified pathogen) is a serious medical condition that can be characterized by a whole-body inflammatory state called a systemic inflammatory response syndrome (SIRS). SIRS is a result of complex host responses to infection (Levy et al. 2003). Advanced cases of sepsis may induce or include the presence of multi-organ failure, which is a defining feature of severe sepsis (Singer et al. 2004, Levi et al. 2008), and induce a high risk for critical illness neuromuscular syndromes (De Jonghe et al. 2008). Infections and sepsis often result after being hospitalized for another comorbidity or condition. *Sepsis and other infections may be both a factor of and a consequence from being CCI.* Estenssoro et al. (2006) states that repeated episodes of sepsis are the hallmark of the CCI. Critically ill patients with sepsis have been found to exhibit higher severity of illness scores than those without sepsis and developed more derangements in metabolic and hematologic measures than healthy patients (Jeng et al. 2009).

Severe sepsis patients commonly require inotropic support, need mechanical ventilation, and receive renal therapy (Ball and Baudouin 2010). Severe sepsis can also be the cause of prolonged respiratory failure. According to one study of ICU CCI patients, 12 percent of patients had either sepsis or multiple organ dysfunctions (Nelson et al. 2004). During sepsis and other infections that plague those with chronic critical illness, the body undergoes a state of stress resulting in hypermetabolism with increased energy expenditure producing hyperglycemia and muscle loss (Levy 2007).

Additionally, infectious complications take their toll on the CCI. The CCI have an enhanced susceptibility to infection as a result of a potent mixture of barrier breakdown, exposure to virulent and resistant nosocomial pathogens, and postulated "immune exhaustion" that stems from the combined impact of comorbidities and the sequellae of critical illness (Kalb and Lorin 2002). Also, in the intensive care unit (ICU), most (>85%) pneumonias are associated with mechanical ventilation, and are generally ventilator associated pneumonias (Ahmed and Niedermen 2001). Many of these patients that require mechanical ventilation also require tracheostomy and are CCI, and many of these patients develop pneumonia or other respiratory infections. Catheter-related infections, primary bacteremias, and urinary tract infections are also found to be common complications of the CCI/MC (Estenssoro 2006)

Chronic Critical Illness Syndrome and other CCIS conditions. In addition to the conditions cited above, some researchers have attempted to identify something they term a Chronic Critical Illness Syndrome. Due to long periods in the ICU, a patient experiences neuroendocrine changes that are sometimes referred to as *Chronic Critical Illness Syndrome (CCIS)*. Nierman and Mechanick (1998) discussed this over a decade ago, and more recent literature about CCIS includes Mechanick and Brett (2005), Hollander and Mechanick (2006), Wiencek and Winkelman (2010), and Nelson et al. (2010). Nelson and colleagues summarize the defining clinical attributes of CCIS as follows:

Besides prolonged ventilator dependence, evidence suggests that chronic critical illness is a syndrome comprising additional characteristic features. These include profound weakness attributed to myopathy, neuropathy, and alterations of body composition including loss of lean body mass, increased adiposity, and anasarca; distinctive neuroendocrine changes including loss of pulsatile secretion of anterior pituitary hormones, contributing to low target organ hormone levels and impaired anabolism; increased vulnerability to infection, often with multiresistant microbial organism; brain dysfunction manifesting as coma or delirium that is protracted or permanent; and skin breakdown associated with nutritional deficiencies, edema, incontinence, and prolonged immobility. This constellation of factors serves as framework for the clinical definition of chronic critical illness.

Nelson et al. (2010) and other researchers also have found that other diagnoses associated with CCIS and extended critical care stays include critical care myopathy and polyneuropathy; encephalopathy, disseminated intravascular coagulation (DIC), and nutritional deficiency and weight loss.

Wounds. Chronically critically ill (CCI) patients are almost universally at high risk for developing pressure ulcers (Brem 2002). With such strong predispositions, CCI patients may develop pressure ulcers despite preventive care and continuous monitoring. Although there has not been a strong focus on wounds in the CCI/MC literature, wound care patients can have long recoveries and often require a high level of resources.

1.3 Development of a Set of Criteria to Evaluate the Success of the Definitions

In order to formulate payment recommendations for the CCI/MC, we worked with CMS to establish four criteria to evaluate a definition of the CCI/MC that could be implemented in Medicare payment policy changes. The four criteria are:

- **Clinical coherence** — a definition of the CCI/MC population must be based on a population that can be identified using clinical factors such as diagnoses, procedures, or MS-DRGs;

- **Identification of a high-resource use population** — the definition should include patients with a high likelihood of significant resource use, as evidenced by an expectation of extremely long lengths of hospital level stay or high Medicare payments/costs;

- **Identification of systematic payment problems** — the long-staying, clinically-coherent population with expected high resource use should be associated with systematic Medicare payment concerns. These concerns include but are not limited to Medicare payments that are systematically above or below cost. The systematic payment concerns also include populations that have payment inconsistencies that are inappropriate in different settings or across an episode of care, such as different Medicare payments for similar patients by setting.

- **Operationalizability** — CMS must be able to implement any definition in its payment systems.

1.4 Process of Developing the CCI/MC Definition

After reviewing the literature on the CCI/MC and developing the criteria, we conducted seven tasks to develop a final definition of the CCI/MC population:

1. We first developed two initial definitions of the CCI/MC population that would incorporate a range of possible definitions of this population.
2. Clinical consultants then reviewed the preliminary definitions and suggested refinements to eliminate patients with expected low resource use and to add conditions that were expected to require long hospital stays and use high levels of resources. After the review by the clinical consultants, we revised the two initial definitions to incorporate their suggestions.
3. We then used Medicare claims data to analyze resource use, such as length of stay and Medicare payments for the two revised preliminary definitions. We created an episode file which grouped patients into episodes of care so that we could analyze both Medicare acute care and post-acute care.
4. We analyzed Medicare payments and margins for the CCI/MC patients under each of the revised preliminary definitions to determine if there were Medicare payment problems. We used the episode file so that we could analyze both ACH and LTCH margins for patients.
5. Because Medicare claims data only capture diagnosis and procedure codes, we evaluated whether CARE[4] assessment data, which have additional information on patient conditions and services, could make a significant contribution to the identification of the CCI/MC (CARE assessments are discussed in 1.4.5 below).

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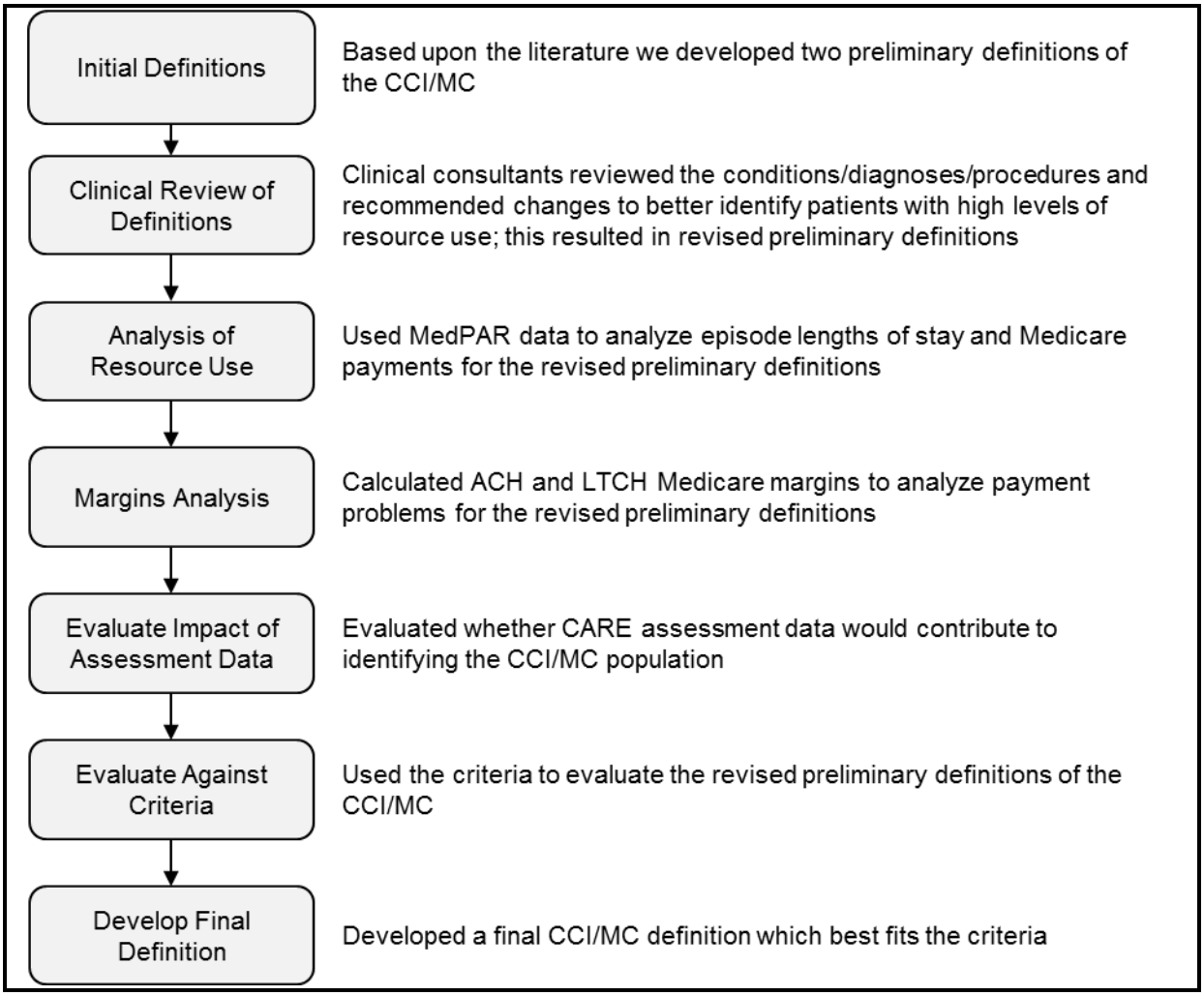
[4] The Continuity Assessment Record and Evaluation (CARE) tool is a patient assessment instrument developed under a contract for CMS. Under the Post Acute Care Payment Reform Demonstration, CARE information was collected at discharge from ACH hospitals and at admission and discharge from LTCHs, SNFs, IRFs, and HHAs. Additional CARE tool information was collected in medical and step down units of ACHs with a large number of long staying patients. Additional information on the CARE tool and its collection can be found at ***http://cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Post-Acute-Care-Quality-Initiatives/CARE-Item-Set-and-B-CARE.html*** and http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/Research-Reports-Items/PAC_Payment_Reform_Demo_Final.html

6. We then evaluated the revised preliminary definitions using the criteria to ascertain whether one or both of the definitions met the criteria.
7. We then developed a final definition of the CCI/MC population that we thought would best meet the criteria.

Steps 1-7 are shown in ***Figure 1-1***. Each of the steps is discussed in detail below.

Figure 1-1
Steps used to develop the CCI/MC definition



NOTE: CCI/MC, chronically critically ill or medically complex; MedPAR, Medicare Provider Analysis and Review data; ACH, acute care hospital; LTCH, long-term care hospital.

1.4.1 Develop Two Initial Definitions of the CCI/MC

Based on findings from the literature review, we developed two initial definitions for the CCI/MC population. These two definitions focused on the presence of clinical conditions and the number of critical care days that were likely to lead to extended hospital stays. We were particularly interested in identifying patients with certain conditions that regularly have long

lengths of stay or that have high Medicare payments. We also thought that these high-resource use populations might have systematic Medicare payment problems. The goal of these definitions was to develop initial definitions that would represent a range of populations that the clinical consultants could review and that we could analyze in greater depth.

The CCI literature identifies a number of clinical conditions associated with the CCI and discusses a range of critical care days that is associated with the CCI. Despite the extensive literature on the CCI, there is no universally accepted definition of the CCI or of the number of critical care days that should be used to define the CCI. As a result, the two initial definitions were an attempt to capture a *range* of likely definitions of the CCI/MC. The literature identifies five clinical conditions associated with CCI/MC patients: 1) a tracheostomy; 2) prolonged mechanical ventilation (PMV); 3) multiple organ failure (MOF); 4) sepsis or other severe infections; or 5) complex wounds. We also developed a sixth category, called a "constellation of debilitating factors" or COF. This group of patients includes several different clinical characteristics of the CCI/MC that are not easily grouped within one of the other major categories. This group has multiple comorbidities and includes patients that have a range of different combinations of conditions including single organ failure, malnutrition, and patients who are comatose. It also includes patients who are receiving multiple intravenous (IV) antibiotics, dialysis, or who have a trach tube. In the initial definition, patients met the COF criteria if they had at least two of five COF clinical factors (the five COF clinical factors were: 1) multiple IV antibiotics; 2) malnutrition, total parenteral nutrition (TPN), or percutaneous endoscopic gastrostomy (PEG); 3) restricted mobility/comatose; 4) trach tube; and 5) single organ failure/lymphoma/leukemia/dialysis).

We then developed two initial definitions of the CCI/MC. They each had the same clinical characteristic requirements, but they differed by the required number of critical care days. The first initial definition, which we called the ***"restrictive definition"***[5] was based on findings from the CCI literature review and included a requirement that patients had to have one of the clinical conditions ***and*** eight or more ICU/CCU days, except for tracheostomy patients who required four or more ICU/CCU days. We originally considered a requirement of 14 or more ICU/CCU days which is used often in the CCI literature, but our preliminary analyses found that 14 days was too stringent and identified too few patients with high resource use.

The second preliminary definition, known as the ***"inclusive definition,"*** used the same clinical conditions as the "restrictive" definition, but it was broader because it required fewer days of critical care (a range of three to eight days, depending on the condition). To identify the critical care day requirement for each condition under the inclusive definition, we determined whether there were systematic Medicare payment problems for different numbers of critical care days. Specifically, we analyzed ACH margins to determine the difference in margins by clinical condition at various ICU/CCU day cut-points. For trach patients, we found that the ACH margins were slightly positive and found very little difference in margins when the critical care day criteria were changed to less than four days. Therefore, we used the four or more critical care day criteria for trach patients in the inclusive definition. We found that PMV patients with

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5 The use of the terms "restrictive" and "inclusive" are used solely for identification purposes are not intended to imply a value judgment for either definition.

eight or more critical care days had more negative margins than those with less than eight critical care days. As a result, we required eight or more critical care days for PMV patients in the initial inclusive definition. We found distinct critical care day cut-points where the ACH margins became more negative before reaching eight critical care days for the other four clinical conditions. For MOF and sepsis, we found that the margins became increasingly negative beginning at five or more critical care days. For wounds and COF patients, the margins became increasingly negative beginning at three or more critical care days. As a result, under the initial inclusive definition, we required five or more critical care days for MOF and sepsis patients and three or more critical care days for wounds and COF patients.

These two initial definitions included both claims data variables and CARE assessment tool variables. The CARE tool is a standardized assessment tool that was collected as part of the CMS Post-Acute Care-Payment Reform Demonstration (PAC-PRD) designed to measure differences in patient severity associated with resource needs and outcomes for patients in acute and PAC settings. It is used to measure patient severity in the acute hospital and post-acute care settings. The ability of the CARE tool data to identify the CCI/MC was later tested and discussed in detail in 1.4.5 below.

1.4.2 Review of the Initial Definitions by Clinical Consultants

We asked several clinicians to review the initial definitions and to determine whether they thought that the initial definitions would identify patients with extended stays and high resource use. The clinicians represented several different specialty fields including pulmonology and wound care management. In general, the clinical consultants thought that the initial definitions provided an appropriate range of clinical conditions that should be used to define the CCI/MC. The clinicians verified that the initial definitions identified a group of patients that were clinically homogenous and that they would identify a group of patients who were likely to have extended stays and use a high level of resources. However, the clinicians also provided specific feedback on the initial definitions and recommended modifications, such as specific changes to the diagnosis and procedure codes used in the definitions. For example, the clinical consultants suggested that:

- stroke and traumatic brain injury (TBI) be added as organ failures in the multiple organ failure category;
- lymphoma and leukemia be added as an additional organ failure group;
- chronic kidney disease and any kidney disease below stage IV be excluded;
- early-stage pressure ulcers be excluded.

After the review by the clinical consultants we revised the two initial definitions to incorporate their comments. The revised preliminary definitions of the CCI/MC are shown in ***Table 1-1***.

Table 1-1
Revised preliminary definitions of the CCI/MC

Clinical factor (one or more of the following:)	Description of Definition Components	Required # of critical care (CC) days	
		Restrictive CCI/MC	Inclusive CCI/MC
PMV	MS-DRGs with 96+ hrs. of mechanical ventilation, or procedure code 96.72	8+	8+
Tracheostomy	MS-DRG 003 or 004, or other trach MS-DRGs or procedure codes with mechanical ventilation procedure codes 96.70, 96.71, or 96.72	4+	4+
Multiple Organ Failure	Two or more of the following organ failures: • renal, • heart, • respiratory, • liver, • kidney, or • stroke / intercerebral hemorrhage / TBI	8+	5+
Sepsis and Other Severe Infections	• Sepsis (severe sepsis, septic shock, septicemia), • Infections, or other CCI Syndrome (metabolic encephalopathy, neuropathies)	8+	5+
Wounds	• Complex wound or pressure ulcer procedure code and MS-DRGs, or complex wound management variables (CARE)	8+	3+
Constellation of Debilitating Factors	• Two or more of the following factors: • multiple IV antibiotics (CARE) • single organ failure/ hemodialysis/lymphoma or leukemia • comatose or restricted mobility (CARE) • TPN (CARE), malnutrition, or PEG • trach tube (CARE)	8+	3+

NOTE: To be considered CCI/MC a patient must meet both the critical care day requirement and the clinical condition requirement. CCI/MC, chronically critically ill or medically complex; MS-DRGs, Medicare seventy diagnosis-related groups; TBI, traumatic brain injury; CARE, Continuity Assessment Record and Evaluation item set; TPN, total parenteral nutrition; PEG, percutaneous endoscopic gastrostomy; trach tube, tracheostomy or endotracheal tube.

1.4.3 Analyze Resource Use

To confirm whether the revised preliminary definitions shown in Table 1-1 would identify long-staying patients and patients with high Medicare payments, we used an episode-based dataset developed by RTI based on 2009 MedPAR claims data for both the "index" ACH stays and subsequent inpatient stays. The "index" admission for each episode was defined as the first acute care hospitalization that was preceded by at least 60 days with no evidence of any inpatient stay. Starting with the discharge date for the index claim, we looked forward 60 days for a subsequent inpatient admission and included that claim in the episode. Then we looked forward again, up to 60 days after the last discharge date, to find any other inpatient admissions. The episode continued until the patient died or spent at least 60 days outside of an inpatient setting. We limited episodes in this analysis to those where the index admission was an acute care hospital (ACH) or a critical access hospital (CAH) claim discharged in FY 2009. We used claims information for all subsequent inpatient stays including other ACHs, critical access hospitals (CAHs), long-term care hospitals (LTCHs), inpatient rehabilitation facilities (IRFs), inpatient psychiatric facilities (IPFs), and skilled nursing facilities (SNFs). Although IRF, IPF, and SNF claims were included in the episode definition, the inpatient days and margins measures that we calculated used only the information from the index ACH and LTCH transfer claims. We used the information in the index ACH claim to determine whether or not that patient met one of the two CCI/MC definitions.

Within this file, 2.6 percent of Medicare index admissions in FY 2009 met the "restrictive" CCI/MC definition and 4.7 percent of index admissions met the "inclusive" CCI/MC definition (see ***Table 1-2***). Not surprisingly, the inclusive definition captured a broader population compared to the restrictive definition.

Table 1-2
Percentage of acute hospital index admissions meeting the revised preliminary CCI/MC criteria, 2009

CCI/MC definition	Number	Percent
Restrictive CCI/MC	215,213	2.6
Inclusive CCI/MC	383,271	4.7
Non CCI/MC (neither restrictive nor inclusive)	7,768,840	95.3
Total national ACH index admissions	8,152,111	100

NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care hospital.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode file.

We identified the number of index admissions for each of the six clinical condition types under the restrictive and inclusive definitions. We found that the inclusive definition identifies almost twice the number of MOF, COF, and sepsis admissions as the restrictive definition and more than twice the number of wounds admissions (see ***Table 1-3***). We identified the same number of trach and PMV admissions under the restrictive and inclusive definitions because the

definitions are identical. In total, the inclusive CCI/MC definition identified 78 percent more index admissions than the restrictive CCI/MC definition in 2009.

One measure of resource use is the length of stay for all hospital-level services. (We defined an episode facility-based inpatient length of stay as the number of covered days in the episode (including ACH, LTCH and CAH during the defined episode). Index admissions under the restrictive definition had much longer median episode lengths of stay than those patients added under the inclusive definition (see ***Table 1-3*** and ***Figure 1-2***). Patients in the tracheostomy and PMV groups had 64 and 33 median episode days respectively (there is no difference in the restrictive and inclusive definition for tracheostomy and PMV patients). The median number of episode days for the restrictive definition for the other clinical conditions ranged from 25 to 40 days, while the median number of days in stays added under the inclusive definition ranged from 11 to 18 days. Although the restrictive definition identifies admissions with much longer stays than those added under the inclusive definition, both CCI/MC definitions identify a more resource intensive group than those that do not meet either definition. For example, the mean number of episode days for non-CCI/MC patients in 2009 was approximately 7 days. Thus, both CCI/MC definitions identify populations which have much longer stays than average.

We also looked at the distribution of episode days among the CCI/MC and the non-CCI/MC and found that episode stays were longer for restrictive CCI/MC patients than for inclusive CCI/MC patients, and were considerably longer in both groups than in the group of non-CCI/MC patients. About 23 percent of the restrictive CCI/MC episodes and 16 percent of inclusive CCI/MC episodes had stays of 40 days or longer, compared to only 2 percent of all non-CCI/MC episodes (see ***Table 1-4***). We also found that about 10 percent of the restrictive CCI/MC population and 53 percent of the CCI/MC population added under the inclusive definition had stays less than 10 days. In contrast, almost 80 percent of non-CCI/MC episode stays were less than 10 days. However, the number of relatively short stays in the inclusive CCI/MC population is high. For example, only 11 percent of all episodes added under the inclusive CCI/MC population had hospital stays of 30 days or longer (see ***Figure 1-3***). These findings suggest that the inclusive CCI/MC definitions may not be accurately targeting the high-resource use population.

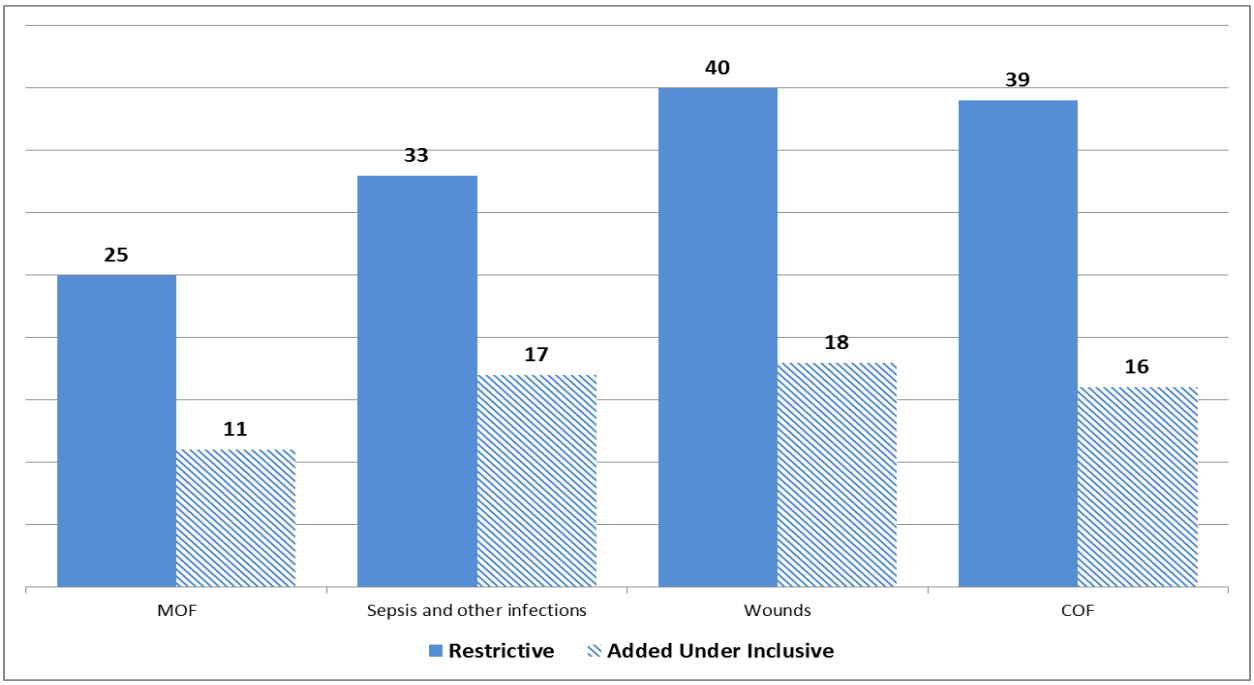
Table 1-3
Number of index admissions, median episode days, and edian Medicare ACH + LTCH payments for the restrictive CCI/MC, inclusive CCI/MC, and admissions added under the inclusive definition, by clinical condition

CCI/MC clinical condition	Number of index admissions			Median episode days			Median ACH + LTCH payment		
	Restrictive	Added under inclusive	Inclusive	Restrictive	Added under inclusive	Inclusive	Restrictive	Added under inclusive	Inclusive
Tracheostomy	32,859	0	32,859	64	0	64	$110,283	$0	$110,283
PMV	67,934	0	67,934	33	0	33	$44,635	$0	$44,635
MOF	118,981	92,134	211,115	25	11	18	$24,455	$10,142	$13,758
Sepsis	101,641	65,603	167,244	33	17	27	$29,886	$11,298	$17,649
Wounds	17,323	23,161	40,484	40	18	28	$29,970	$11,954	$16,342
COF	33,728	20,781	54,509	39	16	30	$36,330	$12,936	$27,042
Total	215,213	168,058	383,271	29	13	22	$27,182	$10,592	$15,048

NOTE: The total is not equal to the sum of each of the clinical conditions because a patient may qualify under more than one condition. CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation; MOF, multiple organ failure; COF, constellation of debilitating factors.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) Episode File

Figure 1-2
Median number of episode days for the restrictive CCI/MC definition and for episodes added under the inclusive definition, by clinical condition



NOTE: Tracheostomy and PMV clinical conditions are not shown because the restrictive and inclusive definitions are identical. MOF, multiple organ failure; COF, constellation of debilitating factors.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode file.

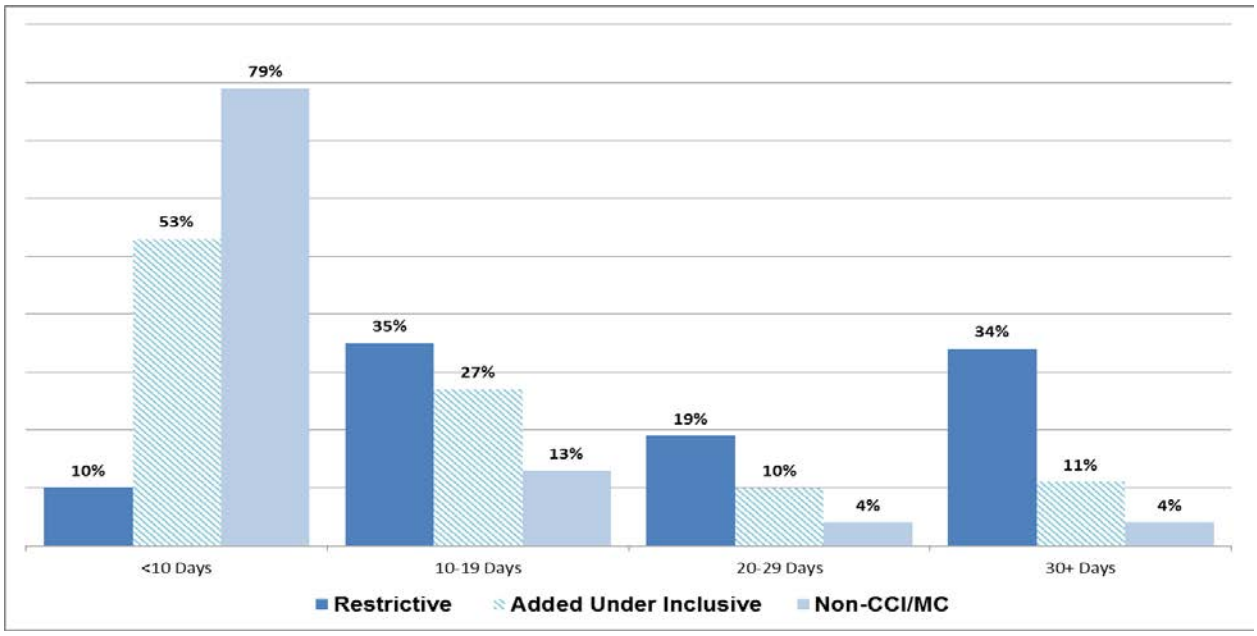
Table 1-4
Distribution of Episode Days for the Restrictive and Inclusive CCI/MC Populations

Episode days	Restrictive CCI/MC	Inclusive CCI/MC	Not CCI/MC
<10	10%	29%	79%
10-19	35%	31%	13%
20-29	19%	15%	4%
30-39	11%	8%	2%
40+	23%	16%	2%
Total	100%	100%	100%
N=	215,213	383,271	7,768,840

NOTE: CCI/MC, chronically critically ill or medically complex; N, number of discharges.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode file.

Figure 1-3
Distribution of inpatient lengths of stay, by CCI/MC status
(percentage distribution of episode days for each group)



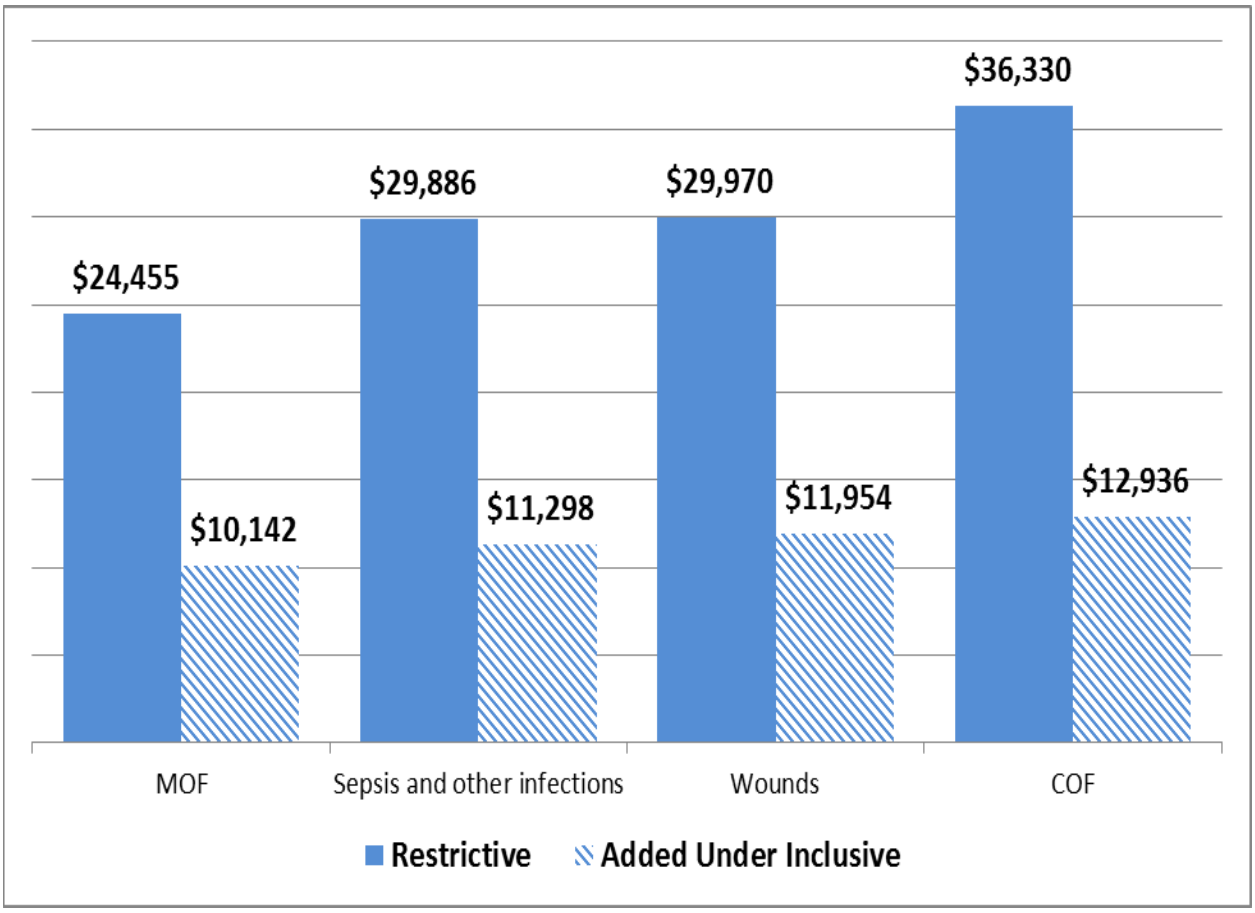
NOTE: CCI/MC, chronically critically ill or medically complex.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

A second measure of resource use is the median Medicare payment for ACH and LTCH care during an episode of care. Excluding tracheostomy and PMV discharges where the definitions are identical, the median Medicare payments exceeded $24,000 for each clinical condition group under the restrictive definition but were less than $13,000 for each condition added under the inclusive definition (see ***Figure 1-4***). We found that the median ACH plus LTCH payments for restrictive CCI/MC admissions that met the sepsis and other infections, COF, wounds, and MOF conditions were 140-180 percent higher than those added under the inclusive definition. Both of these definitions identify index admissions with higher episode payments than the non-CCI/MC (mean episode payment of $7,991 in 2009).

We also found that the episode length of stay and Medicare payment data supported the recommendations made by the clinical reviewers, with the exception that the lymphoma and leukemia patients did not have long median lengths of stay. As a result, we did not add them as a stand-alone organ failure within the multiple organ failure condition, but instead, we added leukemia and lymphoma within the constellation of debilitating factors as a potential single organ failure. The analysis also confirmed that traumatic brain injury (TBI) and stroke patients should be included within the multiple organ failure group given their high resource use.

Figure 1-4
Median Medicare ACH + LTCH payments for the restrictive CCI/MC and for episodes added under the inclusive definition, by clinical condition



NOTE: Tracheostomy and PMV clinical conditions are not shown because the restrictive and inclusive definitions are identical. CCI/MC, chronically critically ill or medically complex; MOF, multiple organ failure; COF, constellation of debilitating factors.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

In summary, these analyses indicate that there are differences in resource utilization among the two initial CCI/MC definitions and that the restrictive CCI/MC definition identifies patients with substantially greater resource use than those patients identified under the inclusive definition. Specifically, we found that the restrictive CCI/MC had much longer median episode lengths of stay and much higher Medicare ACH plus LTCH payments than those added under the inclusive CCI/MC definition.

Long-staying patients who are not CCI/MC. One of the criteria used to judge the CCI/MC population is whether the definitions capture populations that are high-resource users. One concern is whether the clinical conditions or the ICU requirements in the definitions exclude a large number of patients with long stays or high Medicare payments. Length of stay is often a proxy measure for resource use (although without knowing the mix of routine or critical care

days, it is not a very good proxy for patient acuity). In terms of determining how well the two preliminary definitions identified patients with high-resource use, we analyzed the number and characteristics of patients with very long episode stays that did ***not*** meet the CCI/MC criteria. We found that 75 percent of all 381,087 MedPAR episodes with 30 ACH days or more in 2009 were for patients that did ***not*** meet the CCI/MC criteria (see ***Figure 1-5***). ***Table 1-5*** presents data on the 20 MS-DRGs with the highest number of index admissions in this group. We found that:

- Many of the other long-staying non-CCI/MC admissions had conditions associated with CCI/MC, but few days of critical care during their index admission. For example, five of the top 20 MS-DRGs for the non-CCI with 30 ACH days or more are also in the top 20 MS-DRGs for the CCI/MC population (MS-DRGs 871, 291, 190, 193, and 64).[6] The patients with 30 days or more of hospitalization shown in Table 1-5 did not qualify as CCI/MC because they did not use critical care or used only a few days.

- Many of the non-CCI/MC patients with long episode stays were assigned to very common MS-DRGs in the index admission with relatively short ACH DRG mean lengths of stay. For example, six of the 20 most common MS-DRGs for the non-CCI/MC population with long episode stays are the six most common MS-DRGs among all Medicare inpatient stays (DRGs 470, 392, 885, 871, 194, and 690).[7] Within any MS-DRG, there can be a wide distribution of length of stay. The patients in these MS-DRGs with long-stays may simply be long stayers who are part of the "right tail" of the length of stay distribution. Also, many of them may have longer episode stays due to subsequent admissions, but there is no evidence that they are *critically* ill.

- The most common long-stay "non-CCI/MC" MS-DRG is for psychoses (MS-DRG 885). This MS-DRG accounts for 7.4 percent of all non-CCI/MC admissions with 30 or more episode days; these patients infrequently use critical care days (we found an average of 0.7 per episode), so while they may have long stays, they are not critically ill.

- Of the 20 most common MS-DRGs in this groups, only three (065, 064, and 329) had an average of two or more critical care days.

- Based upon this analysis, we revised the CCI/MC wounds category to include MS-DRG 329 as one of the wound MS-DRGs.

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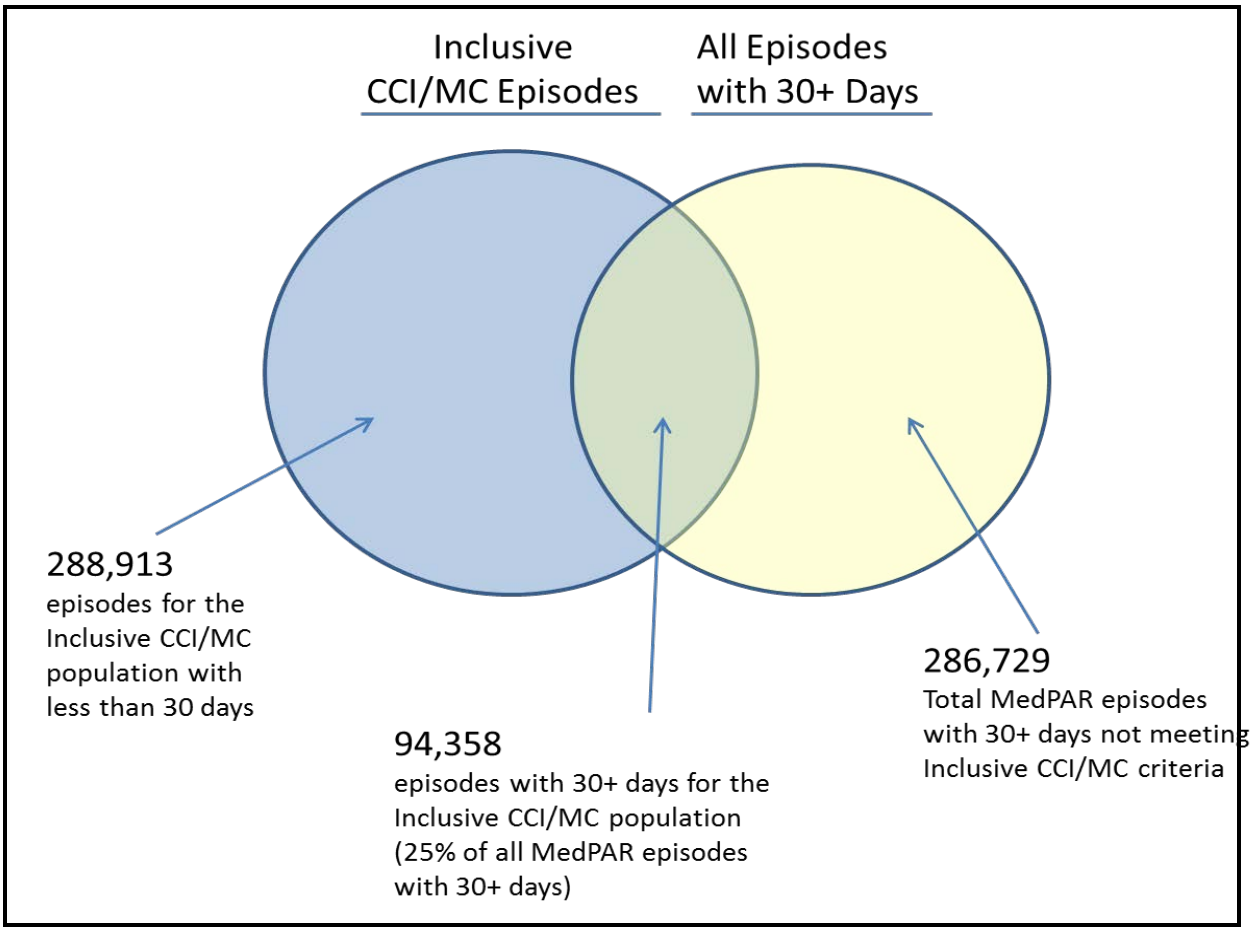
6 DRG 871: Septicemia w/o MV+96 hrs. w/MCC; DRG 291: Heart failure and shock w/MCC; DRG 190: Chronic obstructive pulmonary disease w/MCC; DRG 193: Simple pneumonia & pleurisy w/MCC; DRG 64: Intracranial hemorrhage or cerebral infraction w/MCC.

7 DRG 470: Major joint replacement or reattachment of lower extremity w/o MCC; DRG 392: Esophagitis, gastroent & misc digestive disorders w/o MCC; DRG 885: Psychoses; DRG 871: Septicemia w/o MV+96 hours w/MCC; DRG 194: simple pneumonia & pleurisy w/CC ; DRG 690: kidney and urinary tract infections w/o MCC.

Figure 1-5
Overlap of Episodes for the Inclusive CCI/MC Population with all MedPAR Inpatient Episodes Over 30 Days



NOTE: CCI/MC, chronically critically ill or medically complex; MedPAR, Medicare Provider Analysis and Review data.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

In summary, many of the non-CCI/MC with long stays had conditions that are associated with the CCI/MC but did not need critical care. However, most of the non-CCI/MC patients with long episode stays were patients with conditions that were not associated with the CCI/MC. They were simply long-stayers in MS-DRGs, not patients in need of extended critical care.

Table 1-5
Characteristics of episodes of 30 or more days that do not meet the inclusive CCI/MC criteria

Rank	MS-DRG and description	Total number of non-CCI episodes with 30+ days	Average number of CCU days per episode for non-CCI with 30+ days	Percent of episodes within MS-DRG with 10+ days
2	Common ACH MS-DRGs Among the CCI/MC 871: Septicemia w/o MV 96 + hours w MCC	6,199	0.9	37
4	291: Heart failure & shock w MCC	5,753	1.4	30
6	190: Chronic obstructive pulmonary disease w MCC	4,632	1.1	25
10	193: Simple pneumonia & pleurisy w MCC	3,695	1.5	28
14	064: Intracranial hemorrhage or cerebral infarction w MCC	3,495	3.1	34
1	Common ACH MS-DRGs Among Medicare Admissions 885: Psychoses	21,375	0.7	47
7	194: Simple pneumonia & pleurisy w CC	4,161	1.0	19
8	470: Major joint replacement or reattachment of lower extremity w/o MCC	4,113	0.6	12
11	690: Kidney & urinary tract infections w/o MCC	3,603	0.5	16
13	392: Esophagitis, gastroent & misc. digest disorders w/o MCC	3,501	0.5	11
3	Other ACH MS-DRGs 065: Intracranial hemorrhage or cerebral infraction w CC	6,085	2.3	33
5	292: Heart failure & shock w CC	4,736	1.8	23
9	191: Chronic obstructive pulmonary disease w CC	3,779	0.9	22
12	057: Degenerative nervous system disorders w/o MCC	3,554	0.4	40
16	603: Cellulitis w/o MCC	3,105	0.3	16
15	329: Major small & large bowel procedures w MCC	3,156	6.9	62
17	641: Nutritional & misc. metabolic disorders w/o MCC	3,097	0.6	14
18	481: Hip & Femur procedures except major joint w CC	3,036	0.8	33
19	192: Chronic obstructive pulmonary disease w/o CC/MCC	3,023	0.8	14
20	682: Renal failure w MCC	3,014	1.7	32
	Subtotal	97,112	1.3	23%
	Total Non-CCI Episodes over 30 Total Days	286,729	1.8	20

NOTE: CCI/MC, critically critical ill or medically complex; ACH, acute care hospital; MS-DRGs, Medicare severity diagnosis-related groups; MV, mechanical ventilation; MCC, major complication or comorbidity; CC , complication or comorbidity; CCU, critical care unit.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

1.4.4 Analyze Medicare Margins

We used the FY09 MedPAR episode dataset to determine if there are systematic Medicare payment problems for CCI/MC patients. CMS is concerned about both systematic underpayments (low margins) for certain types of patients and/or facilities and overpayments (high margins) for other patients and facilities. CMS is also interested in whether there are inconsistencies in payments for patients with similar characteristics but who receive care in different settings.

We analyzed the ACH margins of the revised preliminary CCI/MC definitions. For each patient we computed the index ACH margins and included an indicator if the patient had an LTCH referral. The margins were defined as:

$$\frac{\text{Medicare payments} - \text{Medicare costs}}{\text{Medicare payments}}$$

where Medicare payments included the basic MS-DRG payment, any outlier payments, and any deductibles or coinsurance that were the responsibility of the patient. Costs were estimated by multiplying the charges on each claim by a cost-to-charge ratio (CCR) that was developed from the Medicare cost report for each facility and was specific to one of fourteen different charge or service groups, which correspond to the groups that CMS uses to compute cost-based weights under the Inpatient Prospective Payment System (IPPS). Unlike CMS' approach to claims-based cost estimation, however, we applied facility-specific CCRs rather than national aggregate CCRs to convert the claims charges to cost); this method better captures the individual facility's costs compared to using either the national CCRs or a single facility-level CCR.

Patients were classified according to the following hierarchy, since patients could qualify for more than one condition: tracheostomy, PMV, MOF, sepsis and other severe infections, wounds, and COF. We calculated the ACH, LTCH, and combined median margins for restrictive and inclusive CCI/MC by type of condition and found that all restrictive admission conditions, except tracheostomy, had negative median ACH margins (see ***Table 1-6***). We found that the restrictive population had median ACH margins ranging from -28 to -63 percent (excluding tracheostomy patients) in comparison to median ACH margins ranging from -24 to -41 percent for the inclusive definition. Although all CCI/MC (restrictive and inclusive) appear to have payment problems based on the very negative median acute hospital margins, the restrictive definition appears to identify the population with the most payment problems. The positive (9 percent) median ACH margins for tracheostomy patients suggest that ACH payments may be too high.

Figure 1-6 presents the margins for the restrictive episodes and the episodes added under the inclusive definition (note that the findings in Figure 1-6 differ from those in Table 1-6 because Table 6 presented the margins for all restrictive and inclusive episodes, not just the episodes added under the inclusive definition). The margins for the restrictive CCI/MC are much more negative than for the episodes added under the inclusive definition with MOF, sepsis, wounds, and COF.

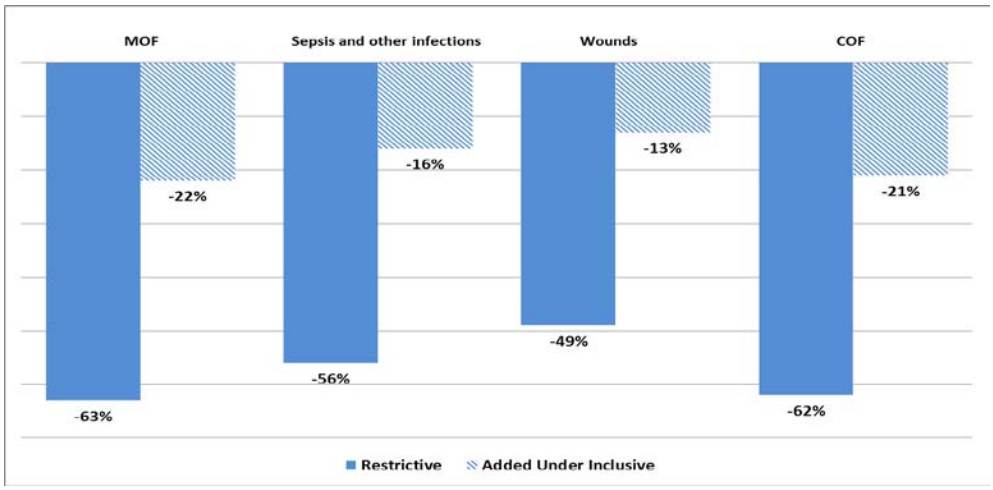
Table 1-6
Comparison of the median ACH, LTCH, and combined margins for the restrictive and inclusive CCI/MC

Clinical condition	Median ACH margin		Median LTCH margin		Median ACH and LTCH combined margin	
	Restrictive admissions	Inclusive admissions	Restrictive admissions	Inclusive admissions	Restrictive admissions	Inclusive admissions
Tracheostomy	9%	9%	13%	13%	13%	13%
PMV	-28%	-28%	5%	5%	-12%	-12%
MOF	-63%	-41%	1%	2%	-21%	-17%
Sepsis	-56%	-36%	1%	3%	-19%	-14%
Wounds	-49%	-24%	0%	1%	-16%	-10%
COF	-62%	-37%	-2%	0%	-20%	-16%

NOTE: Patients were classified according to the following hierarchy: tracheostomy, PMV, MOF, sepsis and other severe infections, wounds, and COF. This table includes all admissions under the inclusive definition, not just those added under the inclusive definition. The number of LTCH admissions used in the calculations is much smaller than the number of ACH admissions because not all ACH admission are transferred to LTCHs. ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; PMV, prolonged mechanical ventilation; MOF, multiple organ failure; COF, constellation of debilitating factors.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode file.

Figure 1-6
Median ACH margins for the restrictive CCI/MC definition and for episodes added under the inclusive definition, by clinical condition



NOTE: Tracheostomy and PMV clinical conditions are not shown because the restrictive and inclusive definitions are identical. Margins are equal to (Medicare payments – Medicare Costs)/Medicare payments. ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; MOF, multiple organ failure; COF, constellation of debilitating factors.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode file.

We also calculated and plotted the distribution of margins for the index admission and any subsequent LTCH admission for the restrictive definition (see ***Figures 1-7*** through ***1-12***). These figures indicate that:

- For tracheostomy patients, both the ACH and LTCH margins are positive; the LTCH margins are somewhat higher (because more of the distribution is above zero).

- For PMV, MOF, sepsis, wounds, and COF, the ACH margins are quite negative ranging from -24 to -63.

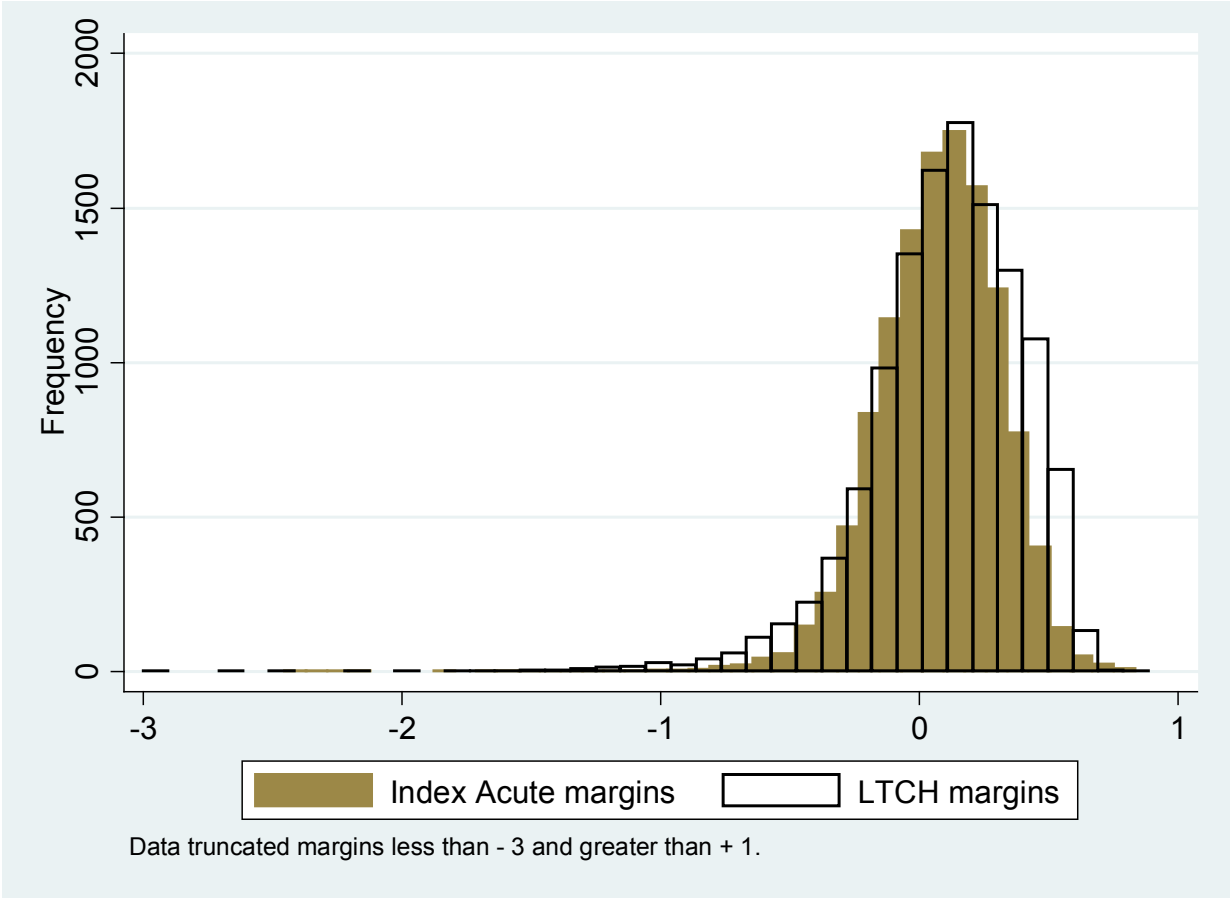
For each condition, the LTCH margins are higher than the ACH margins. These figures indicate that there are systematic payment problems for the restrictive CCI/MC population.

We also analyzed the median LTCH margins and the median combined ACH and LTCH margins for both the restrictive and inclusive populations. LTCH margins were close to zero for both the restrictive and inclusive populations in each clinical category (ranging from -2 to 5 percent), except tracheostomy patients where the median ACH margin was 13 percent. Again, the positive median margin for tracheostomy patients in the LTCH setting suggests that payments may be too high. We also examined the median ACH and LTCH combined margins for the restrictive CCI/MC and found that all clinical conditions except tracheostomy had negative margins ranging from -16 to -21 percent. In comparison, combined ACH and LTCH margins for the inclusive CCI/MC were less negative and ranged from -10 to -17 percent.

These analyses suggest that there are acute care hospital payment problems for non-trach CCI/MC patients. In comparison, Medicare is paying both restrictive and inclusive non-trach CCI/MC patients slightly more than costs in the LTCH setting.

In summary, analysis of the median ACH, LTCH, and combined median margins for the restrictive and inclusive CCI/MC finds that the restrictive population in particular has very negative median ACH margins for all CCI/MC clinical conditions except for tracheostomy patients. Our analyses suggest that the inclusive CCI/MC do not have the same payment problems as the patients identified under the restrictive definition, as reflected by the ACH hospital, LTCH, and combined ACH and LTCH margins.

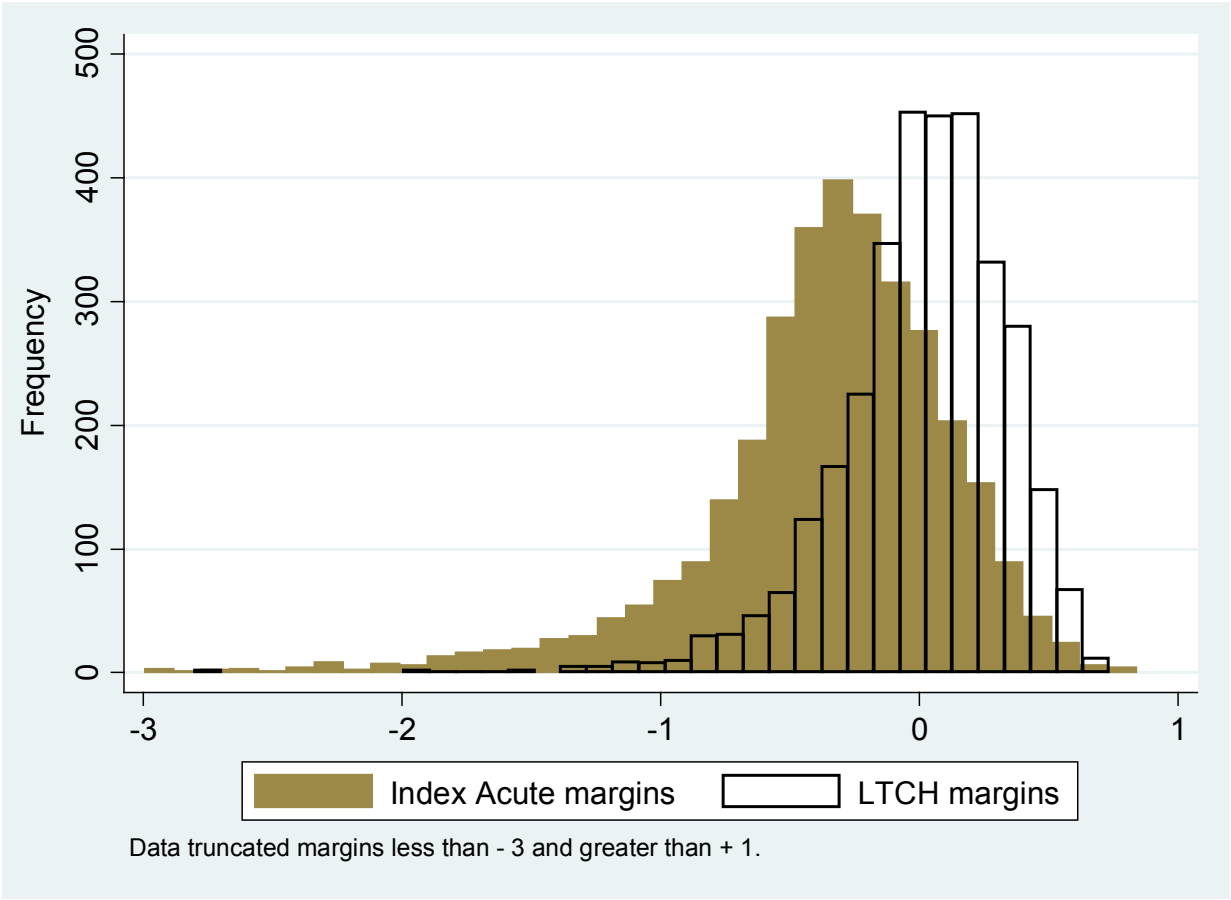
Figure 1-7
Acute care hospital and LTCH margins for restrictive CCI/MC tracheostomy patients



NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

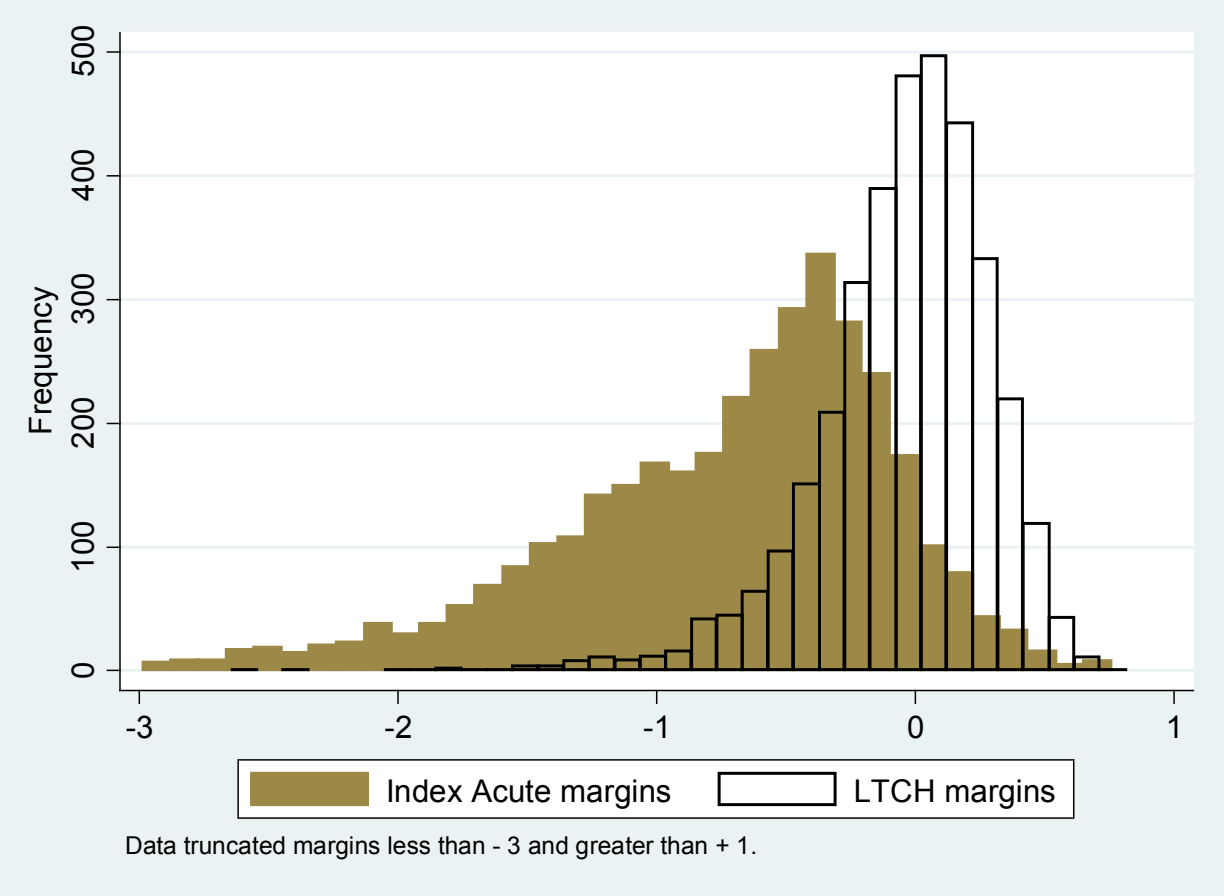
Figure 1-8
Acute care hospital and LTCH margins for restrictive CCI/MC prolonged mechanical ventilation patients



NOTE: Excludes Tracheostomy patients. CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

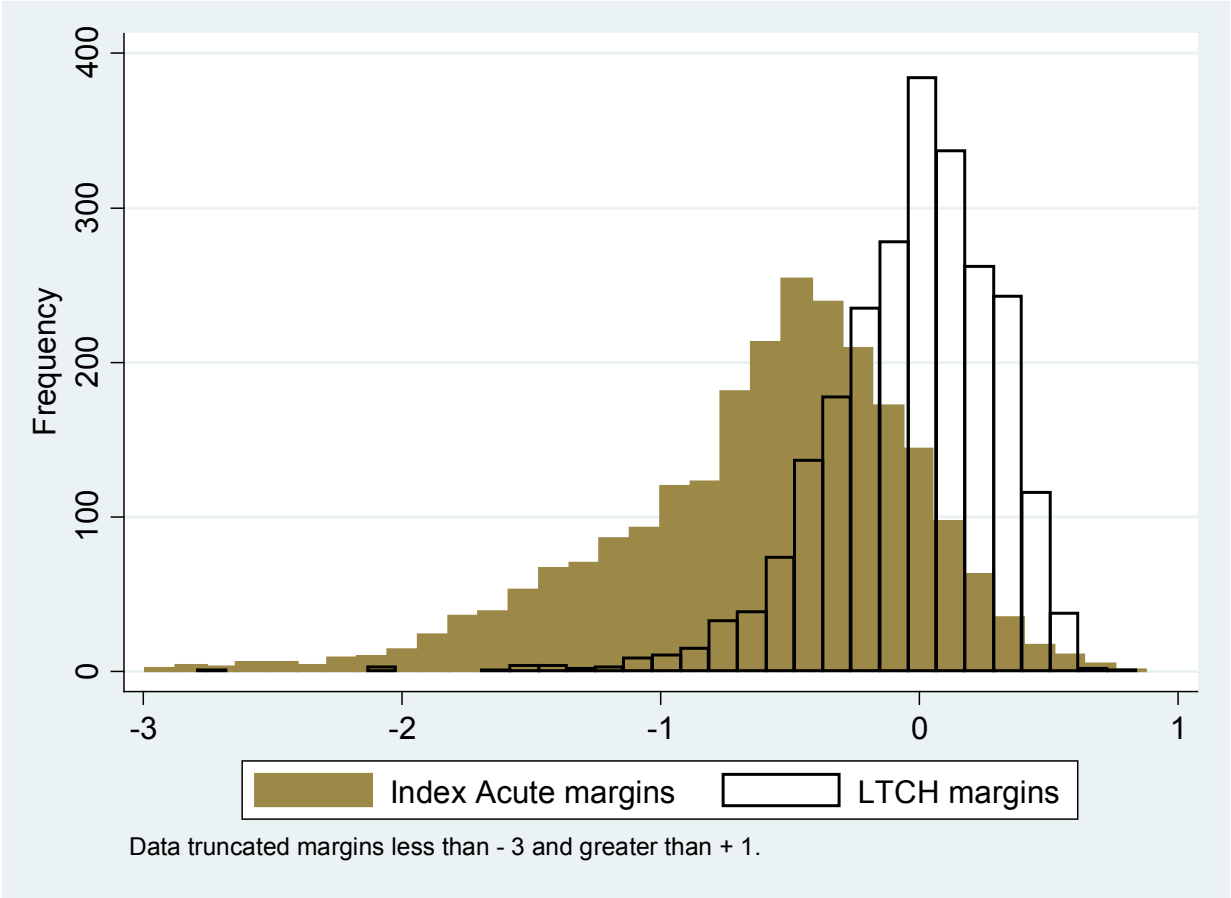
Figure 1-9
Acute care hospital and LTCH margins for restrictive multiple organ failure CCI/MC patients



NOTE: Excludes patients who qualified as CCI/MC under any of the other clinical conditions (Tracheostomy and Prolonged Mechanical Ventilation). CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

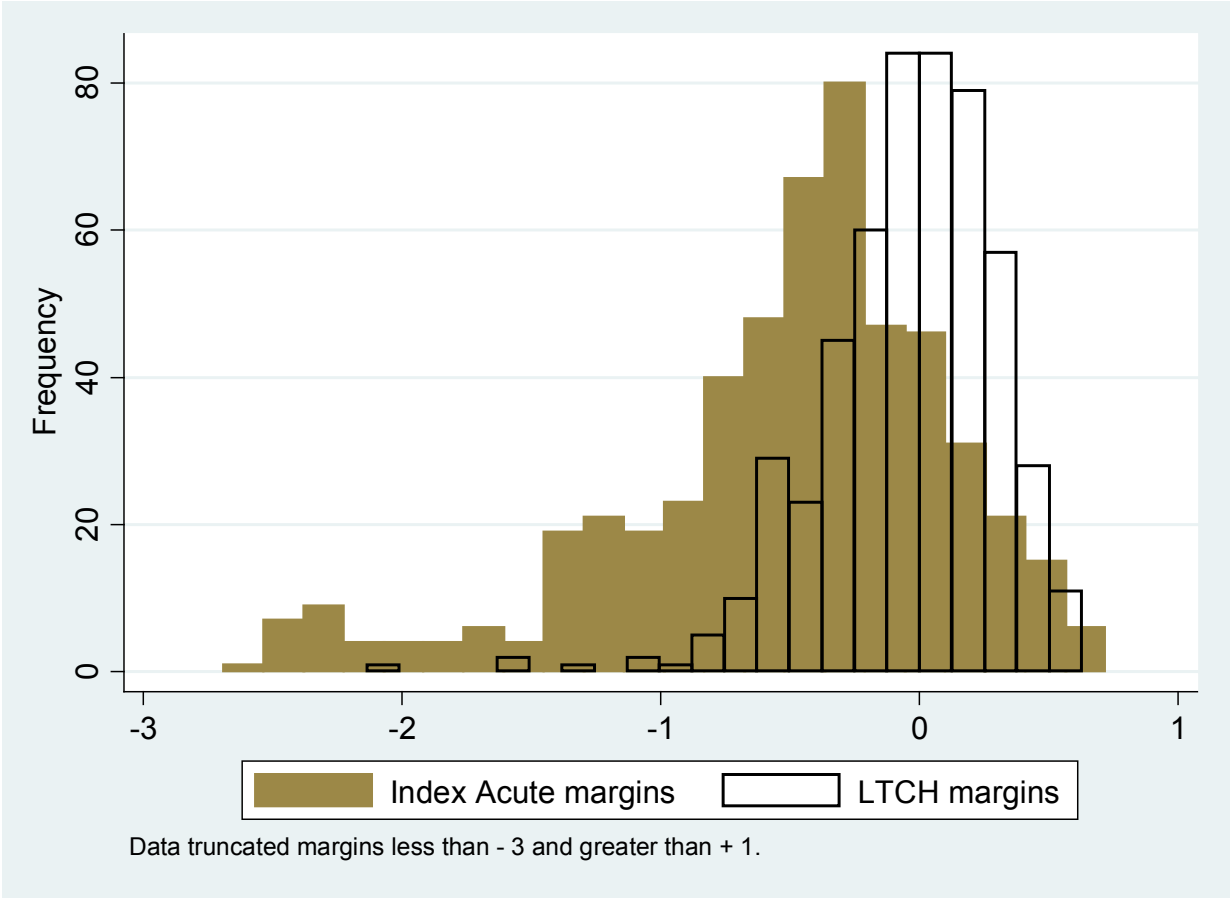
Figure 1-10
Acute care hospital and LTCH margins for restrictive CCI/MC "sepsis and other" patients



NOTE: Excludes Tracheostomy, PMV, and MOF patients. CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; PMV, prolonged mechanical ventilation; MOF, multiple organ failure.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

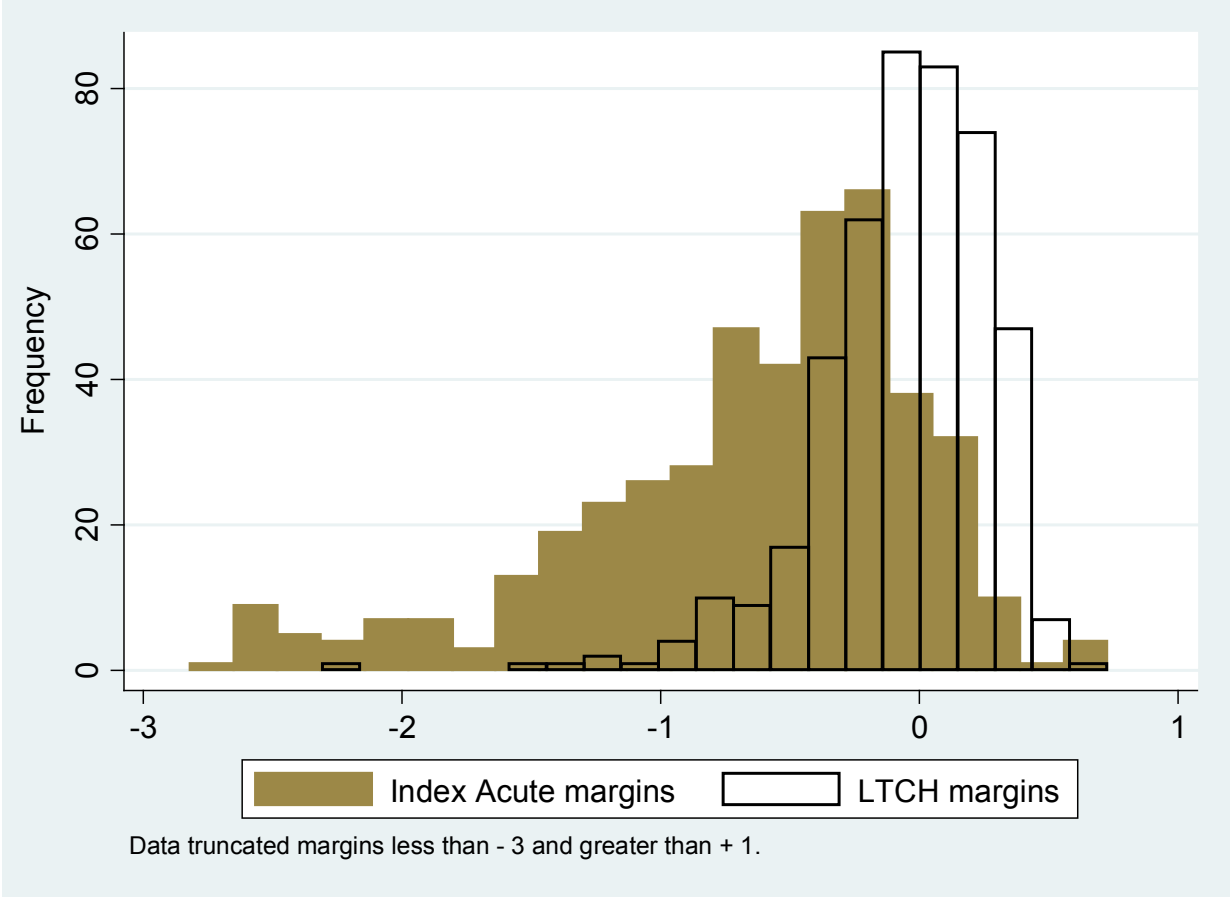
Figure 1-11
Acute care hospital and LTCH margins for restrictive CCI/MC wound patients



NOTE: Excludes Tracheostomy, PMV, MOF, and Sepsis patients. CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; PMV, prolonged mechanical ventilation; MOF, multiple organ failure.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

Figure 1-12
Acute care hospital and LTCH margins for restrictive CCI/MC constellation of debilitating factor patients



NOTE: Excludes Tracheostomy, PMV, MOF, Sepsis, and Wound patients. CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; PMV, prolonged mechanical ventilation; MOF, multiple organ failure.

SOURCE: FY09 Medicare Provider Analysis and Review (MedPAR) episode files.

1.4.5 Analyze the CARE Assessment Data Variables Within the CCI/MC Definitions

The analysis of CCI/MC episode length of stay, costs, and margins in the previous sections used the FY09 MedPAR claims data to identify the CCI/MC. Patient assessment data may also be useful in identifying the CCI/MC using information not available from claims, such as data on medications or the use of arterial lines. As a result, we were interested in exploring the use of patient assessment instruments, in addition to claims data, to identify the CCI/MC. We were particularly interested in whether CARE assessment tool data would be useful for identifying the CCI/MC for payment purposes. As discussed above, when the initial definitions were constructed, we had identified several CARE tool variables that might be helpful in identifying the CCI/MC, such as complex wound management for wounds. The next step was to

analyze whether there was an additional benefit of using CARE assessment data in addition to claims data to identify the CCI/MC. Would a significant share of the acute care CCI/MC population be excluded if the definition were limited to the variables that are available on the claim form?

To address this question, we used the CARE assessments as a diagnostic tool to analyze the impact of additional clinical data. We created a new dataset which included ACH CARE assessments completed at discharge from an ACH stay that were matched to the MedPAR record containing the Medicare claim for the same hospital stay. We also matched LTCH CARE assessments completed on admission to an LTCH to the Medicare claim for the ACH stay immediately preceding the LTCH transfer.

Using the analysis file, we compared the number of the CCI/MC and their characteristics in two situations: 1) using only claims-based information and 2) using both claims-based information and items from the CARE tool. RTI matched 4,056 CARE assessments completed at discharge to the MedPAR claim record for their ACH stay. We identified CCI/MC patients using the inclusive CCI/MC definition because we believed that the addition of the CARE variables would have the largest impact on the broader population of patients.

In the case of three CCI/MC groups – "Tracheostomy," "Multiple Organ Failure (MOF)," and "Sepsis and other severe infections" there were either zero or an inconsequential number of cases that qualified as CCI/MC based on added CARE information, and thus we did not analyze these three groups. Instead, we focused on the contribution of CARE tool variables to the identification of the remaining three CCI/MC conditions – PMV, complex wounds, and COF. ***Table 1-7*** describes the CARE tool variables used to potentially identify CCI/MC cases that would not otherwise be identified through claims alone for these three additional CCI/MC conditions.

PMV. A prolonged mechanical ventilation (PMV) patient could be classified as CCI/MC under the inclusive CARE-based definition if he or she has eight or more critical care days and has an indication of "vent weaning" or "vent non-weaning" indicated on the CARE tool assessment. For the PMV condition, CARE tool "vent weaning" and/or "vent non-weaning" items identified a number of patients with continuous mechanical ventilation in the acute care setting where none of the three possible ICD-9 codes for mechanical ventilation appear on the ACH MedPAR claim. It is possible that some of these may not have qualified as "prolonged" ventilation, since the CARE items do not identify "length of time on the ventilator." We found that this variable increased the number of PMV cases substantially: 79 cases were identified using only claims data and 230 were identified using both CARE and claims data (see ***Table 1-8***). We also found that most of the added cases were cardiac surgery patients by examining their DRGs. We believe it is possible that the ventilation procedure was coded by the hospital but that the code was placed in a later field on the claim for these cardiac surgery patients, and thus not picked up by the Medicare files in 2009. If this is the case, the problem of understating ventilator patients in the claims data should be reduced after January 2012, when the MedPAR files populated up to 25 diagnosis and procedure codes for all hospitals.

Table 1-7
CARE tool items used as additional variables to potentially identify CCI/MC patients

Clinical group	CARE variables	Comment
PMV	• Vent-Weaning • Vent-Non-Weaning	No hourly time component included in CARE variables for vent weaning or non-weaning.
Complex Wound Care	• Number of Stage IV Pressure Ulcers • Number of Trauma-Related Wounds • Negative Pressure Wound Therapy (NPWT) • Complex Wound Management	Stage IV pressure ulcers are also available on claims data. It is unclear whether the severity of trauma wounds, NPWT, and complex wound management is equivalent to cases found through claims. Must rely on secondary resource use information (e.g., LOS) to make judgment regarding severity equivalence of CARE cases to claims cases.
Constellation of Other Factors (COF)	• Multiple Types of IV antibiotics • Hemodialysis • TPN (Total Parenteral Nutrition) • Comatose/Restricted Mobility • Trach Tube	Hemodialysis and comatose are also available on claims data. Trach tube is a broad term that can apply to many types of intubation. Must rely on secondary resource use information to make judgment regarding severity equivalence of CARE cases to claims cases.

NOTE: CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation; CARE, Continuity Assessment Record and Evaluation item set; trach tube, tracheostomy or endotracheal tube.

SOURCE: Kennell/RTI International, Analysis of Matched FY 2009 CARE and Medicare Provider Analysis and Review (MedPAR) data.

Table 1-8
Additional unique CCI/MC added with CARE tool assessments

Identification of CCI/MC	PMV	Complex wounds	COF
Number of Cases Identified by Claims	79	54	61
Number of Unique Cases Identified by CARE	151	24	203
Total CCI/MC Cases	230	78	264
Ratio: CARE Only to All Claims	1.91	0.44	3.33

NOTE: CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation; CARE, Continuity Assessment Record and Evaluation item set; trach tube, tracheostomy or endotracheal tube.

SOURCE: Kennell/RTI International, Analysis of Matched FY 2009 CARE and Medicare Provider Analysis and Review (MedPAR) data.

An important factor related to whether CARE assessment data should be used to identify PMV patients is whether they add patients with high-resource use. We found that the added CARE cases have ACH resource-use measures (critical care days, episode days and index admission payments) that are from 40 to 60 percent less than the measures for cases identified through claims (see ***Table 1-9***).

Complex Wounds. A complex wound patient can be classified as CCI/MC under the inclusive CARE-based definition criteria if he or she has three or more critical care days and the presence of at least one of the following: 1) Stage IV pressure ulcers, 2) trauma–related wounds, 3) negative pressure wound therapy (NPWT), or 4) complex wound management indicated on the CARE tool assessment. CARE tool items included in the CCI/MC criteria identified 44 percent more CCI/MC patients then claims data alone (see Table 1-8). These additional cases, however, had acute care hospital resource use measures that were 30 to 50 percent less than those identified through claims alone (see Table 1-9).

Constellation of Debilitating Factors (COF). A COF patient can be classified as CCI/MC under the inclusive CARE-based definition criteria if he or she has three or more critical care days and the presence of at least two of the following on his or her CARE assessment: 1) multiple IV antibiotics, 2) hemodialysis, 3) TPN, 4) restricted mobility or an indication of being comatose, or 5) trach tube. CARE tool information had the largest impact on identifying CCI/MC cases for patients meeting the COF criteria, increasing the number of identified cases by over 300 percent compared to the number identified by claims data alone (see Table 1-8). This is not surprising since the COF factor is highly dependent on CARE tool items. These are cases identified based on a number of characteristics that cannot be captured by diagnosis or procedure codes because the codes do not exist in the ICD-9 system. However, we found that cases identified through CARE alone had resource use that was 67 to 69 percent less than those identified through claims data alone (see Table 1-9).

Table 1-9
Relative resource use of additional unique CCI/MC cases added with CARE tool assessments

Resource use for claims and CARE cases	PMV	Complex wounds	COF
Median Critical Care Days	18	8	15
For Cases Identified by Claims			
For Unique Cases Identified by CARE	11	4	5
% That Unique CARE Cases Are Lower Than Claims	39%	50%	67%
Median Episode Days	27	10	27
For Cases Identified by Claims			
For Unique Cases Identified by CARE	12	7	9
% That Unique CARE Cases Are Lower Than Claims	56%	30%	67%
Median Medicare Index Admission Payment	$70,826	$18,702	$43,042
For Cases Identified by Claims			
For Unique Cases Identified by CARE	$40,090	$12,960	$13,338
% That Unique CARE Cases Are Lower Than Claims	43%	31%	69%

NOTE: CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation; CARE, Continuity Assessment Record and Evaluation item set; trach tube, tracheostomy or endotracheal tube.

SOURCE: Kennell/RTI International, Analysis of Matched FY 2009 CARE and Medicare Provider Analysis and Review (MedPAR) data.

This analysis highlights interesting considerations for defining the CCI/MC categories.

Three of the six condition groups (trach, MOF, sepsis and other infections) are almost entirely based on diagnosis and procedure code information and the claims files alone were useful in identifying all or nearly all CCI/MC cases. For the other three CCI/MC categories that did not rely entirely on diagnosis and procedure code information (PMV, wounds, and COF), the CARE data provided some useful information. In the case of PMV, however, it is likely that many of the additional acute care cases identified through CARE will be picked up now that the MedPAR files populate up to 25 diagnosis and procedure codes for all hospitals. In the other CCI/MC condition groups, however, CARE items identified patients with far lower resource use than those identified through claims alone. It is also important to note that combined CARE/claims analytic file did not include cost estimates and therefore had no information on ACH margins. Based on resource use variables, however, the CARE items as defined for this analysis seem to identify cases with lower costs and therefore fewer payment problems.

We cannot conclude from this analysis that added clinical data would not be useful for refining the CCI/MC definitions – in particular, lab and other diagnostic test values, and information such as length of time on a ventilator, oxygen use, medications, pressors and arterial lines might all be very helpful. These, however, are not CARE tool specific items and were not available for use. From the cost and payment data that we have on the set of patients identified as CCI/MC, we think there is enough evidence to support using only MedPAR claims data to identify CCI/MC patients.

Implications for including COF in the definitions. Because the identification of COF patients relies heavily on CARE data, we questioned whether we should also eliminate COF from the CCI/MC definition criteria. In order to qualify as CCI/MC under COF, a patient must have two or more of the five following criteria:

- Multiple IV antibiotics (CARE only),
- Single organ failure (claims), or acute or chronic dialysis (claims), hemodialysis (CARE or claims), and/or lymphoma or leukemia (claims),
- Malnutrition (claims), TPN (CARE only), or PEG (claims),
- Restricted mobility (CARE only) and/or comatose (CARE and claims),
- Trach tube (CARE only)

Although it is technically possible to qualify under COF using only claims data, very few patients will qualify because they must meet two out of three possible criteria (the single organ failure, malnutrition, or comatose criteria). We analyzed the COF patients who qualified as CCI/MC using only claims data and found that these patients had resource use that was similar to other non-PMV CCI/MC patients. We then examined the number of patients who were added by including COF using the FY09 MedPAR Episode file and found that the inclusion of COF adds only five percent to the total number of CCI/MC index admissions in FY09.

Although the COF patients appear to have similar resource use when compared to other non-PMV CCI/MC patients, the number of CCI/MC patients is increased by only five percent using the restrictive definition based on the COF criteria. As a result, we recommended excluding COF from the CCI/MC definition.

1.4.6 Evaluate the Definition Using the CMS Criteria

We then evaluated how well each of the two definitions met the criteria following exclusion of the CARE tool items. We made this comparison after eliminating the use of CARE variables and the COF clinical factor from the definitions. With respect to the "clinical coherence" criteria, we think that both the restrictive and inclusive definitions can be defined with measures such as diagnoses, procedures, MS-DRGs, and the number of critical care days.

As discussed in 1.4.3, we think that the restrictive definition is superior to the inclusive definition in identifying patients who use a high level of resources and who have extended stays.

More importantly, the marginal cases added in the inclusive definition do not exhibit particularly long stays or high-resource use. In terms of resource use, the restrictive definition is superior for the following reasons:

- By definition, the restrictive CCI/MC have had longer periods of critical illness due to their higher number of critical care days than the inclusive CCI/MC, and we found that they also have longer lengths of stay. About 23 percent of the restrictive CCI/MC had hospitalizations of 40 days or more compared with 16 percent of the inclusive CCI/MC. Hospitalizations included both ACH and LTCH stays. The median number of critical care days for the restrictive admissions was 12; the median for the admissions added under the inclusive definition was 6.

- The restrictive CCI/MC population had fewer shorter-staying patients. About 10 percent of the restrictive CCI/MC had episode stays of less than 10 days while 29 percent of the inclusive CCI/MC had episode stays of less than 10 days.

- The restrictive CCI/MC have higher Medicare payments than the inclusive CCI/MC for all clinical factors, except PMV and tracheostomy where the definitions are the same. The median Medicare payments for the restrictive admissions are more than double the payments for those added under the inclusive definition.

In terms of identifying Medicare payment problems, the restrictive definition also identifies patients with more systematic payment problems than the inclusive definition (see ***Table 1-10***). The restrictive CCI/MC have more negative margins than the inclusive CCI/MC population when analyzing patients in each clinical factor group or by MS-DRG. The median ACH margin for the restrictive CCI/MC was -41 percent in comparison to -19 percent for the additional discharges added under the inclusive definition. For each of the clinical conditions, we found that the margins were 2-3 times more negative for the restrictive CCI/MC admissions than for the admissions added under the inclusive CCI/MC definition.

Table 1-10
Assessment of preliminary CCI/MC definitions

Criteria	Restrictive definition	Inclusive definition
Clinical Coherence?	Yes	Yes
Identifies high-resource use population?	Yes, hospital stays (ACH + LTCH) are very long and have high payments; excludes some high-resource stays without long ICU stays	Yes, but cases added under the inclusive definition do not have particularly long stays and do not have high payments
Identifies payment problems	Yes, very negative margins	Yes, but cases added under the inclusive definition have less negative margins
Operationalizability?	Yes	Yes

NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care inpatient hospital paid under IPPS, LTCH, long-term care hospital.

We believe that both definitions would be able to be implemented in Medicare payment systems because they are based on DRGs and claims data.

In summary, we think that the restrictive definition meets the criteria more successfully than the inclusive definition.

1.4.7 Developing a Final Definition

Before finalizing the restrictive CCI/MC definition, CMS reviewed all MS-DRGs, ICD-9 procedure codes, and ICD-9 diagnosis codes that were included within the CCI/MC definition and suggested that we determine whether the CCI/MC definition would still meet the criteria if the definition excluded patients who:

- qualified because they had a non-MCC MS-DRG;
- qualified because of a non-OR procedure code except for 96.72 (prolonged mechanical ventilation >96 hrs.);
- qualified because of a non-MCC diagnosis code; or
- qualified as trach with a code other than MS-DRG 003 or 004.

CMS thought that these exclusions would ensure that the final definition would be based on high-resource use patients.

CMS also suggested using a definition of the CCI/MC with a critical care requirement that would be the same for all clinical conditions, rather than separate requirements based on clinical condition. Prior to finalizing the definition, however, CMS thought it was important to establish whether eight or more critical care days was the appropriate critical care day criteria to use for all conditions, or whether a lower number of days was appropriate.

To address these questions, we used FY10 MedPAR data and analyzed the length of stay (LOS) of CCI/MC patients based on the number of critical care days. We found that patients with eight or more critical care days and who met the CCI/MC clinical criteria had a median total (ACH + LTCH) length of stay of 17 days (see ***Table 1-11***), which was more than double the median LOS for discharges that had the CCI/MC clinical factors and 5-7 critical care days (see Table 1-11). As expected, the median LOS for discharges with 8 or more critical days was much higher than for discharges with fewer than 5 critical care days (see ***Figure 1-13***). The discharges with eight or more critical care days also had median total payments (ACH plus LTCH) over $28,000 which is more than double the median amount for discharges with 5-7 critical care days (about $12,300). Although not a measure of resource use, the LTCH transfer rate was also three times higher for the CCI/MC with eight or more critical care days than for discharges with the CCI/MC clinical conditions and 5-7 critical care days.

Table 1-11
Resource use of the restrictive CCI/MC, by the number of critical care days

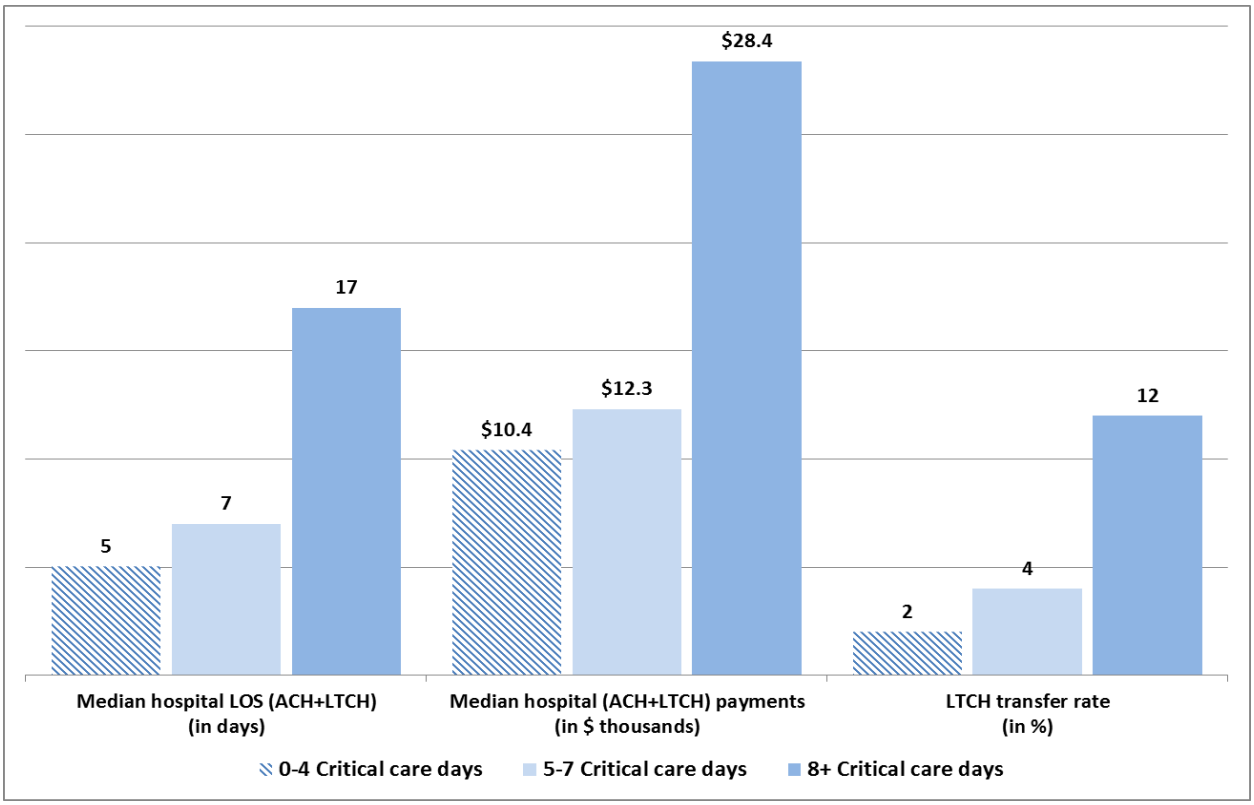
CCI/MC clinical conditions status	Total ICU/CCU days		
	0-4 days	5-7 days	8+ days
CCI/MC Clinical Conditions			
Median ACH days	5	7	16
Median total days (ACH + LTCH)	5	7	17
Median ACH payment	$10,375	$12,123	$26,670
Median total payment (ACH + LTCH)	$10,444	$12,276	$28,363
# ACH discharges	1,044,941	178,383	314,651
LTCH Transfer Rate	2%	4%	12%
Not meeting the CCI/MC Clinical Condition			
Median ACH days	3	6	11
Median total days (ACH + LTCH)	3	6	11
Median ACH payment	$5,849	$8,247	$11,223
Median total payment (ACH + LTCH)	$5,855	$8,282	$11,382
# ACH discharges	11,164,466	684,990	428,961
LTCH Transfer Rate	0%	1%	3%

NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care inpatient hospital; LTCH, long-term care hospital; ICU/CCU, intensive care unit/critical care unit.

SOURCE: Kennell/RTI International, Analysis of Matched FY 2010 Medicare Provider Analysis and Review (MedPAR) data 100 percent sample of ACH and LTCH claims.

The initial "restrictive" CCI/MC definition required only four or more critical care days for tracheostomy patients. The CMS payment group's suggestion to have a uniform requirement of eight or more days would reduce the number of trach patients who would qualify as CCI/MC. We calculated the effect of changing the CCI/MC criteria for trach patients from 4 or more critical care days to 8 or more critical care days, and found that the change would reduce the number of CCI/MC LTCH transfers by approximately 400 admissions a year. We determined that using a criteria of 8 or more critical days for all CCI/MC patients, regardless of the clinical criteria, has relatively little impact on the number of CCI/MC transfers. While the advantage of this change is that the criteria are simpler, we note that some administrative exception for identifying CCI/MC among tracheostomy patients with shorter CCU stays might be needed, particularly if the patient is a readmission or transfer from another level of care.

Figure 1-13
Resource use measures for discharges meeting the CCI/MC clinical factors, by critical care days



NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care inpatient hospital; LTCH, long-term care hospital; LOS, length of stay.

SOURCE: Kennell/RTI International, Analysis of Matched FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample.

We also wanted to determine whether the clinical factors in the final definition excluded high-resource use patients. First, as shown in Table 1-11, we found that the patients with 8 or more critical care days who did *not* meet the clinical criteria had a median total (ACH + LTCH) LOS of 11 days, which is much less than the median LOS for the CCI/MC condition patients (17 days). Thus, we believe that the combination of the clinical criteria and 8 or more critical care days is a good measure of predictably long hospital stays. Second, the discharges with 8 or more critical care days who did not meet the CCI/MC clinical conditions had median payments of $11,400, which is about 60 percent less than the discharges with 8 or more critical care days who met the CCI/MC clinical criteria had a much lower LTCH transfer rate (about 75 percent less than the transfer rate for the discharges with 8 or more critical care days who did meet the CCI/MC clinical criteria). Thus, we think that the revised restrictive CCI/MC definition does meet the criteria.

The final definition we developed is shown in ***Table 1-12***.

Table 1-12
Final definition of the CCI/MC

Clinical conditions (requiring 8 or more critical care days)	Description of definition components
Tracheostomy	MS-DRGs 003 and 004 for Tracheostomy
PMV	• MS-DRGs 207, 870, 933, or 927 for PMV (all with 96+ hrs. of mechanical ventilation), or • ICD-9 Procedure code 96.72 (mechanical ventilation for more than 96+ hours)
Multiple Organ Failure	Two or more of the following organ failures (identified through ICD-9 diagnosis codes): • Renal failure, including acute stage renal failure or end stage renal failure • Heart failure • Respiratory failure, including acute and chronic respiratory failure and COPD with MCC • Hepatic (liver) failure • Cerebrovascular disease, including intercerebral hemorrhage and traumatic brain injury
Sepsis and Other Severe Infections	• MS-DRGs 870, 871 for sepsis and ICD-9 codes for severe sepsis and septic shock or, • MS-DRGs 856 and 862 for post-operative and post-traumatic infections with MCC, or • MS-DRGs 094 and 096 for bacterial and non-bacterial infections with MCC, or • MS-DRG 177 for respiratory infections and inflammations with MCC, or • Insertion of an implantable heart assist syndrome, or • Metabolic encephalopathy or difibrination syndrome, or • System Inflammatory Response Syndrome (SIRS)
Wounds	• MS-DRGs 463 and 901 for wound debridement with MCC, or • MS-DRGs 576, 592, and 622 for skin grafts with MCC, or • MS-DRG 329 for major small and large bowel procedures with MCC, or • MS-DRG 928 for full thickness burn with MCC, or • ICD-9 procedure codes for wounds and grafts, or • ICD-9 diagnoses codes for stage III and IV pressure ulcers

NOTE: To be considered CCI/MC a patient must meet one or more of the clinical conditions and have 8 or more critical care days. CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation; MS-DRG, Medicare seventy diagnosis-related group; ICD-9, International classification of diseases, ninth revision; MCC, major complications or comorbidities.

1.4.8 Issues in Implementing the Definitions in CMS Payment Systems

One of the criteria discussed above was whether CMS would be able to implement the CCI/MC definition in its payment systems. We believe that the final definition could be implemented, but there are a number of operational issues, including:

- Should CCI/MC status in LTCHs be based on the preceding ACH stay or from the LTCH stay?

- Should claims from multiple hospitalizations be used or just the immediate prior stay?

We discuss these issues below.

Using ACH claims to define the CCI/MC in LTCHs. Should CCI/MC status for an LTCH patient be determined based on clinical data from the preceding ACH stay or based on clinical data from the LTCH stay? Ninety-percent of LTCH admissions are direct transfers from an ACH stay, and a few percent more are for patients admitted up to 30 days after an initial stay, and we have found that roughly 40 percent of these patients do qualify as restrictive CCI/MC patients during their preceding stay. If CCI/MC status were determined based on the prior ACH stay, the status would serve as an indicator of clinical severity. We know that it would also be an indicator of significantly higher ACH costs compared to the non-CCI/MC in the same MS-DRGs.

Applying the CCI/MC criteria to LTCH claims. Much of the CCI definition rests on critical care use that is identified on the claim from the revenue codes assigned to intensive or intermediate care nursing charges. LTCHs often staff at the level of an intermediate or even critical care unit for individual patients, but not all actually run dedicated ICUs. For this reason, it was not clear to us how many patients would qualify as CCI/MC based on LTCH claims data, regardless of the level of nursing.

Our FY 2009 episode file did not include information on critical care days or diagnoses for the LTCH stays that were matched to index ACH admissions. Therefore we used the FY10 MedPAR file, and applied the restrictive CCI/MC criteria to all claims (ACH and LTCH). We found that in FY10, about 11 percent of LTCH patients would meet the CCI/MC criteria using data from the LTCH claims. By comparison, about 36 percent of LTCH claims met the restrictive CCI/MC definition using data from the previous ACH claim. As expected, the low percentage of CCI/MC found from LTCH claims data occurs because LTCHs do not use the critical care revenue codes on their claims; in fact, only one-half of all LTCHs reported any critical care days in 2010. Based on this finding we do not think that using the LTCH claims would provide an accurate clinical measure of the CCI/MC in LTCHs. Further, it is reasonable to assume that if any sort of higher payment were attached to the use of critical care nursing revenue codes, the charge coding practices of LTCHs would immediately change. Another problem with using LTCH claims is the complications posed by interrupted stays; critical care days incurred during a readmission of three days or less could be hard to track, although their costs would be incorporated into the LTCH claims.

Using designation from prior ACH admission. Many LTCH patients are admitted after a transfer or after several ACH stays over a short period of time. If CCI/MC status for LTCH patients is determined based on prior ACH data, and a patient has had multiple ACH stays within a short period prior to an LTCH admission, should CMS use only the data from the ACH stay immediately prior to the LTCH admission? Or, would it make sense to combine data from the ACH stay immediately prior to the LTCH admission plus any qualifying extended/transfer ACH stays? While two stays linked by a transfer might make sense clinically, it makes less sense in the context of the current discharge-based payment system. If CMS were to pursue a bundled payment structure for CCI/MC, where the payment was shared between the transferring hospitals and the receiving hospital, it would be administratively feasible to identify the CCI/MC based on combining the claims data from the two stays, but it would be very complicated to develop weights for the CCI/MC based on combined facility costs.

We identified and then tested three possible ways to use prior ACH data for identifying the CCI/MC in LTCHs:

- **Immediate prior ACH claim** - Use the ACH claim that occurs immediately before the LTCH admission to identify the CCI/MC in the LTCH.

- **Immediate prior ACH claim plus previous transfer claims** - Use the combined data from a prior "extended stay," defined as the ACH stay immediately before the LTCH admission plus a qualifying ACH stay from which the patient was transferred into the ACH stay preceding the LTCH admission. With this approach, because ICU days and clinical diagnosis from both stays would be aggregated to identify CCI/MC status, a patient could be identified as an LTCH CCI/MC patient even if he or she was not an ACH CCI/MC discharge. **Any ACH admission (or readmission) claim within a fixed period - -**Use all ACH claims for 30 days (or other fixed period of time) prior to LTCH admission. ICU days and clinical diagnosis would be combined from any qualifying ACH stays.

Using the immediately prior ACH claim to identify the CCI/MC in LTCHs is the least complex and is most administratively feasible for CMS. However, it is important to analyze whether or not extended stays or readmissions identify a sizable group of CCI/MC patients who would not otherwise be identified through the simpler method**.** To analyze whether ACH extended stays and ACH readmissions identify a sizable number of additional CCI/MC patients in LTCHs, we first identified all LTCH admissions in FY10 using the 100 percent MedPAR claims file. We focused the analysis on patients who had a single LTCH admission during FY10, and found that there were approximately 93,000 LTCH admissions. We then identified all ACH discharges that occurred during a 30 day time period before each LTCH admission. We found that approximately 71,000 LTCH admissions (77 percent) had only one ACH admission and approximately 22,000 LTCH admissions (23 percent) had two or more ACH admissions within the 30 day time period before each LTCH admission.

First, we focused on the number of patients who qualified as CCI/MC in the LTCH based on the immediate prior ACH discharge claim, and found that 34 percent of LTCH patients would be identified as CCI/MC. This would be the easiest and simplest method of identifying the

CCI/MC in LTCHs, because the LTCH is currently provided with claims details from the prior ACH stay.

We then used the same data set and identified the number of additional patients that would qualify as CCI/MC by combining qualifying extended stay/transfer ACH claims information (including diagnoses and critical care days) with the immediate prior ACH admission claim. We defined an extended stay as an ACH discharge that occurs within one day of another ACH admission. We identified an additional 620 patients that qualified as CCI/MC by including claims data from extended/transfer stays, which increases the percent of CCI/MC in LTCHs by only 2 percent (see ***Table 1-13***). This approach, however, would be much more complex to administer – CMS would be required to combine claims data for some LTCH patients and not others, and would be required to identify and provide details on the extended stay/transfer CCI/MC status to the LTCH.

Finally, we looked at the patients who qualified as CCI/MC in any one of their ACH admissions during the 30-day time period prior to their LTCH admission (see ***Table 1-14***). We identified an additional 1,383 patients that qualified as CCI/MC by including claims data from extended/transfer stays, which increases the percent of CCI/MC in LTCHs by 4 percent It is unclear, however, whether qualifying LTCH CCI/MC patients based on any ACH admission is appropriate because their diagnoses and conditions during an earlier ACH stay could be unrelated to their LTCH stay. In addition, this method would also be very complex to administer because CMS would be required to potentially review multiple ACH admissions in order to identify whether or not a patient qualified as CCI/MC in any of the acute care hospital admissions. CMS would also be required to provide the details of the ACH admissions to the LTCH.

Discussion and recommendations. For purposes of identifying a group of patients that is more complex than others *on admission* to the LTCH, we recommend using the ACH CCI/MC status, because the critical care utilization data on an LTCH claim are not adequate (and are subject to gaming, if coding depends on assigned staffing rather than admissions to distinct-part units). Given this recommendation, in the interests of administrative simplicity we would also recommend using only the data from the immediate prior ACH stay. Our work indicates that including transfers or discharges in the 30 days prior to the LTCH admission only identifies an additional 2 to 4 percent of possible CCI/MC patients, while being less clinically cohesive and adding to the implementation complexity of having to link prior claims.

Table 1-13
Effect of using extended stays to identify CCI/MC

Number of ACH admissions within 30 day period prior to LTCH admission	FY10 number of LTCH admissions	% of total admissions	Number of CCI/MC from ACH stay directly prior to LTCH admission	% CCI/MC from prior admission	Number of CCI from extended ACH stays (not prior)	% CCI/MC from all admissions (prior + extended)	% CCI/MC added by extended stays
1	71,248	77%	29,517	36%	—	36	—
2	18,889	20%	5,509	29%	547	32	10
3	2,543	3%	469	18%	62	21	13
4 or more	257	0%	38	15%	11	19	29
Grand Total	92,937	100%	31,531	34%	620	34	2

NOTE: all admissions occurred during the 30 day period from the LTCH admission. Includes only LTCH admission with one LTCH admission within the FY10 file. Approximately 15 percent of LTCH admissions within the FY10 MedPAR file had multiple LTCH Admissions. An extended stay is defined as an ACH discharge that occurs within one day of a prior ACH admission. CCI/MC, chronically critically ill or medically complex; ACH, acute care inpatient hospital, LTCH, long-term care hospital.

SOURCE: Kennell/RTI International, Analysis of Matched FY 2010 Medicare Provider Analysis and Review (MedPAR) data 100 percent sample of ACH and LTCH claims.

Table 1-14
Effect of readmissions on identifying the CCI/MC

Number of ACH admissions within 30 day period prior to LTCH admission	FY10 number of LTCH admissions	% of total Admissions	Number of CCI/MC from ACH stay directly prior to LTCH admission	% CCI/MC from prior admission	Number of CCI/MC from readmissions (not prior)	% CCI/MC from any stay within 30 days (prior + readmissions)	% Additional CCI/MC added by readmissions
1	71,248	77%	29,517	41%	—	41%	—
2	18,889	20%	5,509	29%	1,102	35	20
3	2,543	3%	469	18%	252	28	54
4 or more	257	0%	38	15%	29	26	76
Grand Total	92,937	100%	31,531	34%	1,383	40	4

NOTE: all admissions occurred during the 30 day period from the LTCH admission. Includes only LTCH patients with one LTCH admission within the FY10 file. Approximately 15 percent of LTCH patients within the FY10 MedPAR file had multiple LTCH Admissions. CCI/MC, chronically critically ill or medically complex; ACH, acute care inpatient hospital, LTCH, long-term care hospital.

SOURCE: Kennell/RTI International, Analysis of Matched FY 2010 Medicare Provider Analysis and Review (MedPAR) data. 100 percent sample of ACH and LTCH claims.

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SECTION 2
CHARACTERISTICS OF THE CCI/MC PATIENT IN ACUTE CARE HOSPITAL AND LTCH SETTINGS

2.1 Overview

As discussed in Chapter 1, chronically critically ill and other medically complex (CCI/MC) Medicare patients are beneficiaries who were hospitalized with long-term intensive care needs and require extended periods of hospital-level care. They are defined through a combination of diagnosis and procedures and an ICU length of stay requirement. Many CCI/MC patients are transferred after their initial hospitalization to Long-Term Care Hospitals (LTCHs) for continuing hospital care or to Skilled Nursing Facility (SNFs) or Inpatient Rehabilitation Facility (IRFs) for further care. This chapter examines the characteristics of the CCI/MC and describes how their cost and utilization patterns and their use of LTCHs differs from that of patients who are not CCI/MC.

Section 2.2 discusses the proportion of acute care hospital (ACH) cases that are CCI/MC, the extent to which they are concentrated within certain types of conditions, and the variations in their discharge status. [8] The key questions answered are:

- What proportion of the CCI/MC receive inpatient care after discharge from an ACH?
- Are the CCI/MC primarily discharged to LTCHs or to a range of settings following the initial ACH stay?
- Are there differences in ACH length of stay and payments between those CCI/MC patients discharged to LTCHs and those discharged elsewhere?
- What is the episode length for CCI/MC (including the first post-acute care (PAC) setting after acute care hospital discharge)?
- Do the answers to these questions vary by whether or not the patient is in a state with a high concentration of LTCHs?

Section 2.3 discusses the transfer of CCI/MC patients from acute care hospitals to LTCHs. It examines differences in LTCH use between those who were CCI/MC and those who were not. It addresses the following questions:

- What MS-LTC-DRGs are most common for the CCI/MC?
- Do the CCI/MC who use LTCHs have longer lengths of stay than the non-CCI/MC LTCH users?

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[8] In Chapter 2, acute care hospitals (ACHs) refer to hospitals paid under the inpatient prospective payment system (IPPS) MS-DRG system and critical access hospitals.

- Where are LTCH patients discharged? How does this differ between the CCI/MC and the non-CCI/MC?

- Across states, how much variation is there in the proportion of LTCH admissions that are CCI/MC?

Section 2.4 discusses readmission and death rates for the CCI/MC. It answers these questions:

- Are readmission rates higher for the CCI/MC patients who are transferred to LTCHs compared to the CCI/MC with other discharge destinations?

- Are the mortality rates higher for the CCI/MC transferred to LTCHs compared to the CCI/MC with other discharge destinations?

Section 2.5 presents findings on the non-CCI/MC patients who are in LTCHs and discusses the MS-LTC-DRGs for the non-CCI/MC admitted to LTCHs and how they differ from the MS-LTC-DRGs for the CCI/MC LTCH users.

2.2 The CCI/MC in Acute Care Hospitals

Who are the CCI/MC? Among the 10.9 million acute care hospital discharges in 2010, less than three percent met the CCI/MC criteria (see ***Table 2-1***). Over 60 percent of CCI/MC discharges in 2010 were concentrated in ten MS-DRGs and the top five MS-DRGs accounted for over 40 percent of CCI/MC discharges. The MS-DRG that accounted for the largest proportion of CCI/MC discharges, a total of 12.3 percent, was septicemia (MS-DRG 871). The next four most common MS-DRGs were tracheostomy or prolonged mechanical ventilation (PMV) MS-DRGs (003, 004, 207, and 870); together these four conditions accounted for 29.3 percent of the CCI/MC. The next five most common MS-DRGs within CCI/MC discharges accounted for approximately one-fifth of total CCI/MC ACH discharges in 2010 and included bowel surgery (MS-DRG 329), infectious and parasitic diseases (MS-DRG 853), respiratory infections (MS-DRG 177), heart failure (MS-DRG 291), and ventilator support with <96 hrs. mechanical ventilation (MS-DRG 208). In sum, among the top ten MS-DRGs for CCI/MC discharges, five involve ventilator support and the other five are MS-DRG designated as "MCCs," which indicates that these patients have multiple serious comorbidities and complications.

There is no single MS-DRG that includes only CCI/MC patients. However, in four of the 10 MS-DRGs (MS-DRGs 207, 003, 004, and 870) with the highest numbers of CCI/MC discharges, the CCI/MC accounted for more than two-thirds of all discharges with the MS-DRG, (shown in the last column of Table 2-1). These four MS-DRGs are for tracheostomy and PMV cases. The percentage of CCI/MC discharges in the other top 10 MS-DRGs ranged from 6.8 percent to 31.3 percent. Almost all discharges in the trach MS-DRGs (003 and 004) meet the CCI/MC definition.

Table 2-1
ACH discharges, by CCI/MC status and MS-DRG, 2010

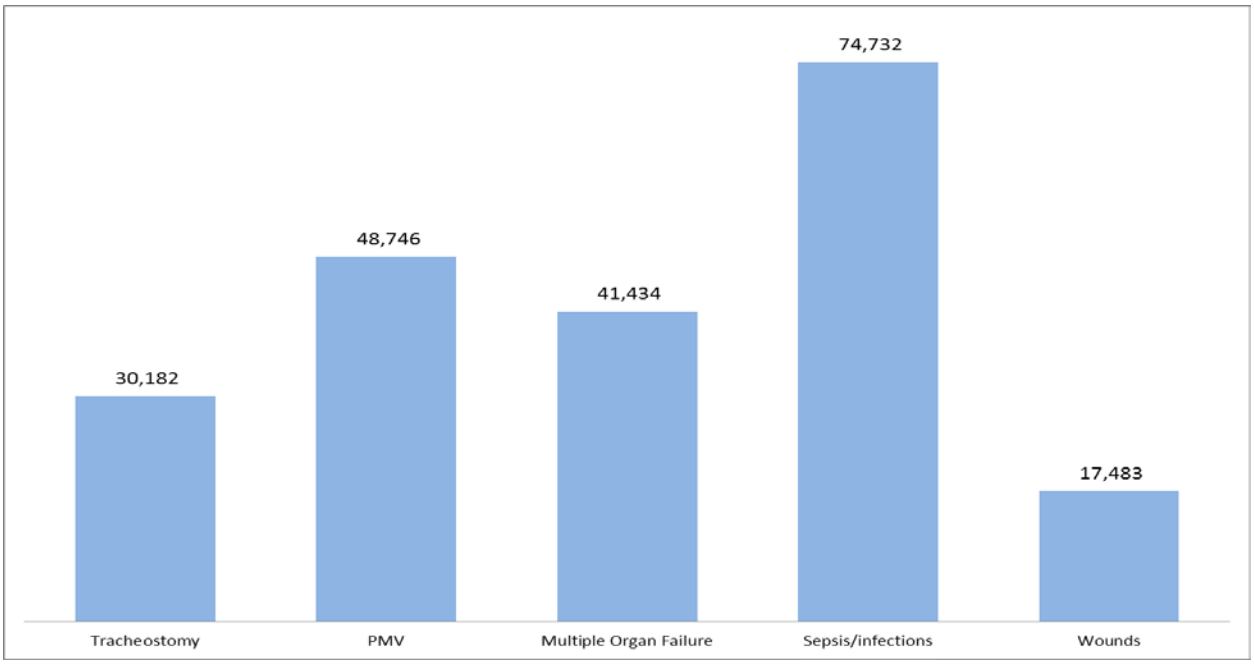
ACH MS-DRG	Total	Percent of total	N CCI/MC	Percent of CCI/MC (column)	Percent meeting CCI/MC definition (row)
All MS-DRGs	10,925,559	100.0	268,319	100.0	2.5
871: Septicemia w/o MV 96+ hours w MCC	313,479	2.9	33,065	12.3	10.5
207: Respiratory system diagnosis w ventilator support 96+ hours	34,020	0.3	23,105	8.6	67.9
003: ECMO or trach w MV 96+ hrs or PDX exc face, mouth & neck w maj O.R.	19,762	0.2	18,734	7.0	94.8
004: Trach w MV 96+ hrs or PDX exc face, mouth & neck w/o maj O.R.	20,615	0.2	18,389	6.9	89.2
870: Septicemia w MV 96+ hours	27,047	0.2	18,182	6.8	67.2
329: Major small & large bowel procedures w MCC	48,646	0.4	15,244	5.7	31.3
853: Infectious & parasitic diseases w O.R. procedure w MCC	43,499	0.4	13,184	4.9	30.3
177: Respiratory infections & inflammations w MCC	80,454	0.7	9,590	3.6	11.9
291: Heart failure & shock w MCC	244,823	2.2	8,706	3.2	3.6
208: Respiratory system diagnosis w ventilator support <96 hours	71,129	0.7	4,854	1.8	6.8

NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care hospital; MCC, major complication or comorbidity; MV, mechanical ventilation; ECMO, extra corporeal membranous oxygen; MS-DRG, Medicare Seventy Diagnosis-related Group, O.R., operating room; PDX, primary diagnosis. Includes all discharges (live and dead).

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

We examined which of the five CCI/MC conditions discussed in Chapter 1 was associated with each CCI/MC discharge and found that over one-third of all the live CCI/MC discharges in 2010 were sepsis/infections patients (see ***Figure 2-1***).[9] Another 14 percent of the CCI/MC who were discharged alive from an ACH were tracheostomy cases and approximately 23 percent were prolonged mechanical ventilation cases. Multiple organ failure (MOF) CCI/MC cases accounted for about one-fifth of the CCI/MC live discharges. The most common conditions for MOF cases were respiratory and kidney failures, heart and kidney failures, and heart and respiratory failures. CCI/MC patients with wounds comprised the remaining eight percent of CCI/MC discharges.

Figure 2-1
Number of live CCI/MC discharges from Acute Care Hospitals, by condition, 2010



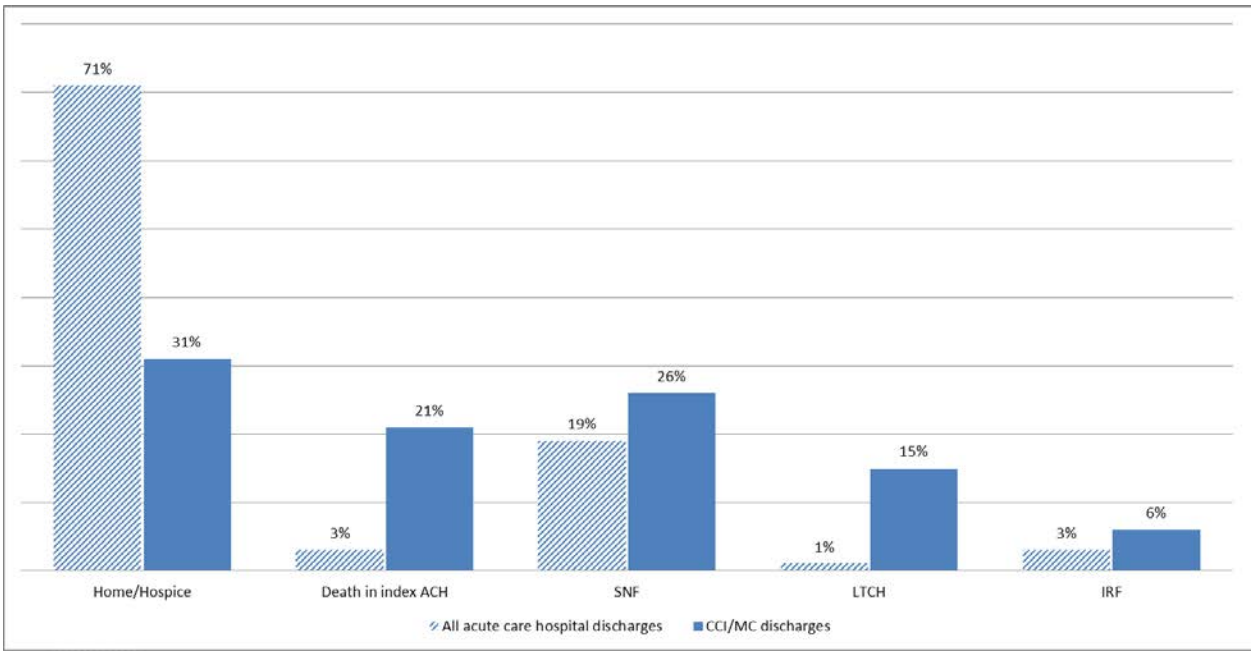
NOTE: CCI/MC, chronically critically ill or medically complex; PMV, prolonged, mechanical ventilation. The following hierarchy was used to classify discharges: tracheostomy, PMV, MOF, sepsis, and wounds.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

9 We used a hierarchical approach for classifying CCI/MC cases to address instances where a patient meets the diagnosis criteria for more than one CCI/MC condition. We first identified all tracheostomy cases. Among the non-tracheostomy cases, we then identified prolonged mechanical ventilation (PMV) patients. Among the non-PMV, non-tracheostomy patients, we then identified multiple organ failure cases. Using this hierarchical approach we then identified sepsis and wounds patients.

Discharge destinations. We identified the subsequent claim following an ACH discharge and found that for all ACH discharges, including both the CCI/MC and the non-CCI/MC, the majority (71 percent) were discharged home either with home health care, outpatient therapy, hospice, or no continued post-acute care (see ***Figure 2-2***). Among the remaining one-quarter of all hospital discharges, 25 percent were discharged to another facility; about 19 percent were discharged to a SNF, 3 percent to an IRF, 2 percent to another acute hospital, and 1 percent to a LTCH. Three percent died in the hospital. This distribution of discharge destinations is markedly different for the subpopulation defined by CCI/MC. Only 31 percent of the CCI/MC were discharged home, 21 percent of the CCI/MC died in the hospital, and 49 percent were transferred to other facility-based settings (26 percent of the CCI/MC were discharged to a SNF, 15 percent to an LTCH, 6 percent to an IRF, and 2 percent were readmitted to another acute care hospital). The finding that about one-half of all CCI/MC discharges continue to receive further facility-based care is an indication of the severity of illness among these patients.

Figure 2-2
Discharge destinations from the Acute Care Hospital for the CCI/MC and all discharges, 2010 (percent of acute care hospital discharges to each setting)



NOTE: ACH, acute care hospital, CCI/MC, chronically critically ill or medically complex; SNF, skilled nursing facility; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

Discharges to other facilities from the acute care hospital. Although about one-half of CCI/MC discharges are to other facility-based settings, there is a great deal of variation in the type of follow-on care. One source of this variation is the type of MS-DRG. Over one-half of the tracheostomy cases (MS-DRGs 003 and 004) were discharged to LTCHs (see ***Table 2-2***), about 11 percent to SNFs, and about 5 percent to IRFs. In contrast, only nine percent of the CCI/MC discharged with one of the other eight most common non-tracheostomy MS-DRGs were discharged to LTCHs. In these other eight MS-DRGs, 30 percent of the CCI/MC discharges were discharged to SNFs and 4 percent were discharged to IRFs (see ***Figure 2-3***). Thus, SNFs admitted the largest number of CCI/MC discharges from acute care hospitals in each MS-DRG with the exception of tracheostomy cases where LTCHs admitted four times as many CCI/MC patients as SNFs.

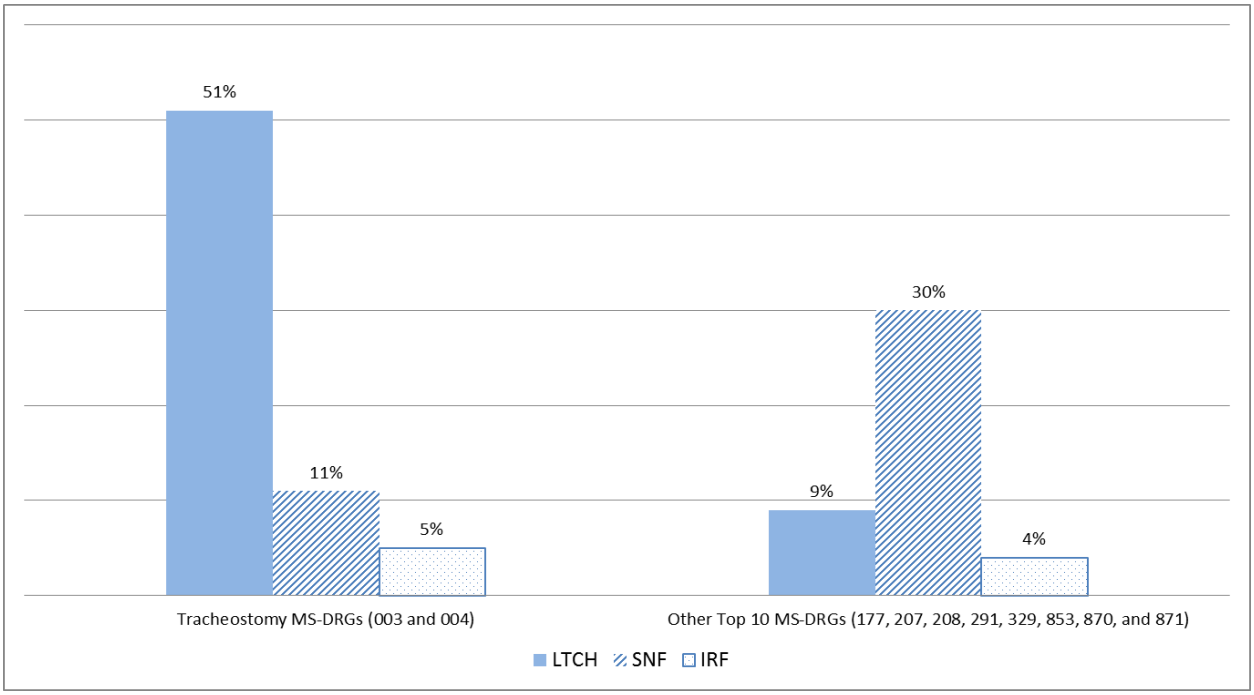
Table 2-2
Discharge destination from Acute Care Hospitals for the CCI/MC, by MS-DRG, 2010

		Percentage of CCI/MC Discharges to:			
MS-DRG	Number CCI/MC discharges	LTCH	SNF	IRF	Any facility-based setting
003	18,734	48	11	7	66
004	18,389	55	12	3	69
207	23,105	10	22	4	36
870	18,182	10	21	3	34
329	15,244	10	32	7	49
853	13,184	14	30	5	49
177	9,590	6	37	3	46
871	33,065	7	36	3	46
208	4,854	6	29	5	41
291	8,706	5	31	3	40

NOTE: MS-DRGs 003 and 004 are tracheostomy DRGs. CCI/MC, chronically critically ill or medically complex; MS-DRG, Medicare severity diagnosis-related group; LTCH, long-term care hospital; SNF, skilled nursing facility; IRF, inpatient rehabilitation facility. Includes only live discharges.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

Figure 2-3
Discharge destination of the CCI/MC, by selected MS-DRGs, 2010



NOTE: CCI/MC, chronically critically ill or medically complex; MS-DRG, Medicare severity diagnosis-related group; LTCH, long-term care hospital; SNF, skilled nursing facility; IRF, inpatient rehabilitation facility.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

The characteristics of the CCI/MC who are transferred to LTCHs differ considerably by condition type. Consistent with the findings on MS-DRGs, we determined that over 60 percent of live CCI/MC tracheostomy discharges are transferred to LTCHs while 15 percent or less of the patients in the other four conditions types are transferred to LTCHs (see ***Table 2-3***). Within each condition type, the average length of the SNF and LTCH stays is similar, although the average length of stay is about 5-10 percent longer in LTCHs for tracheostomy and PMV patients (see ***Table 2-3***). The ACH length of stay was similar for all conditions except for tracheostomy where the mean ACH length of stay was 42 days for patients discharged to SNF compared to 26 days for patients discharged to LTCH. One major difference between CCI/MC patients discharged to SNFs and LTCHs is that the Medicare LTCH payments are substantially higher than the Medicare SNF payments. Even though the lengths of the LTCH and SNF stays are similar across all five major conditions, the Medicare LTCH payments are at least three times as high as the Medicare SNF payments. Part of these differences may reflect the underlying patient care requirements of the patients. They also reflect different Medicare reimbursement rates.

Table 2-3
Discharge destinations for live CCI/MC ACH discharges, by condition, 2010

Condition	CCI/MC live discharges	% of CCI/MC live discharges to:		ACH ALOS for discharges to:		ALOS for discharges to:		Average Medicare payment for discharges to:	
		SNF	LTCH	SNF	LTCH	SNF	LTCH	SNF	LTCH
Tracheostomy	30,184	14%	63%	42.0	26.0	32.2	35.7	$12,521	$59,057
PMV	48,746	33%	15%	21.4	18.8	27.4	29.1	$10,257	$42,166
MOF	41,434	35%	9%	18.2	20.3	25.3	24.9	$9,522	$32,234
Sepsis	74,732	39%	9%	17.0	18.9	28.0	26.2	$9,996	$32,374
Wounds	17,483	39%	11%	18.5	19.6	27.9	28.6	$10,189	$32,704

NOTE: CCI/MC, chronically critically ill or medically complex; MS-DRG, Medicare severity diagnosis-related group; ACH, acute care hospital; LTCH, long-term care hospital; SNF, skilled nursing facility; IRF, inpatient rehabilitation facility; ALOS, average length of stay; PMV, prolonged mechanical ventilation; trach, tracheostomy; MOF, multiple organ failure. The SNF and LTCH average length of stay (ALOS) values exclude days in the prior acute care hospital stay. The following hierarchy was used to classify discharges: tracheostomy, PMV, MOF, sepsis, and wounds.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute hospital discharges (ACH) include critical access hospitals.

Episodes of care. We also looked at the episodes of care for the CCI/MC. We defined an episode to include the days from the patient's first hospitalization in FY10 (which we called the index hospitalization), any days from subsequent transfers to other acute care hospitals, and any days from the first post-acute care (PAC) transfer to SNF, IRF, or LTCH. Note that subsequent transfers to ACHs or other PAC settings may occur after the first transfer, but these subsequent transfers were excluded. If a transfer to a SNF, IRF, or LTCH did not occur, then the episode included only the index ACH hospitalization and any subsequent transfer to another acute care hospital.

We found that almost one-fifth (18.2 percent) of the CCI/MC had extremely high resource use as evidenced by the fact that they had 14 or more days of critical care and an episode length of stay of 40 days or more (see ***Table 2-4***). Over one quarter (26.6 percent) of the CCI/MC had 40 or more episode days and almost half (45.8 percent) had 14 or more CCU days in the episode, indicating that most of the CCI/MC have extended hospital stays and extensive critical care stays. In contrast, close to 85 percent of the non-CCI/MC had episodes with 1-19 days (compared to 42 percent of the CCI/MC) and over 64 percent of the non-CCI/MC had no critical care use (see Table 19). Only 0.2 percent of the non-CCI/MC had 14 or more critical care days and 40 or more episode days (vs. 18.2 percent of the CCI/MC). Tables 2-4 and ***2-5*** indicate that the CCI/MC definition does a good job of distinguishing between patients with long hospital stays and extensive critical care use during their episode of care and those that do not.

Table 2-4
Distribution of critical care days and episode days for the CCI/MC population, 2010

	Critical care days		
Episode days	8-13	14+	Row total
1-19	33.0%	9.2%	42.1%
20-39	12.8%	18.5%	31.3%
40+	8.5%	18.2%	26.6%
Column Total	54.2%	45.8%	100.0%

NOTE: Episode days include index admissions at acute care, critical access, or rural hospitals and additional admission days from acute care, critical access, or rural hospitals and LTCH, IRF, and SNF stays immediately following an acute hospitalization. Critical care days are measured for the index admission.

CCI/MC, chronically critically ill or medically complex.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. N=267,560.

Table 2-5
Distribution of critical care days and episode days for the Non-CCI/MC population, 2010

	Critical care day					
Episode days	0	1-2	3-7	8-13	14+	Row total
1-19	54.8%	14.6%	13.3%	1.8%	0.3%	84.8%
20-39	5.4%	0.9%	1.9%	0.6%	0.4%	9.1%
40+	3.9%	0.6%	1.2%	0.3%	0.2%	6.1%
Column Total	64.1%	16.0%	16.4%	2.7%	0.9%	100.0%

NOTE: Episode days include index admissions at acute, critical access, or rural hospitals and additional admission days from acute, critical access, or rural hospitals and LTCH, IRF, and SNF stays immediately following an acute hospitalization. Critical care days are measured for the index admission. CCI/MC, chronically critically ill or medically complex.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. N=267,560.

Median episode length and payments for the CCI/MC by condition are shown in ***Table 2-6***. Tracheostomy episodes had the longest median episode length (47 days), the longest median CCU days (23 days), and the highest median Medicare payments ($126,924). Median episode and CCU days were similar for the other CCI/MC conditions, ranging from a median of

11-13 CCU days and a median of 20-24 days for episode length. Median episode payments were higher for PMV and wounds patients than for MOF and sepsis patients.

Table 2-6
Median episode length and Medicare payments for the CCI/MC, by condition, 2010

Condition	Episodes	Median CCU days	Median episode days	Median episode payment
Tracheostomy	36,988	23	47	$126,924
PMV	74,418	13	20	$39,734
MOF	51,083	12	20	$24,990
Sepsis	86,413	11	21	$23,131
Wounds	18,658	12	24	$35,038
Total	267,560	13	23	$36,161

NOTE: Episode days include index admissions at acute, critical access, or rural hospitals and additional admissions from acute, critical access, rural hospitals, and LTCH, IRF, and SNF stays immediately following an acute hospitalization. Episodes include both live discharges and discharges upon death. Critical care unit (CCU) days are measured for the index admission. The following hierarchy was used to classify episodes: tracheostomy, PMV, MOF, sepsis, and wounds. CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation; MOF, multiple organ failure; CCU days, critical care unit days.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample.

Death rates. The CCI/MC have much higher death rates than the non-CCI/MC during their episode of care (see ***Table 2-7***). We found that one in four CCI/MC patients die during an episode of care, while only one in twenty-five non-CCI/MC patients dies during an episode. One explanation for the higher death rates of the CCI/MC is that they have longer stays and more critical care days. However, even among those patients with extended critical care stays, the CCI/MC have death rates that are much higher than among the non-CCI/MC, another indication of the severity of illness among the CCI/MC.

Outliers. The CCI/MC are also much more likely to be considered high-cost outliers under Medicare's IPPS payment system. This occurs primarily because the CCI/MC have longer acute care hospital stays. We found that 26.4 percent of index acute care hospitalizations for the CCI/MC were outliers compared to 1.3 percent of the ACH hospitalizations for the non-CCI/MC (***Table 2-8***).

Table 2-7
Percent dying during episodes for the CCI/MC and non CCI/MC, by number of critical care unit days in the ACH

Critical care unit days	CCI/MC	Non CCI/MC
0	—	2.6
1-2	—	6.9
3-7	—	6.1
8-13	23.2	5.8
14+	28.1	10.7
Total	25.4	4.0
N =	267,560	10,646,133

NOTE: Episode days include index admissions from acute, critical access, or rural hospitals and additional admissions from acute, critical access, rural hospitals, and LTCH, IRF, and SNF stays immediately following an acute care hospitalization. CCI/MC patients must have at least 8 critical care unit days. ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; N, number of discharges.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute hospital discharges include critical access hospitals.

Table 2-8
Outlier Status Of Index ACH Admissions for the CCI/MC

Population	Percent outliers
CCI/MC	26.4
Non CCI/MC	1.3

NOTE: CCI/MC, chronically critically ill or medically complex; ACH, acute care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. For this analysis, the sample was limited to IPPS admissions. For the CCI/MC population, N=262,165 and for the Non CCI/MC, N=9,984,582.

2.2.1 Differences Between CCI/MC Populations Discharged to LTCH or Not

Acute care hospital use. Among the 212,577 CCI/MC who were discharged alive in 2010 from an acute care hospital, we found that 18.3 percent were discharged to an LTCH (***Table 2-9***). On average, the CCI/MC discharged to an LTCH have longer ACH lengths of stay (22.5 days compared to 18.9 days) and longer critical care stays prior to discharge (19.8 days v. 14.8 days) compared to those not discharged to LTCHs. As discussed above, these differences vary by type of condition, however, as does the likelihood of being discharged to an LTCH.

Table 2-9
Acute Care Hospital length of stay and medicare payments for the CCI/MC, by LTCH transfer status

Utilization	No LTCH transfer	Transfer to LTCH
All CCI/MC (N=212,577)		
N	173,588	38,989
Percent	81.7	18.3
Mean Length of ACH Stay (days)	18.9	22.5
Mean Critical Care Unit Days	14.8	19.8
Mean ACH Medicare Payment	$34,849	$61,822
CCI/MC: Tracheostomy (N=30,182)		
N	11,078	19,104
Percent	36.7	63.3
Mean Length of ACH Stay (days)	38.2	26.0
Mean Critical Care Unit Days	29.4	24.0
Mean ACH Medicare Payment	$113,877	$88,857
CCI/MC: PMV (N=48,746)		
N	41,310	7,436
Percent	84.7	15.3
Mean Length of ACH Stay (days)	19.5	18.8
Mean Critical Care Unit Days	15.1	16.3
Mean ACH Medicare Payment	$39,674	$39,867
CCI/MC: Multiple Organ Failure (N=41,434)		
N	37,860	3,574
Percent	91.4	8.6
Mean Length of ACH Stay (days)	17.0	20.3
Mean Critical Care Unit Days	13.8	16.7
Mean ACH Medicare Payment	$26,793	$36,559
CCI/MC: Sepsis/Infection (N=74,732)		
N	67,721	7,011
Percent	90.6	9.4
Mean Length of ACH Stay (days)	16.5	18.9
Mean Critical Care Unit Days	13.2	15.2
Mean ACH Medicare Payment	$24,258	$31,549

(continued)

Table 2-9 (continued)
Acute Care Hospital length of stay and medicare payments for the CCI/MC, by LTCH transfer status

Utilization	No LTCH transfer	Transfer to LTCH
CCI/MC: Wounds (N=17,483)		
N	15,619	1,864
Percent	89.3	10.7
Mean Length of ACH Stay (days)	17.9	19.6
Mean Critical Care Unit Days	13.6	15.0
Mean ACH Medicare Payment	$31,486	$34,622

NOTE: CCI/MC, chronically critically ill or medically complex; N, number of discharges; ACH, acute care hospital; LTCH, long-term care hospital; PMV, prolonged mechanical ventilation. Includes only live discharges from ACHs. The following hierarchy was used to classify discharges: tracheostomy, PMV, MOF, sepsis, and wounds.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute hospital discharges include critical access hospitals.

We found other condition-specific differences in utilization. The respiratory cases tended to be discharged earlier to an LTCH although their length of stay in the CCU varied by whether they were on a ventilator or had a tracheostomy. While both tracheostomy and PMV cases had shorter ACH lengths of stay if they were discharged to an LTCH, PMV cases tended to have longer CCU stays while trach cases had shorter CCU stays. In contrast, the non-respiratory CCI/MC cases transferred to LTCHs tend to have longer ACH lengths of stay and more critical care days prior to discharge to an LTCH.

Differences by state. These patterns differ in areas with high numbers of LTCHs (***Table 2-10***). We defined 11 states as "high-LTCH" states: TX, LA, OK, MA, ID, CO, UT, MS, NV, CT, and DC because they had a high number of LTCHs per capita and at least 100 LTCH beds.[10] We found that the high-LTCH areas tend to have higher proportions of the CCI/MC population discharged to LTCHs (32 percent of the CCI/MC cases compared to only 15 percent in the other states). All five of the CCI/MC conditions showed a higher rate of LTCH transfer within the high-LTCH states (see ***Figure 2-4***). The LTCH transfer rates are higher by a factor of three for sepsis, MOF, and wound cases, and about 2.5 times higher for PMV cases. In both high and low-LTCH states, the transfer rate for tracheostomy cases was at least 60 percent. We also found that the CCI/MC cases in high-LTCH areas tend to have shorter acute care hospital stays than those in the other states (20.4 days compared to 23.5 days, respectively) suggesting that patients are transferred to an LTCH earlier in their episode in the high-LTCH areas (see

[10] High-LTCH states includes those with over 100 LTCH beds per 1,000 Medicare beneficiaries. Excludes small states with a high ratio of beds to Medicare beneficiaries but a low overall number of patients.

Figure 2-5). In part due to these shorter average lengths of stay, the average ACH Medicare payments were also lower in the high-LTCH states for the CCI/MC patients transferred to LTCHs. The average payment differences ranged from about 4 percent lower for tracheostomy patients to 14 percent lower for sepsis patients (see ***Figure 2-6***).

Table 2-10
Acute Care Hospital length of stay and Medicare payments for the CCI/MC in high-LTCH areas, by LTCH transfer status

Utilization	No LTCH transfer	Transfer to LTCH
All CCI/MC (N=37,784) N	25,604	12,180
Percent	67.8	32.2
Mean Length of ACH Stay (days)	17.8	20.4
Mean Critical Care Unit Days	14.1	17.7
Mean ACH Medicare Payment	$31,401	$52,096
CCI/MC: Tracheostomy (N=5,637) N	1,257	4,380
Percent	22.3	77.7
Mean Length of ACH Stay (days)	34.2	24.7
Mean Critical Care Unit Days	26.7	22.8
Mean ACH Medicare Payment	$103,784	$85,806
CCI/MC: PMV (N=9,346) N	6,513	2,833
Percent	69.7	30.3
Mean Length of ACH Stay (days)	18.7	17.7
Mean Critical Care Unit Days	14.5	15.2
Mean ACH Medicare Payment	$36,312	$37,347
CCI/MC: Multiple Organ Failure (N=7,441 N	5,965	1,476
Percent	80.2	19.8
Mean Length of ACH Stay (days)	16.5	18.7
Mean Critical Care Unit Days	13.5	15.5
Mean ACH Medicare Payment	$26,115	$33,637
CCI/MC: Sepsis/Infection (N=12,701) N	9,888	2,813
Percent	77.9	22.1
Mean Length of ACH Stay (days)	15.9	17.6
Mean Critical Care Unit Days	12.8	14.3

(continued)

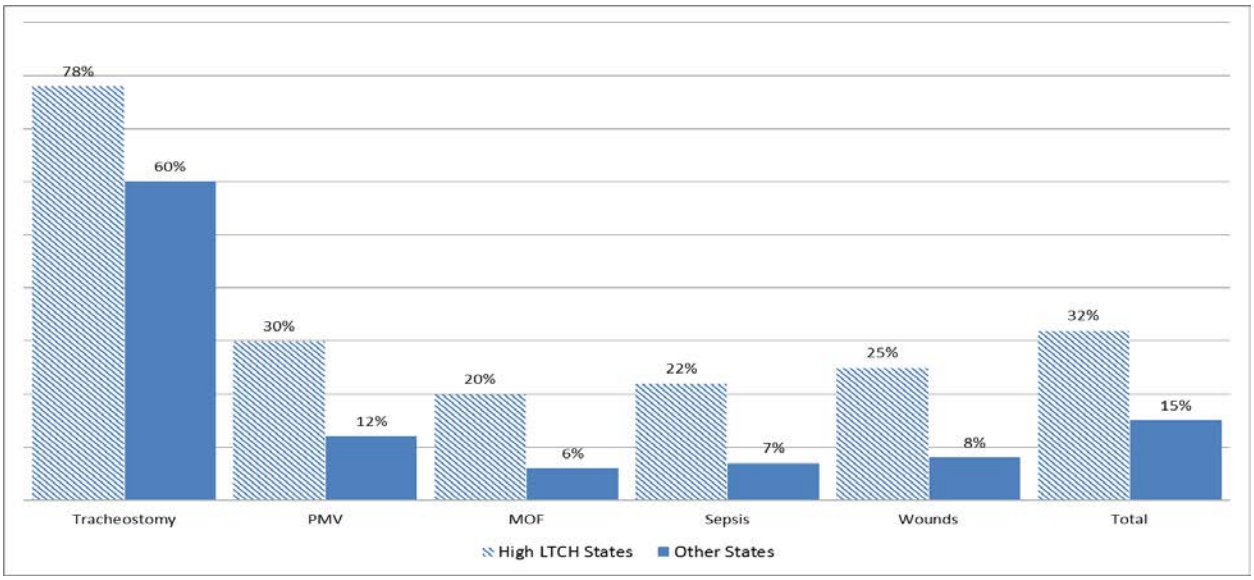
Table 2-10 (continued)
Acute Care Hospital length of stay and Medicare payments for the CCI/MC in high-LTCH areas, by LTCH transfer status

Utilization	No LTCH transfer	Transfer To LTCH
Mean ACH Medicare Payment	$22,456	$28,698
CCI/MC: Wounds (N=2,659)		
N	1,981	678
Percent	74.5	25.5
Mean Length of ACH Stay (days)	17.2	18.3
Mean Critical Care Unit Days	13.0	14.1
Mean ACH Medicare Payment	$29,892	$33,211

NOTE: CCI/MC, chronically critically ill or medically complex; N, number of discharges; ACH, acute care hospital; LTCH, long-term care hospital; PMV, prolonged mechanical ventilation. Includes only live discharges from ACHs. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District of Columbia, and Connecticut. The following hierarchy was used to classify discharges: tracheostomy, PMV, MOF, sepsis, and wounds.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute hospital discharges include critical access hospitals.

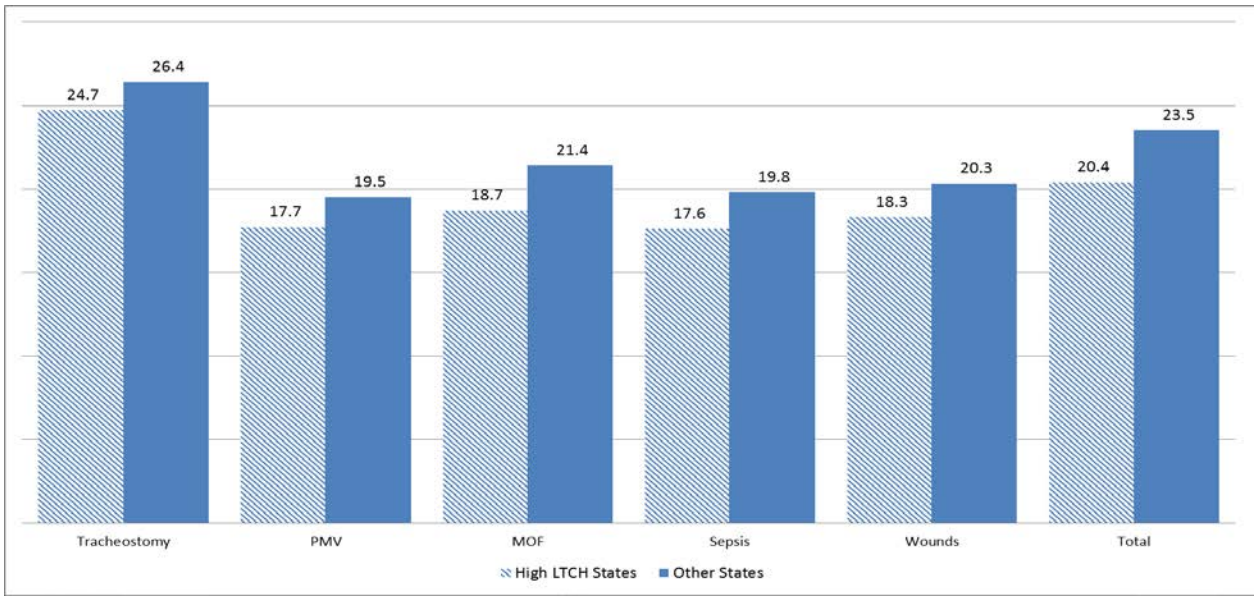
Figure 2-4
LTCH transfer rates for the CCI/MC were much higher in states with a high number of LTCHs, 2010



NOTE: CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation; MOF, multiple organ failure; LTCH, long-term care hospital. Includes only live discharges from ACHs. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District of Columbia, and Connecticut. The following hierarchy was used to classify discharges: tracheostomy, PMV, MOF, sepsis, and wounds.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

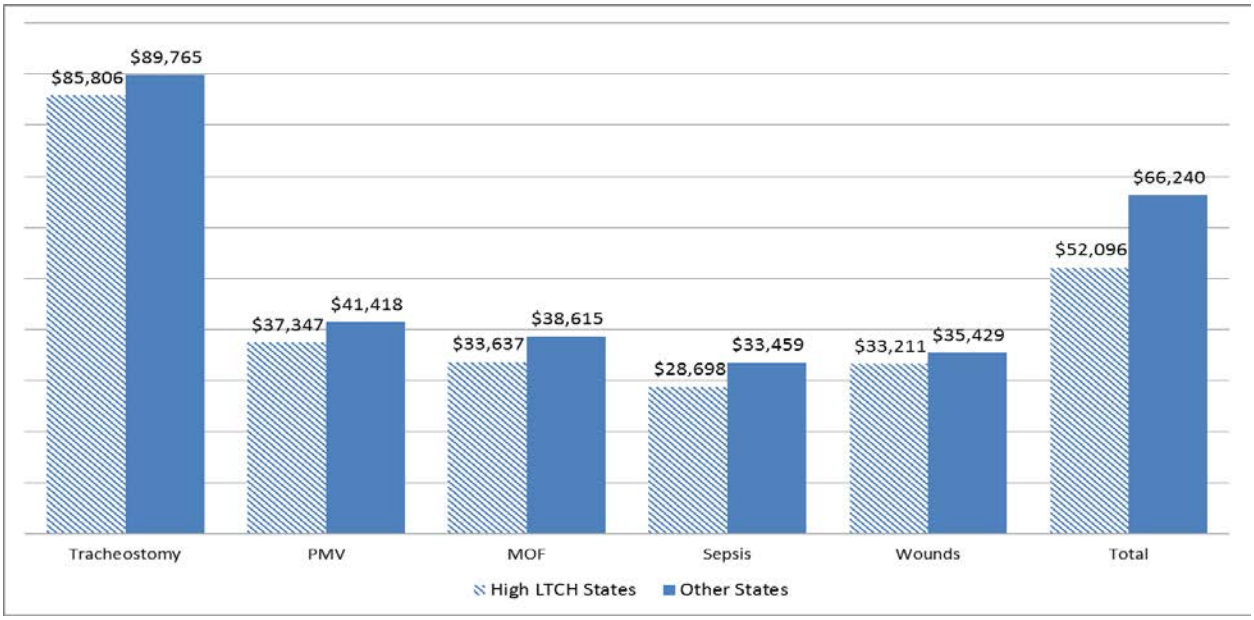
Figure 2-5
Average ACH length of stay for the CCI/MC transferred to LTCHs was shorter in states with a high number of LTCHs, 2010



NOTE: ACH, acute care hospital; LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation; MOF, multiple organ failure. Includes only live discharges from ACHs. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District of Columbia, and Connecticut. The following hierarchy was used to classify discharges: tracheostomy, PMV, MOF, sepsis, and wounds.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

Figure 2-6
Average ACH Medicare Payments for the CCI/MC Transferred to LTCHs, by Condition 2010



NOTE: CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation; MOF, multiple organ failure; ACH, acute care hospital; LTCH, long-term care hospital. Includes only live discharges from ACHs. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District of Columbia, and Connecticut. The following hierarchy was used to classify discharges: tracheostomy, PMV, MOF, sepsis, and wounds.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

We also found differences in transfer rates by MS-DRG between the high-LTCH states and the other states (***Table 2-11***):

- For the two tracheostomy MS-DRGs (003 and 004), almost two-thirds of discharges were to LTCHs in the high-LTCH states and about one-half were to LTCHs in the other states. There was a large difference in the discharge rate to SNFs: about 13 percent of discharges in the "other states" (the non-high-LTCH states) were to SNFs while only 5 percent were discharged to SNFs in the high-LTCH states.

- For the most frequent non-trach MS-DRGs, the differences were more pronounced:

  – in the high-LTCH states, about 20 percent of the CCI/MC discharges were transferred to LTCHs and about 22 percent to SNFs (roughly equal percentages);

– in the other states, only 6 percent of the CCI/MC discharges with these MS-DRGs were transferred to LTCHs and 31 percent were transferred to SNFs.

Table 2-11
Differences in LTCH and SNF transfer rates by state and MS-DRG for the CCI/MC, 2010

	Trach MS-DRGs		Other Top-10 MS-DRGs	
Transfer rates to:	High-LTCH states	Other states	High-LTCH states	Other states
LTCH	65%	48%	19%	6%
SNF	5%	13%	22%	31%
IRF	3%	5%	5%	5%
Total	73%	66%	46%	42%

NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; SNF, skilled nursing facility; IRF, inpatient rehabilitation facility; MS-DRGs, Medicare severity diagnosis-related groups; trach, tracheostomy. Trach MS-DRGs are 003 and 004. The other top 10 MS-DRGs are 177, 207, 208, 291, 329, 853, 870, and 871. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District of Columbia, and Connecticut.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

We also found that a higher proportion of the CCI/MC with these ten MS-DRGs was discharged from an acute care hospital to further facility-based care in the high-LTCH states.

2.3 The CCI/MC in LTCHs

Among the 121,909 LTCH admissions in 2010, only 32 percent met the CCI/MC definition (see ***Table 2-12***). We found large differences between the CCI/MC and non-CCI/MC LTCH users:

- the CCI/MC LTCH users had much longer ACH lengths of stay than the non-CCI/MC LTCH users (22.5 days vs. 9.5 days) and much longer critical care stays (18.5 days vs. 3.6 days);
- the LTCH stays for the CCI/MC were about 25 percent longer than for the non-CCI/MC (31.8 days vs. 25.5 days) and their Medicare payments were about 60 percent higher;
- the readmission rates were similar for the CCI/MC and the non-CCI/MC; and
- the death rates were higher for the CCI/MC.

Table 2-12
Acute Care Hospital and LTCH use for LTCH Users, by CCI/MC status, 2010

Utilization	CCI/MC	Not CCI/MC
N	39,010	82,899
Percentage of LTCH Admissions	32.0	68.0
Mean ACH Length of Stay (days)	22.5	9.5
Mean ACH Critical Care Unit Days	18.5	3.6
Mean ACH Medicare Payment	$61,891	$15,140
Mean LTCH Length of Stay (days)	31.8	25.5
Mean LTCH Medicare Payment	$48,526	$30,558
Percent Readmitted to ACH within 90 days of ACH discharge	41.4	40.8
Percent Dying within 60 days of ACH discharge	32.1	23.9

NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; ACH, acute care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

This suggests that the CCI/MC definition distinguishes between LTCH cases in terms of expected length of stay and Medicare payments. Not only do the CCI/MC have longer lengths of stay and higher Medicare payments in acute care hospitals, but they also have longer stays and higher payments in LTCHs.

MS-LTC-DRGs for CCI/MC. The most common MS-LTC-DRGs for the CCI/MC in LTCHs differ from the MS-DRGs for the CCI/MC in acute care hospitals (compare ***Tables 2-13*** and ***2-1***). However, six DRGs were among the 10 most common DRGs for the CCI/MC in both the acute care hospital and LTCH settings (DRGs 207, 208, 871, 177, 870, and 004). Respiratory conditions accounted for almost all of the top 10 MS-LTC-DRGs in FY 2010; the exceptions were infections and some complicated medical cases. MS-LTC-DRG 207 accounted for over one-third of the LTCH CCI/MC cases followed by MS-LTC-DRG 189, which accounted for about 13 percent of the LTCH CCI/MC cases. Together, these two MS-LTC-DRGs accounted for about one-half of all the CCI/MC admissions to LTCHs.

While these MS-LTC-DRGs are common across the five major CCI/MC condition types, other types of MS-LTC-DRGs also appear among the 10 most common within certain condition groups (results not shown). Among the CCI/MC with multiple organ failure in the LTCH, MS-LTC-DRG 682: Renal failure with MCC was the third most frequent MS-LTC-DRG, accounting for 5.1 percent of the multiple organ failure cases. Wound cases in particular have a different set of common MS-LTC-DRGs with MS-LTC-DRG 949: Aftercare with CC/MCC accounting for 9.7 percent of these cases, MS-LTC-DRG 592: skin ulcers with MCC accounting for 6.8 percent

of cases, and other complicating conditions, such as MS-LTC-DRG 539: Osteomyelitis with MCC, accounting for 4.4 percent of these cases.

Table 2-13
Top 10 MS-LTC-DRGs for CCI/MC discharged to LTCH, 2010

MS-LTC-DRG	N	Percent	Cumulative percent
207: Respiratory system diagnosis w ventilator support 96+ hours	13,050	33.5	33.5
189: Pulmonary edema & respiratory failure	4,902	12.6	46.0
208: Respiratory system diagnosis w ventilator support <96 hours	2,017	5.2	51.2
871: Septicemia w/o MV 96+ hours w MCC	1,829	4.7	55.9
166: Other resp system O.R. procedures w MCC	1,262	3.2	59.1
177: Respiratory infections & inflammations w MCC	1,109	2.8	62.0
870: Septicemia w MV 96+ hours	1,095	2.8	64.8
004: Trach w MV 96+ hrs or PDX exc face, mouth & neck w/o maj O.R.	788	2.0	66.8
949: Aftercare w CC/MCC	758	1.9	68.8
919: Complications of treatment w MCC	576	1.5	70.2

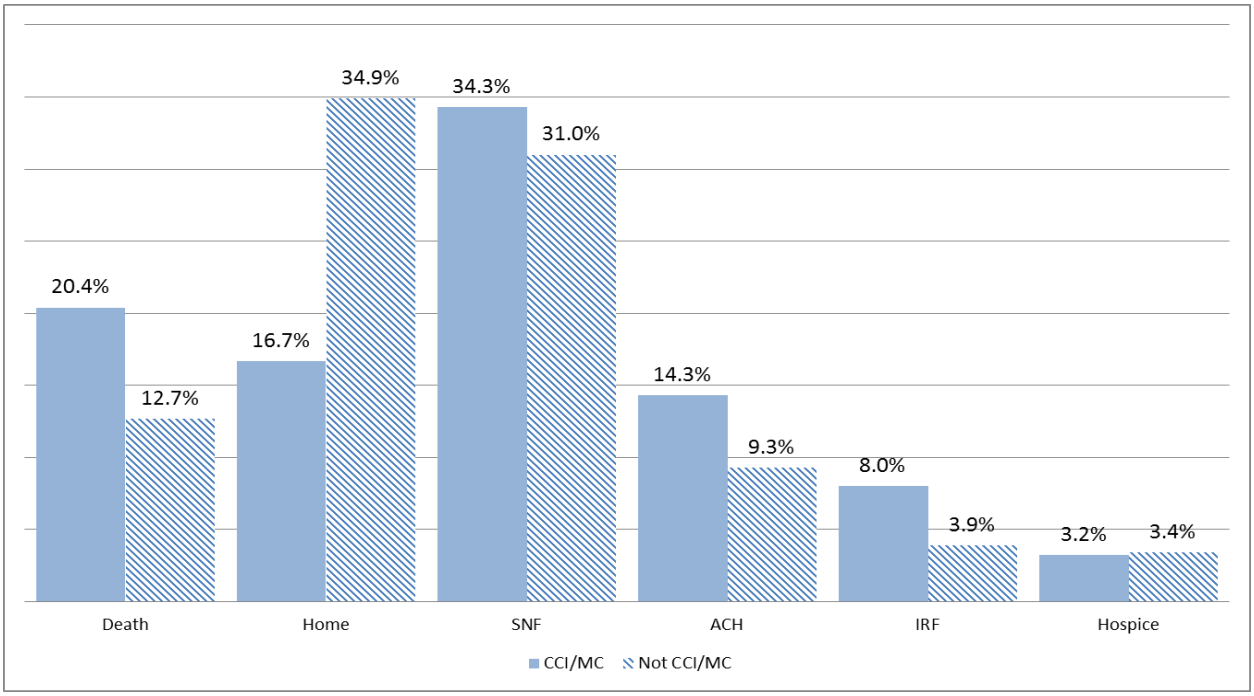
NOTE: CCI/MC, chronically critically ill or medically complex; MS-LTC-DRGs, Medicare seventy long-term care diagnosis-related group; MV, mechanical ventilation; MCC, major complication or comorbidity; CC , complication or comorbidity; PDX, primary diagnosis; O.R., operating room.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample.

Discharge destinations from the LTCH. The CCI/MC and non-CCI/MC LTCH patients differ in terms of their discharge destinations from the LTCH (see ***Figure 2-7***). Among live discharges, the CCI/MC are less than half as likely to be discharged home relative to the non-CCI/MC LTCH users (16.7 percent vs. 34.9 percent). Similarly, while 20.4 percent of the CCI/MC in LTCHs die during their stay, only 12.7 percent of the non-CCI/MC die in the LTCH. A much higher proportion of the CCI/MC continue to need inpatient care after discharge from the LTCH. About 34 percent of the LTCH CCI/MC discharges need continued SNF care, about 14 percent return to an ACH directly from the LTCH, and 8 percent are transferred to an IRF (see Figure 2-7). Over two-third of the LTCH CCI/MC who are discharged alive from the LTCH continue to receive facility-based care while only about one-half of the non-CCI/MC live

discharges continue to receive facility-based care. This is another indication that the CCI/MC definition distinguishes between the most severely ill LTCH patients.

Figure 2-7
Discharge destination of LTCH patients, by CCI/MC status, 2010



NOTE: CCI/MC, chronically critically ill or medically complex; SNF, skilled nursing facility; IRF, inpatient rehabilitation facility; ACH, acute care hospital; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample.

State-level differences in LTCH admissions. The percentage of LTCH admissions that are CCI/MC differs greatly by state. ***Table 2-14*** shows the LTCH transfer rate from ACHs to LTCHs in each state and the proportion of CCI/MC cases in each state's LTCH admissions. Certain states have high numbers of LTCH admissions, including Texas, which has almost three times as many LTCH admissions as California, which is the state with the next highest use of LTCHs (29,065 admissions compared to 11,279 admissions, respectively). Four of the five states with the highest number of LTCH admissions (TX, LA, CA, and MA) admitted over 70 percent non-CCI/MC patients. The one exception was Florida, where the non-CCI/MC constitute only 52 percent of LTCH admissions. The four states with the highest number of LTCH admissions also have high transfer rates (above 1.4 percent). Only four other states (DC, MS, NV, and OK) had LTCH transfer rates above 1.4 percent and they all admitted over 55 percent non-CCI/MC patients.

Table 2-14
LTCH Transfer Rates and CCI/MC Status among LTCH Users, By State

State (provider state)	Total Acute N	Total LTCH N	LTCH Transfer Rate	CCI-MC N	CCI-MC Percent	Not CCI-MC N	Not CCI-MC Percent
Alabama	209,886	1,554	0.7%	594	38.2	960	61.8
Alaska	12,283	148	1.2%	47	31.8	101	68.2
Arizona	163,875	1,528	0.9%	794	52.0	734	48.0
Arkansas	136,906	1,639	1.2%	421	25.7	1,218	74.3
California	754,032	11,279	1.5%	3,312	29.4	7,967	70.6
Colorado	104,436	1,132	1.1%	445	39.3	687	60.7
Connecticut	133,200	657	0.5%	220	33.5	437	66.5
Delaware	37,549	222	0.6%	114	51.4	108	48.6
District of Columbia	32,826	686	2.1%	303	44.2	383	55.8
Florida	769,217	6,226	0.8%	2,987	48.0	3,239	52.0
Georgia	286,757	2,702	0.9%	1,128	41.7	1,574	58.3
Idaho	32,081	453	1.4%	151	33.3	302	66.7
Illinois	530,707	2,712	0.5%	1,554	57.3	1,158	42.7
Indiana	270,227	3,889	1.4%	1,501	38.6	2,388	61.4
Iowa	123,370	378	0.3%	114	30.2	264	69.8
Kansas	114,256	889	0.8%	329	37.0	560	63.0
Kentucky	222,617	1,533	0.7%	674	44.0	859	56.0
Louisiana	175,091	9,056	5.2%	1,305	14.4	7,751	85.6
Maryland	247,529	104	0.0%	25	24.0	79	76.0
Massachusetts	275,597	5,959	2.2%	1,202	20.2	4,757	79.8
Michigan	439,117	4,553	1.0%	1,608	35.3	2,945	64.7
Minnesota	168,496	461	0.3%	261	56.6	200	43.4
Mississippi	149,276	2,414	1.6%	523	21.7	1,891	78.3
Missouri	273,557	2,250	0.8%	1,075	47.8	1,175	52.2
Montana	34,410	201	0.6%	46	22.9	155	77.1
Nebraska	72,473	895	1.2%	306	34.2	589	65.8
Nevada	65,110	2,104	3.2%	830	39.4	1,274	60.6
New Jersey	346,247	1,735	0.5%	973	56.1	762	43.9
New Mexico	48,021	313	0.7%	140	44.7	173	55.3
New York	633,399	1,701	0.3%	146	8.6	1,555	91.4
North Carolina	363,955	1,863	0.5%	813	43.6	1,050	56.4
North Dakota	31,697	235	0.7%	81	34.5	154	65.5
Ohio	439,627	5,854	1.3%	2,465	42.1	3,389	57.9
Oklahoma	154,580	3,541	2.3%	818	23.1	2,723	76.9
Oregon	74,432	161	0.2%	83	51.6	78	48.4
Pennsylvania	466,996	5,322	1.1%	2,088	39.2	3,234	60.8
South Carolina	174,004	1,204	0.7%	494	41.0	710	59.0

(continued)

Table 2-15 (continued)
LTCH Transfer Rates and CCI/MC Status among LTCH Users, By State

State (provider state)	Total Acute N	Total LTCH N	LTCH Transfer Rate	CCI-MC N	CCI-MC Percent	Not CCI-MC N	Not CCI-MC Percent
South Dakota	37,536	102	0.3%	26	25.5	76	74.5
Tennessee	281,572	2,054	0.7%	1,052	51.2	1,002	48.8
Texas	732,590	29,065	4.0%	6,595	22.7	22,470	77.3
Utah	40,555	428	1.1%	134	31.3	294	68.7
Virginia	260,225	895	0.3%	435	48.6	460	51.4
Washington	167,160	207	0.1%	163	78.7	44	21.3
West Virginia	94,057	503	0.5%	289	57.5	214	42.5
Wisconsin	176,682	1,099	0.6%	345	31.4	754	68.6

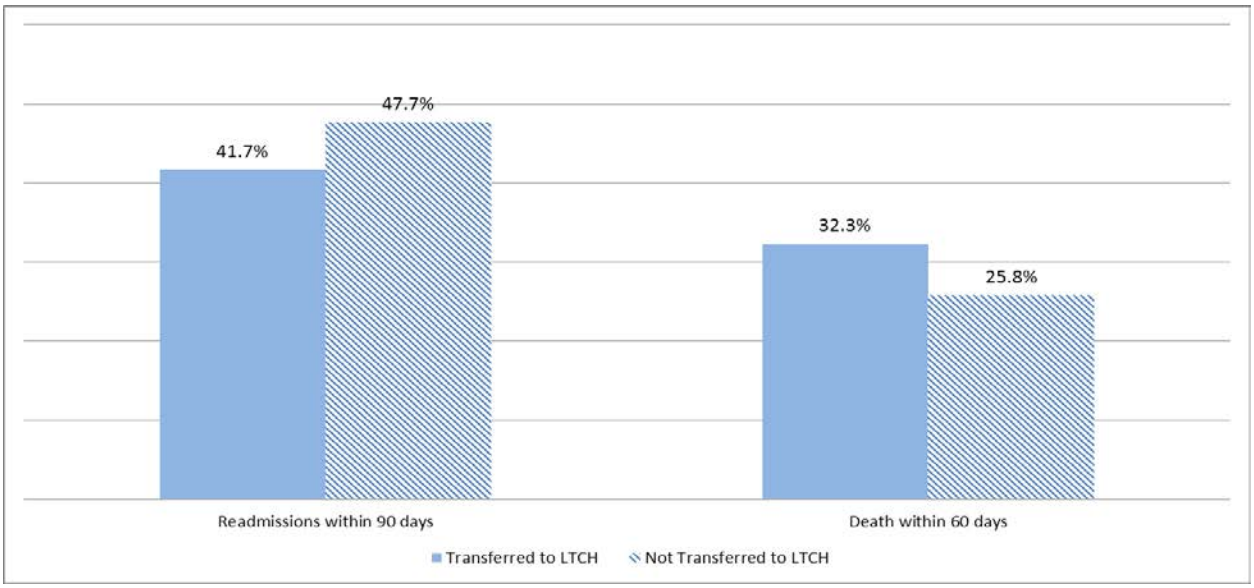
NOTE: Six states (HI, ME, NM, RI, VT and WY) were excluded because they had fewer than 5 LTCH admissions in 2010. ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; N, number of discharges; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute hospital discharges include critical access hospitals.

2.4 Readmission/Deaths Among the CCI/MC

Readmission experience. Is LTCH transfer associated with lower hospital readmissions among the CCI/MC? On average, patients transferred to an LTCH were less likely to be readmitted to an acute care hospital within 90 days of their discharge from the initial acute care hospital stay than those not discharged to an LTCH (see ***Figure 2-8*** and ***Table 2-15***). This was true for all of the CCI/MC condition types except for wounds, where the differences were small (46.2 percent readmitted if discharged to LTCH versus 46.7 percent if not). One possible explanation for the lower readmission rates is that many LTCH patients are still in a hospital (LTCH) for much of the 90-day period and are thus already being treated with hospital-level care. A second explanation is that the clinical characteristics of patients admitted to an acute setting from an LTCH differ from those readmitted from a lower intensity service level. A third explanation for the lower LTCH readmission rates is that cases discharged to an LTCH also were more likely to die within 60 days (see Figure 2-8 and ***Table 2-16***). We found that the same patterns held true in the high-LTCH areas.

Figure 2-8
Readmissions were lower and deaths were higher for CCI/MC live discharge transferred to LTCHs, 2010



NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals.

Table 2-16
Percent of CCI/MC live discharges readmitted to an ACH within 90 days by discharge to LTCH status, 2010

CCI/MC	N	Percent of CCI/MC discharged to LTCH	Percent of CCI/MC discharged to LTCH readmitted within 90 days	Percent of CCI/MC Not discharged to LTCH readmitted within 90 days
All CCI/MC	212,577	18.3	41.7	47.7
Tracheostomy	30,182	63.3	40.9	47.3
PMV	48,746	15.3	40.5	43.3
Multiple Organ Failure	41,434	8.6	44.3	52.3
Sepsis/Infection	74,732	9.4	43.0	48.0
Wounds	17,483	10.7	46.2	46.7

NOTE: Does not include acute care hospital readmissions of three days or less followed by readmission to the same LTCH (LTCH interrupted stay policy). CCI/MC, chronically critically ill or medically complex; N, number of discharges; ACH, acute care hospital; PMV, prolonged mechanical ventilation; LTCH, long-term care hospital. The following hierarchy was used to classify discharges: tracheostomy, PMV, MOF, sepsis, and wounds.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals. CCI/MC death within 60 days = 12,541; CCI/MC survive within 60days = 26,469; non-CCI/MC death within 60 days = 19,811; non-CCI/MC survive within 60 days = 63,088.

Table 2-17
Percent of CCI/MC live discharges dying within 60 days following ACH discharge, by discharge to LTCH status, 2010

CCI/MC	N	Percent of CCI/MC discharged to LTCH	Percent of CCI/MC discharged to LTCH dying within 60 days	Percent of CCI/MC Not discharged to LTCH dying within 60 days
All CCI/MC	212,577	18.3	32.3	25.8
Tracheostomy	30,182	63.3	31.8	26.6
PMV	48,746	15.3	33.6	27.9
Multiple organ failure	41,434	8.6	37.2	26.5
Sepsis/Infection	74,732	9.4	31.8	25.6
Wounds	17,483	10.7	24.9	18.3

NOTE: CCI/MC, chronically critically ill or medically complex; N, number of discharges; ACH, acute care hospital; PMV, prolonged mechanical ventilation; LTCH, long-term care hospital. The following hierarchy was used to classify discharges: tracheostomy, PMV, MOF, sepsis, and wounds.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute hospital discharges include critical access hospitals.

As discussed above, we found lower rates of readmission for CCI/MC patients who were discharged to LTCHs compared to those not discharged to LTCHs (41.7 percent compared to 47.7 percent). ***Table 2-17*** examines both death within 60 days of hospital discharge and readmission within 90 days to answer the question of whether the lower readmission rates in LTCHs are correlated with higher death rates in the LTCH. We found that among the CCI/MC who survived 60 days, the 90-day readmission rate was 48.1 percent, which was almost twice the readmission rate for those who did not die during the 60 day window, suggesting that death had truncated the readmission experience for those in LTCHs.

Table 2-17 also compares the differences between the CCI/MC and non-CCI/MC in LTCHs stratified by death within 60 days. The CCI/MC group consistently has longer acute lengths of stay, longer CCU stays, higher ACH payments, longer LTCH stays, and higher LTCH payments than the non-CCI/MC treated in LTCHs. These differences suggest that the CCI/MC population is more severely ill than the non-CCI/MC population. Looking within the CCI/MC cases to consider differences between those who died and those who were alive 60 days after discharge shows that, in general, those who remained alive had longer LTCH length of stay, higher LTCH payments, and higher readmission rates.

Table 2-18
Length of Stay and Medicare Payments for the CCI/MC and Non-CCI/MC Transferred to LTCHs, 2010

CCI/MC	ACH ALOS	CCU ALOS	Average Medicare ACH payment	LTCH ALOS	Average Medicare LTCH payment	90-day readmission rate
Death within 60 days	22.7	19.4	$60,194	21.1	$36,534	27.1%
Surviving 60 days	22.4	18.0	$62,695	36.9	$54,208	48.1%
Non-CCI/MC	—	—	—	—	—	—
Death within 60 days	10.4	4.5	$15,479	19.1	$25,048	27.5%
Surviving 60 days	9.3	3.3	$15,033	27.5	$32,288	45.0%

NOTE: CCI/MC, chronically critically ill or medically complex; ALOS, average length of stay; ACH, acute care hospital; LTCH, long-term care hospital. Note that the Non-CCI/MC include only the Non-CCI transferred to LTCHs.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample. Note that acute care hospital discharges include critical access hospitals. CCI/MC death within 60 days = 12, 541; CCI/MC survive within 60 days = 26,469; non-CCI/MC death within 60 days = 19,811; non-CCI/MC survive within 60 days = 63,088.

Regression Analyses. We examined readmission, deaths and length of stay for CCI/MC patients using regression analysis in order to control for CCI/MC condition and other factors. ***Tables 2-18*** to ***2-27*** present the results of several regression models which examine the probability of readmission within 90 days of discharge and death within 60 days of discharge with logistic regression. Acute care data include critical access hospitals. The models each control for the age, gender, index acute hospitalization condition, and whether the case was in a high-LTCH state. The regressions were run separately for each CCI/MC condition to allow the explanatory variables to have different effects on the population. There are also control variables indicating whether the patient was in one of the MS-DRGs constituting about 60 percent of the patients in each CCI/MC condition. The remainder of the MS-DRGs are in the reference group. Two sets of models were run for each analysis: one set controlled for ACH discharge destination (to SNF, IRF, or LTCH; the reference group was discharge to home or hospice) while the other set excluded these factors. We only present the results from the first set of models. Including the discharge destination increased the explanatory power or the c-statistic by several points.

Hospital readmissions. ***Tables 2.18*** through ***2.22*** show the models predicting the probability of a hospital readmission within 90 days of discharge from the ACH stay for CCI/MC patients. By definition, this population must be discharged alive from the ACH setting. The tables present the results of logistic regressions for readmissions in CCI/MC cases for: PMV (2.18); wounds (2.19); sepsis/major infections (2.20); multiple organ failures (2.21); and

tracheostomy (2.22). In each table the reference discharge destination is discharge to home or hospice.

Table 2-19
Logistic regression for readmission within 90 days of discharge from an Acute Care Hospital – CCI/MC PMV patients

Variable	Estimate	Standard error	Pr > ChiSq	Odds ratio estimates
Intercept	-0.461	0.033	<.0001	—
Next Setting LTCH	0.169	0.028	<.0001	1.184
Next Setting IRF	0.314	0.035	<.0001	1.369
Next Setting SNF	0.568	0.022	<.0001	1.765
Age 65-74	-0.078	0.024	0.001	0.925
Age 75-84	-0.232	0.025	<.0001	0.793
Age>=85	-0.353	0.033	<.0001	0.703
Male	-0.032	0.019	0.085	0.969
High-LTCH State	-0.121	0.024	<.0001	0.886
Length of acute hospital stay 12-16 days	-0.026	0.028	0.354	0.975
Length of acute hospital stay 17-23 days	0.038	0.029	0.187	1.039
Length of acute hospital stay 24-71 days	0.212	0.030	<.0001	1.237
DRG 207: Respiratory system diagnosis w ventilator support 96+ hours	0.056	0.022	0.012	1.058
DRG 870: Septicemia w MV 96+ hours	0.086	0.024	0.000	1.090
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	0.117	0.045	0.010	1.124
Number of Observations Used	48,746	—	—	—
Likelihood Ratio	1,036	<.0001	—	—
c	0.59	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; PMV, prolonged mechanical ventilation, LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; MCC, major complication or comorbidity. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.
SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-20
Logistic regression for readmission within 90 days of discharge from an Acute Care Hospital – CCI/MC wound patients

Variable	Estimate	Standard error	Pr > ChiSq	Odds ratio estimates
Intercept	0.025	0.051	0.619	—
Next setting LTCH	0.144	0.054	0.008	1.154
Next setting IRF	0.376	0.065	<.0001	1.456
Next setting SNF	0.496	0.035	<.0001	1.643
Age 65-74	-0.171	0.047	0.000	0.843
Age 75-84	-0.338	0.047	<.0001	0.713
Age>=85	-0.534	0.053	<.0001	0.586
Male	0.026	0.031	0.410	1.026
High-LTCH State	-0.027	0.044	0.534	0.973
Length of acute hospital stay 12-16 days	-0.001	0.041	0.971	0.999
Length of acute hospital stay 17-23 days	0.065	0.045	0.143	1.067
Length of acute hospital stay 24-71 days	0.209	0.046	<.0001	1.233
DRG 329: Major small & large bowel procedures w MCC	-0.423	0.035	<.0001	0.655
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	0.016	0.083	0.849	1.016
DRG 928: Full thickness burn w skin graft or inhal inj w CC/MCC	-0.794	0.112	<.0001	0.452
DRG 264: Other circulatory system O.R. procedures	0.231	0.100	0.020	1.260
DRG 463: Wnd debrid & skn grft exc hand, for musculo-conn tiss dis w MCC	0.100	0.102	0.327	1.105
DRG 573: Skin graft &/or debrid for skn ulcer or cellulitis w MCC	-0.120	0.118	0.310	0.887
DRG 252: Other vascular procedures w MCC	0.381	0.123	0.002	1.463
Number of Observations Used	17,483	—	—	—
Likelihood Ratio	612	<.0001	—	—
c	0.61	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; MCC, major complication or comorbidity; CC , complication or comorbidity; wnd, wound. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-21
Logistic regression for readmission within 90 Days of discharge from an Acute Care Hospital – CCI/MC sepsis patients

Variable	Estimate	Standard error	Pr > ChiSq	Odds ratio estimates
Intercept	-0.102	0.025	<.0001	—
Next setting LTCH	0.013	0.027	0.633	1.013
Next setting IRF	0.384	0.033	<.0001	1.468
Next setting SNF	0.486	0.017	<.0001	1.625
Age 65-74	-0.172	0.022	<.0001	0.842
Age 75-84	-0.380	0.022	<.0001	0.684
Age>=85	-0.579	0.025	<.0001	0.560
Male	-0.009	0.015	0.557	0.991
High-LTCH State	-0.092	0.020	<.0001	0.912
Length of acute hospital stay 12-16 days	0.085	0.019	<.0001	1.088
Length of acute hospital stay 17-23 days	0.094	0.022	<.0001	1.099
Length of acute hospital stay 24-71 days	0.241	0.024	<.0001	1.273
DRG 871: Septicemia w/o MV 96+ hours w MCC	0.012	0.018	0.508	1.012
DRG 177: Respiratory infections & inflammations w MCC	0.007	0.027	0.778	1.008
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	-0.040	0.029	0.168	0.961
DRG 329: Major small & large bowel procedures w MCC	-0.190	0.040	<.0001	0.827
DRG 682: Renal failure w MCC	0.151	0.059	0.011	1.163
DRG 314: Other circulatory system diagnoses w MCC	0.586	0.047	<.0001	1.797
Number of Observations Used	74,732	—	—	—
Likelihood Ratio	1,887	<.0001	—	—
c	0.59	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; MCC, major complication or comorbidity. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-22
Logistic regression for readmission within 90 days of discharge from an Acute Care Hospital – CCI/MC multiple organ failure patients

Variable	Estimate	Standard error	Pr > ChiSq	Odds ratio estimates
Intercept	0.162	0.034	<.0001	0.944
Next setting LTCH	-0.058	0.038	0.127	1.353
Next setting IRF	0.302	0.036	<.0001	1.745
Next setting SNF	0.557	0.023	<.0001	0.825
Age 65-74	-0.192	0.028	<.0001	0.608
Age 75-84	-0.498	0.030	<.0001	0.482
Age>=85	-0.731	0.035	<.0001	0.957
Male	-0.044	0.020	0.029	0.898
High-LTCH State	-0.107	0.027	<.0001	0.965
Length of acute hospital stay 12-16 days	-0.035	0.026	0.170	1.034
Length of acute hospital stay 17-23 days	0.033	0.029	0.254	1.076
Length of acute hospital stay 24-71 days	0.073	0.031	0.020	0.941
DRG 871: Septicemia w/o MV 96+ hours w MCC	-0.061	0.037	0.103	1.149
DRG 208: Respiratory system diagnosis w ventilator support <96 hours	0.139	0.043	0.001	1.268
DRG 291: Heart failure & shock w MCC	0.237	0.033	<.0001	1.411
DRG 190: Chronic obstructive pulmonary disease w MCC	0.344	0.064	<.0001	1.122
DRG 193: Simple pneumonia & pleurisy w MCC	0.115	0.071	0.106	1.114
DRG 189: Pulmonary edema & respiratory failure	0.108	0.066	0.101	0.920
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	-0.083	0.054	0.121	0.932
DRG 177: Respiratory infections & inflammations w MCC	-0.070	0.072	0.327	1.260
DRG 280: Acute myocardial infarction, discharged alive w MCC	0.231	0.053	<.0001	1.090
DRG 682: Renal failure w MCC	0.087	0.061	0.152	1.122
DRG 981: Extensive O.R. procedure unrelated to principal diagnosis w MCC	0.116	0.064	0.072	0.818
DRG 064: Intracranial hemorrhage or cerebral infarction w MCC	-0.201	0.048	<.0001	0.846
DRG 233: Coronary bypass w cardiac cath w MCC	-0.167	0.076	0.027	0.973
DRG 237: Major cardiovasc procedures w MCC or thoracic aortic aneurysm repair	-0.027	0.075	0.720	—
Number of Observations Used	41,434	—	—	—
Likelihood Ratio	1,252	<.0001	—	—
c	0.60	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; MCC, major complication or comorbidity. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-23
Logistic regression for readmission within 60 days of discharge from an Acute Care Hospital – CCI/MC tracheostomy patients

Variable	Estimate	standard error	Pr > ChiSq	Odds ratio estimates
Intercept	-0.363	0.064	<.0001	—
Next setting LTCH	0.031	0.033	0.344	1.031
Next setting IRF	0.123	0.055	0.027	1.131
Next setting SNF	0.591	0.043	<.0001	1.805
Age 65-74	-0.033	0.030	0.277	0.968
Age 75-84	-0.096	0.032	0.003	0.908
Age>=85	-0.147	0.045	0.001	0.864
Male	0.003	0.024	0.906	1.003
High-LTCH State	-0.200	0.031	<.0001	0.819
Length of acute hospital stay 12-16 days	0.035	0.059	0.554	1.036
Length of acute hospital stay 17-23 days	0.080	0.056	0.150	1.084
Length of acute hospital stay 24-71 days	0.122	0.054	0.024	1.130
DRG 004: Trach w MV 96+ hrs or PDX exc face, mouth & neck w/o maj O.R. proc	-0.051	0.024	0.038	0.951
Number of Observations Used	30,182	—	—	—
Likelihood Ratio	408	<.0001	—	—
c	0.56	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; PDX, principle diagnosis. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

We found that for PMV, wound, and MOF patients, shorter stays (up to 23 days) in the ACH tend to not be significantly associated with increased odds of readmission, whereas stays of 24-71 days in the ACH tend to be positively associated with readmissions. The odds ratio related to this length of stay for PMV patients was 1.24, for wound patients it was 1.23, and for MOF patients it was 1.08. For sepsis, all length of stay categories had positive effects and were statistically significant and the odds ratios ranged from 1.09 for the 12 – 16 day category to 1.27 for the 24 – 71 day category. For tracheostomy patients, only the highest category had a statistically significant effect on readmissions, with an odds ratio of 1.08. For this group as well as the MOF group the effect of stay length is modest.

We found that PMV patients discharged to a facility had odds ratios indicating higher odds of readmission compared to discharge home. The odds ratio was lowest for the LTCH

(1.18) and highest for the SNF (1.77); for wound patients the same pattern held, with the LTCH odds ratio equal to 1.15 and the SNF odds ratio equal to 1.64. For sepsis patients only the IRF (odds ratio (OR)=1.47) and SNF (OR=1.63) had significant effects. This pattern also was found for multiple organ failure (MOF) and tracheostomy patients. Generally, the patients who were discharged to the LTCHs, which provide hospital-level care, had less incremental chance of being readmitted to the acute care setting than those discharged to IRFs and SNFs.

In addition to testing that the coefficients were significantly different from the reference group, we tested the hypotheses that the first post-acute care (PAC) coefficients for each setting (LTCH, IRF, SNF) were equal. The facility coefficients were statistically significantly different from each other for PMV, sepsis, and MOF patients. For wounds patients, the IRF and SNF coefficients were not statistically different at the 5 percent level and for tracheostomy patients, the LTCH and IRF coefficients were not statistically different at the 5 percent level.

Being in a high-LTCH state reduces the odds of readmission for PMV, sepsis, MOF and tracheostomy patients (odd ratios of 0.89, 0.91, 0.90, and 0.82, respectively) but not for wound patients after controlling for the other variables in the model .

These regressions generally show a pattern in which the coefficients for the odds of readmission are ranked from highest to lowest in the following order: SNF, IRF, LTCH, and home. With some control for morbidity in the form of age and major ACH DRGs, it seems that, among PAC settings, the hospital settings (IRF and LTCH) provide some reduction in odds compared to SNF, with LTCH having the smallest marginal increment in readmission odds compared to the reference group. Skilled nursing homes, with the largest incremental increase in odds, do not provide the intensity of care available at the hospital settings which seems to be associated with the need to transfer to a hospital setting for some conditions while it may be possible to treat some conditions without transfer in the hospital-level settings. Of course, there may be some stratification of patient severity level associated with discharge destination that is not controlled for in the models presented. That the discharge to home is associated with the lowest setting effect may be explained by some patients going to hospice and patient selection effects not captured by the model.

Death within 60 days of discharge. ***Tables 2-23*** through ***2-27*** examine the probability of death within 60 days for the populations in each of the CCI/MC conditions with regressions similar in form to those used for the readmission analysis. The reference groups, as in the readmission analysis, are discharge to home without institutional PAC and the DRGs constituting less than 60 percent of cases for CCI/MC patients. In all cases we found that the probability of death within 60 days increases with age and is higher for males. CCI/MC PMV patients with acute hospital lengths of stay between 12 and 16 days (odds ratio (OR)=0.80) and 17 and 23 days (OR=0.89) had significant coefficients reducing the odds of death compared to shorter and longer stays. The strength of the coefficients indicates the decreasing reductions from the reference group the longer the stay. There is something distinct about prolonged mechanical ventilation patients in the shortest stay group that makes them equivalent to the longest stay group. CCI/MC wound patients with acute length of stay of 17 to 23 days (OR=1.14) and 24 to 71 days (OR=1.47) had increased odds of death. As expected, increased length of stay has higher odds ratios. For sepsis and MOF all length of stay categories had positive effects, were statistically significant, and increasing with the acute care length of stay. In the case of

tracheostomy patients only the longest length of stay category of 24-71 days had a significant effect (OR= 1.24).

Table 2-24
Logistic regression for death within 90 days of discharge from an Acute Care Hospital – CCI/MC PMV patients

Variable	Estimate	Standard error	Pr > ChiSq	Odds ratio estimates
Intercept	-1.393	0.038	<.0001	—
Next setting LTCH	-0.260	0.030	<.0001	0.771
Next setting IRF	-2.013	0.060	<.0001	0.134
Next setting SNF	-0.989	0.026	<.0001	0.372
Age 65-74	0.790	0.030	<.0001	2.204
Age 75-84	1.372	0.031	<.0001	3.944
Age>=85	1.807	0.037	<.0001	6.090
Male	0.144	0.021	<.0001	1.155
High-LTCH State	-0.007	0.028	0.810	0.993
Length of acute hospital stay 12-16 days	-0.229	0.031	<.0001	0.796
Length of acute hospital stay 17-23 days	-0.121	0.032	0.000	0.886
Length of acute hospital stay 24-71 days	-0.020	0.034	0.548	0.980
DRG 207: Respiratory system diagnosis w ventilator support 96+ hours	0.070	0.026	0.007	1.073
DRG 870: Septicemia w MV 96+ hours	0.238	0.028	<.0001	1.269
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	0.100	0.052	0.055	1.105
Number of Observations Used	—	—	—	—
Likelihood Ratio	—	<.0001	—	—
c	0.71	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; MCC, major complication or comorbidity. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-25
Logistic regression for death within 60 days of discharge from an Acute Care Hospital – CCI/MC wound patients

Variable	Estimate	Standard error	Pr > ChiSq	Odds ratio estimates
Intercept	-2.131	0.075	<.0001	—
Next setting LTCH	0.230	0.065	0.000	1.259
Next setting IRF	-0.945	0.110	<.0001	0.389
Next setting SNF	-0.225	0.045	<.0001	0.799
Age 65-74	0.690	0.072	<.0001	1.993
Age 75-84	1.033	0.071	<.0001	2.809
Age>=85	1.613	0.074	<.0001	5.019
Male	0.099	0.040	0.014	1.104
High-LTCH State	-0.037	0.057	0.521	0.964
Length of acute hospital stay 12-16 days	0.074	0.053	0.169	1.076
Length of acute hospital stay 17-23 days	0.133	0.058	0.022	1.142
Length of acute hospital stay 24-71 days	0.382	0.059	<.0001	1.465
DRG 329: Major small & large bowel procedures w MCC	-0.650	0.045	<.0001	0.522
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	0.436	0.093	<.0001	1.546
DRG 928: Full thickness burn w skin graft or inhal inj w CC/MCC	-1.491	0.229	<.0001	0.225
DRG 264: Other circulatory system O.R. procedures	-0.334	0.130	0.010	0.716
DRG 463: Wnd debrid & skn grft exc hand, for musculo-conn tiss dis w MCC	-0.681	0.150	<.0001	0.506
DRG 573: Skin graft &/or debrid for skn ulcer or cellulitis w MCC	-0.254	0.154	0.099	0.775
DRG 252: Other vascular procedures w MCC	-0.343	0.159	0.031	0.710
Number of Observations Used	—	—	—	—
Likelihood Ratio	—	<.0001	—	—
c	0.67	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; MCC, major complication or comorbidity; CC , complication or comorbidity; and wounds. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-26
Logistic regression for death within 60 days of discharge from an Acute Care Hospital with Next Setting – sepsis patients

Variable	Estimate	Standard error	Pr > ChiSq	Odds ratio estimates
Intercept	-2.081	0.033	<.0001	—
Next setting LTCH	0.147	0.030	<.0001	1.158
Next setting IRF	-1.305	0.052	<.0001	0.271
Next setting SNF	-0.462	0.019	<.0001	0.630
Age 65-74	0.605	0.029	<.0001	1.831
Age 75-84	1.012	0.029	<.0001	2.752
Age>=85	1.507	0.030	<.0001	4.515
Male	0.129	0.017	<.0001	1.137
High-LTCH State	-0.042	0.024	0.072	0.959
Length of acute hospital stay 12-16 days	0.230	0.022	<.0001	1.258
Length of acute hospital stay 17-23 days	0.428	0.025	<.0001	1.534
Length of acute hospital stay 24-71 days	0.551	0.027	<.0001	1.735
DRG 871: Septicemia w/o MV 96+ hours w MCC	0.240	0.021	<.0001	1.272
DRG 177: Respiratory infections & inflammations w MCC	0.400	0.029	<.0001	1.492
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	-0.095	0.035	0.007	0.909
DRG 329: Major small & large bowel procedures w MCC	-0.400	0.049	<.0001	0.670
DRG 682: Renal failure w MCC	0.380	0.065	<.0001	1.462
DRG 314: Other circulatory system diagnoses w MCC	0.078	0.057	0.175	1.081
Number of Observations Used	74,732	—	—	—
Likelihood Ratio	4,786	<.0001	—	—
c	0.66	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; MCC, major complication or comorbidity. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-27
Logistic regression for death within 60 days of discharge from an Acute Care Hospital with Next Setting – Multiple organ failure patients

Variable	Estimate	Standard error	Pr > ChiSq	Odds ratio estimates
Intercept	-1.911	0.042	<.0001	—
Next setting LTCH	0.237	0.040	<.0001	1.267
Next setting IRF	-1.283	0.053	<.0001	0.277
Next setting SNF	-0.422	0.026	<.0001	0.656
Age 65-74	0.497	0.036	<.0001	1.643
Age 75-84	0.858	0.037	<.0001	2.357
Age>=85	1.326	0.040	<.0001	3.766
Male	0.145	0.023	<.0001	1.155
High-LTCH State	-0.008	0.030	0.788	0.992
Length of acute hospital stay 12-16 days	0.289	0.030	<.0001	1.336
Length of acute hospital stay 17-23 days	0.413	0.033	<.0001	1.511
Length of acute hospital stay 24-71 days	0.558	0.036	<.0001	1.747
DRG 871: Septicemia w/o MV 96+ hours w MCC	0.449	0.041	<.0001	1.566
DRG 208: Respiratory system diagnosis w ventilator support <96 hours	0.033	0.051	0.516	1.033
DRG 291: Heart failure & shock w MCC	0.254	0.037	<.0001	1.289
DRG 190: Chronic obstructive pulmonary disease w MCC	-0.270	0.080	0.001	0.763
DRG 193: Simple pneumonia & pleurisy w MCC	0.180	0.080	0.024	1.197
DRG 189: Pulmonary edema & respiratory failure	0.343	0.072	<.0001	1.409
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	0.245	0.060	<.0001	1.278
DRG 177: Respiratory infections & inflammations w MCC	0.604	0.074	<.0001	1.829
DRG 280: Acute myocardial infarction, discharged alive w MCC	0.326	0.058	<.0001	1.385
DRG 682: Renal failure w MCC	0.238	0.067	0.000	1.268
DRG 981: Extensive O.R. procedure unrelated to principal diagnosis w MCC	-0.157	0.078	0.044	0.855
DRG 064: Intracranial hemorrhage or cerebral infarction w MCC	0.582	0.053	<.0001	1.790
DRG 233: Coronary bypass w cardiac cath w MCC	-0.973	0.122	<.0001	0.378
DRG 237: Major cardiovasc procedures w MCC or thoracic aortic aneurysm repair	-0.057	0.089	0.525	0.945
Number of Observations Used	41,434	—	—	—
Likelihood Ratio	2,839	<.0001	—	—
c	0.66	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; MCC, major complication or comorbidity. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-28
Logistic regression for death within 60 days of discharge from an Acute Care Hospital with Next Setting – Tracheostomy patients

Variable	Estimate	Standard error	Pr > ChiSq	Odds ratio estimates
Intercept	-1.425	0.072	<.0001	—
Next setting LTCH	-0.261	0.034	<.0001	0.771
Next setting IRF	-2.105	0.098	<.0001	0.122
Next setting SNF	-0.751	0.048	<.0001	0.472
Age 65-74	0.549	0.036	<.0001	1.732
Age 75-84	0.945	0.037	<.0001	2.574
Age>=85	1.190	0.048	<.0001	3.288
Male	0.126	0.026	<.0001	1.134
High-LTCH State	-0.034	0.033	0.314	0.967
Length of acute hospital stay 12-16 days	0.048	0.065	0.459	1.049
Length of acute hospital stay 17-23 days	0.096	0.061	0.119	1.100
Length of acute hospital stay 24-71 days	0.219	0.059	0.000	1.244
DRG 004: Trach w MV 96+ hrs or PDX exc face, mouth & neck w/o maj O.R. proc	0.203	0.027	<.0001	1.226
Number of Observations Used	30,182	—	—	—
Likelihood Ratio	1,805	<.0001	—	—
c	0.65	—	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; PDX, principle diagnosis. High LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

CCI/MC vent and tracheostomy patients discharged to a PAC setting all had reduced odds of death compared to discharge home, with the largest reduction being for the IRF setting (vent OR=0.13 and tracheostomy OR=0.12) and the smallest reduction for the LTCH setting (OR=0.77 for both). The pattern differed for the CCI/MC wound, sepsis and MOF patients. All the coefficients were significant, with the LTCH patients having increased odds and patients in the other settings have decreased odds. The IRF reduction was strongest (wound OR=0.39, sepsis OR=0.27, and MOF OR=0.28). We tested for equality of setting effect coefficients for all of the CCI/MC conditions. In all cases the setting coefficients were significantly different from each other.

The variable indicating a high-LTCH state was negative but not significant for the PMV, wound, and tracheostomy conditions. It was negative and significant for MOF and of marginal significance for the sepsis group ($p = 0.072$).

As with the readmission equations the control variables for morbidity are likely not fully controlling for selection of patients into setting. In most cases, we found that an institutional setting is associated with reduced odds for death, with IRF having the largest reduction. IRF patients are required to have the stamina to receive therapy for three hours each day; irrespective of condition type this is likely to be selecting a less fragile patient group. The LTCHs would normally be taking patients with higher acuity and deaths would occur at a higher rate. The association of LTCHs with increased odds of death, compared to discharge to home, for wound, sepsis and MOF patients would be hard to explain except for patient selection based on unobserved acuity. Additionally, there could be patients that were not able to be discharged to an LTCH and thus spent a longer period of time in the acute hospital prior to discharge. These patients may have died in the first setting (and have not been included in this analysis) or may have been discharged home, to hospice, a SNF, or an IRF after the longer acute stay; this could result in some bias in the results. Therefore, the results of these analyses should be regarded descriptively and not causally.

Combined acute care hospital and LTCH length of stay. ***Tables 2.28*** through ***2.32*** present the results for predicting combined acute care hospital and LTCH length of stay, controlling for the same factors as in the other analyses previously described. These are linear regressions (ordinary least squares (OLS)) and the coefficients represent incremental days. The intercept represents the length of stay for patients discharged home, which only have ACH days. We found that the length of stay decreases with increasing age for each group. In the tracheostomy case, the differences among the length of stay groups are not significant. In the prolonged mechanical ventilation, the decrease for age group 65 to 74 is negligible compared to the reference group of age less than 65.

Because the dependent variable is the sum of the acute care hospital stay and LTCH days only, the patients that are discharged to other settings (home, IRF and SNF) have only incremental acute care stay days associated with them. The length of stay for the reference group (discharged home) is interesting itself. That intercept is between 17 and 20 for most conditions but much higher (38 days) for tracheostomy cases. The interpretation of the LTCH incremental effect is the difference in these patients' acute stay and LTCH stay days and it is dominated by the LTCH days. The magnitude of the next setting LTCH coefficient is large for all conditions and a bit more than the 25-day LTCH Medicare-required average length of stay, ranging from 26 days for tracheostomy patients to 30 days for wounds patients.

For the discharge settings other than LTCH, the incremental effect of the coefficients is positive for length of stay for PMV, wound, sepsis and MOF. For the tracheostomy condition, the coefficient for IRF is about one day, but only marginally statistically significant ($p=0.06$), and the coefficient for SNF is unusually long, almost seven days and is also significant. Most of the incremental effects of length of stay for IRF and SNFs are on the order of two days over the reference group (home). Overall, the patients going to institutional settings have longer acute care hospital lengths of stay than those discharged home from the ACH.

Table 2-29
OLS regression for combined length of stay in the Acute Care Hospital and LTCH – CCI/MC prolonged mechanical ventilation patients

Variable	Estimate	Standard error	Pr > ChiSq
Intercept	20.279	0.153	<.0001
Next setting LTCH	28.928	0.168	<.0001
Next setting IRF	2.234	0.208	<.0001
Next setting SNF	3.445	0.130	<.0001
Age 65-74	-0.063	0.142	0.656
Age 75-84	-0.611	0.150	<.0001
Age>=85	-1.539	0.195	<.0001
Male	0.166	0.111	0.136
High-LTCH State	-1.518	0.144	<.0001
DRG 207: Respiratory system diagnosis w ventilator support 96+ hours	-3.872	0.132	<.0001
DRG 870: Septicemia w MV 96+ hours	-2.790	0.145	<.0001
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	1.999	0.271	<.0001
Number of Observations Used	48,746	—	—
R-Square	0.406	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; PDX, principle diagnosis; OLS, ordinary least squares. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-30
OLS regression for combined length of stay in the Acute Care Hospital and LTCH – CCI/MC wound patients

Variable	Estimate	Standard error	Pr > ChiSq
Intercept	17.287	0.267	<.0001
Next setting LTCH	30.486	0.311	<.0001
Next setting IRF	2.122	0.376	<.0001
Next setting SNF	1.699	0.200	<.0001
Age 65-74	-1.347	0.268	<.0001
Age 75-84	-1.926	0.270	<.0001
Age>=85	-3.660	0.301	<.0001
Male	0.096	0.180	0.595
High-LTCH State	-1.043	0.253	<.0001
DRG 329: Major small & large bowel procedures w MCC	2.417	0.195	<.0001
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	4.179	0.481	<.0001
DRG 928: Full thickness burn w skin graft or inhal inj w CC/MCC	3.403	0.619	<.0001
DRG 264: Other circulatory system O.R. procedures	-1.179	0.573	0.040
DRG 463: Wnd debrid & skn grft exc hand, for musculo-conn tiss dis w MCC	5.359	0.586	<.0001
DRG 573: Skin graft &/or debrid for skn ulcer or cellulitis w MCC	2.871	0.684	<.0001
DRG 252: Other vascular procedures w MCC	2.515	0.694	0.000
Number of Observations Used	17,483	—	—
R-Square	0.389	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; MCC, major complication or comorbidity; CC , complication or comorbidity; OLS, ordinary least squares. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-31
OLS regression for combined length of stay in the Acute Care Hospital and LTCH – CCI/MC Sepsis patients

Variable	Estimate	Standard error	Pr > ChiSq
Intercept	19.995	0.120	<.0001
Next setting LTCH	28.043	0.148	<.0001
Next setting IRF	2.165	0.181	<.0001
Next setting SNF	1.494	0.089	<.0001
Age 65-74	-1.313	0.119	<.0001
Age 75-84	-2.544	0.120	<.0001
Age>=85	-3.680	0.132	<.0001
Male	0.200	0.081	0.013
High-LTCH State	-0.858	0.110	<.0001
DRG 871: Septicemia w/o MV 96+ hours w MCC	-5.283	0.095	<.0001
DRG 177: Respiratory infections & inflammations w MCC	-4.878	0.142	<.0001
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	-0.340	0.158	0.031
DRG 329: Major small & large bowel procedures w MCC	6.574	0.213	<.0001
DRG 682: Renal failure w MCC	-3.298	0.323	<.0001
DRG 314: Other circulatory system diagnoses w MCC	-5.047	0.246	<.0001
Number of Observations Used	74,732	—	—
R-Square	0.396	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; PDX, principle diagnosis; OLS, ordinary least squares. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-32
OLS regression for combined length of stay in the Acute Care Hospital and LTCH – CCI/MC multiple organ failure patients

Variable	Estimate	Standard error	Pr > ChiSq
Intercept	19.888	0.159	<.0001
Next setting LTCH	27.863	0.204	<.0001
Next setting IRF	1.813	0.194	<.0001
Next setting SNF	2.649	0.123	<.0001
Age 65-74	-1.296	0.153	<.0001
Age 75-84	-1.936	0.161	<.0001
Age>=85	-2.953	0.186	<.0001
Male	0.145	0.108	0.181
High-LTCH State	-0.885	0.143	<.0001
DRG 871: Septicemia w/o MV 96+ hours w MCC	-4.024	0.200	<.0001
DRG 208: Respiratory system diagnosis w ventilator support <96 hours	-5.710	0.229	<.0001
DRG 291: Heart failure & shock w MCC	-5.969	0.173	<.0001
DRG 190: Chronic obstructive pulmonary disease w MCC	-7.257	0.341	<.0001
DRG 193: Simple pneumonia & pleurisy w MCC	-6.069	0.384	<.0001
DRG 189: Pulmonary edema & respiratory failure	-6.745	0.352	<.0001
DRG 853: Infectious & parasitic diseases w O.R. procedure w MCC	3.507	0.290	<.0001
DRG 177: Respiratory infections & inflammations w MCC	-4.005	0.384	<.0001
DRG 280: Acute myocardial infarction, discharged alive w MCC	-5.382	0.286	<.0001
DRG 682: Renal failure w MCC	-4.307	0.325	<.0001
DRG 981: Extensive O.R. procedure unrelated to principal diagnosis w MCC	1.072	0.345	0.002
DRG 064: Intracranial hemorrhage or cerebral infarction w MCC	-4.782	0.259	<.0001
DRG 233: Coronary bypass w cardiac cath w MCC	0.259	0.410	0.528
DRG 237: Major cardiovasc procedures w MCC or thoracic aortic aneurysm repair	0.469	0.406	0.248
Number of Observations Used	41,434	—	—
R-Square	0.373	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; PDX, principle diagnosis; OLS, ordinary least squares. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

Table 2-33
OLS regression for combined length of stay in the Acute Care Hospital and LTCH – CCI/MC tracheostomy patients

Variable	Estimate	Standard error	Pr > ChiSq
Intercept	38.387	0.423	<.0001
Next setting LTCH	25.617	0.352	<.0001
Next setting IRF	1.135	0.603	0.060
Next setting SNF	6.728	0.462	<.0001
Age 65-74	-0.711	0.327	0.030
Age 75-84	-0.715	0.346	0.039
Age>=85	-0.878	0.481	0.068
Male	-0.356	0.255	0.162
High-LTCH State	-0.631	0.329	0.055
DRG 004: Trach w MV 96+ hrs or PDX exc face, mouth & neck w/o maj O.R.	-6.885	0.256	<.0001
Number of Observations Used	30,182	—	—
R-Square	0.213	—	—

NOTE: The acute hospital length of stay was trimmed at the 99th percentile (71 days). ACH, acute care hospital; CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; MV, mechanical ventilation; O.R.; operating room; PDX, principle diagnosis; OLS, ordinary least squares. High-LTCH states include the following states: Louisiana, Idaho, Oklahoma, Colorado, Utah, Massachusetts, Mississippi, Texas, Nevada, District or Columbia, and Connecticut. Next setting of home or hospice is the excluded category.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of ACH and LTCH claims.

We also found that states with a high number of LTCHs have an average total length of stay that is shorter than states with a low number of LTCHs. For length of stay, the DRG control variables have notably different incremental effects within the CCI/MC groups, and these effects were stronger than most other effects in the models aside from admission to an LTCH. This is because the DRGs themselves vary in mean length of stay.

2.5 The Non-CCI/MC in LTCHs

The non-CCI accounted for 68 percent of LTCH admissions in 2010. We found that the majority of non-CCI LTCH admissions are scattered across many different MS-LTC-DRGs (see ***Table 2-33***). There are only two MS-LTC-DRGs (189: pulmonary edema and respiratory failure and 871: sepsis without mechanical ventilation) that account for 5 percent or more of the non-

CCI LTCH admissions. In comparison, the CCI/MC LTCH admissions are concentrated in a few MS-LTC-DRGs and are over 50 percent of CCI/MC LTCH admissions are in one of three MS-LTC-DRGs (207, 189, and 208, see Table 2-13). The most common CCI/MC MS-LTC-DRG is 207, which is for prolonged mechanical ventilation, and this MS-LTC-DRG accounts for 33.5 percent of the CCI/MC LTCH admissions. In comparison, less than three percent of the non-CCI LTCH admissions are in MS-LTC-DRG 207.

Table 2-34
Top 15 MS-LTC-DRGs for the non-CCI/MC discharged to LTCHs

MS-LTC-DRG	Description	Number of Non-CCI/MC	% of Non-CCI/MC	Non-CCI/MC Rank	Rank for CCI/MC
189	Pulmonary edema & respiratory failure	5,880	7.1%	1	2
871	Septicemia w/o MV + 96 hours w MCC	5,331	6.4%	2	4
177	Respiratory infections & inflammations w MCC	3,748	4.5%	3	6
592	Skin ulcers w MCC	2,279	2.7%	4	16
193	Simple pneumonia & pleurisy w MCC	2,277	2.7%	5	15
190	Chronic obstructive pulmonary disease w MCC	2,238	2.7%	6	20
949	Aftercare w CC/MCC	2,169	2.6%	7	9
207	Respiratory system diagnosis w ventilator support + 96 hours	2,114	2.6%	8	1
539	Osteomyelitis w MCC	1,963	2.4%	9	22
559	Aftercare, musculoskeletal system & connective tissue w MCC	1,577	1.9%	10	28
291	Heart failure & shock w MCC	1,448	1.7%	11	19
314	Other circulatory system diagnoses w MCC	1,395	1.7%	12	14
862	Postoperative & post-traumatic infections w MCC	1,375	1.7%	13	12
178	Respiratory infections & inflammations w CC	1,351	1.6%	14	24
682	Renal failure w MCC	1,309	1.6%	15	13
—	Subtotal Top 15	36,454	44.0%	—	—
—	Total	82,899	100.0%	—	—

NOTE: CCI/MC, chronically critically ill or medically complex; MS-LTC-DRG, Medicare severity long-term care diagnosis-related group; LTCH, long-term care hospital; MCC, Major complication or comorbidity; CC , complications or comorbidities; MV, mechanical ventilation.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of acute care hospital and LTCH claims.

Nine of the 15 most common non-CCI/MC MS-LTC-DRGs were also among the 15 most common CCI/MC MS-LTC-DRGs (see Table 2-33). Approximately one-third of non-CCI/MC LTCH admissions are in these nine MS-LTC-DRGs. In comparison, just over 60 percent of all CCI/MC LTCH admissions are in one of these nine MS-LTC-DRGs. Of the 15 most common non-CCI MS-LTC-DRGs, three were not among the 20 most common MS-LTC-DRGs for the

CCI/MC. The three are MS-LTC-DRGs (539: osteomyelitis w/MCC, 559: aftercare w/MCC, and 178: respiratory infection w/CC). The MS-LTC-DRGs that are more common among the CCI/MC are ones associated with tracheostomies and prolonged mechanical ventilation (MS-LTC-DRGs 208 and 870 for example).

Overall, we found that the non-CCI are spread across many MS-LTC-DRGs, some of which are not as complex as the most common MS-LTC-DRGs among the CCI/MC. Just under half of the 15 most common non-CCI MS-LTC-DRGs are also common to the CCI/MC.

2.6 Conclusion

The findings in this chapter confirm that the CCI/MC definition identifies a small population of high-resource use discharges from acute care hospitals. The CCI/MC discharges are concentrated in a few acute care MS-DRGs, many of which include tracheostomies or prolonged mechanical ventilation. About half of all the CCI/MC who were discharged alive from acute care hospitals received further facility-based care and 21 percent died in the hospital, indicating the severity of illness among the CCI/MC.

About 18 percent of the CCI/MC who were discharged alive in 2010 were discharged to an LTCH. The LTCH transfer rate varies greatly by geographic location. In the 11 states with a high number of LTCH beds per beneficiary about 32 percent of the CCI/MC are discharged to LTCHs while only 15 percent of the CCI/MC are discharged to LTCHs in the other states. The LTCH transfer rates also vary by MS-DRG. About one-half of all trach patients are transferred to LTCHs while only about 10 percent of non-trach CCI/MC patients are transferred to LTCHs. In high-LTCH states, about 20 percent of the non-trach patients in the most common CCI/MC MS-DRGs were transferred to LTCHs and an equal proportion to SNFs. By comparison, in the other states, only 6 percent of the CCI/MC were discharged to LTCHs and 31 percent were transferred to SNFs.

The CCI/MC and non-CCI/MC who are transferred to LTCHs also have different utilization patterns. The CCI/MC had much longer acute hospital lengths of stay than the non-CCI/MC (22.5 days vs. 9.5 days) and longer LTCH stays (31.8 days vs. 25.5 days). This indicates that the CCI/MC who use LTCHs are more severely ill than the non-CCI/MC LTCH users.

Not only do the CCI/MC that transferred to LTCHs have longer lengths of stay in hospitals than non-CCI/MC LTCH users, but they are much less likely to be discharged home than the non-CCI/MC (16.7 percent vs. 34.9 percent) and are more likely to die (20.4 percent vs. 12.7 percent). The CCI/MC are also much more likely to need further inpatient care (56 percent vs. 44 percent). All these factors indicate that the CCI/MC definition distinguishes the most severely ill patients.

In summary, the CCI/MC definition identifies high-resource users in acute care hospitals. It also captures patients that are more likely to need further inpatient care upon discharge from the acute care hospital. The CCI/MC who are transferred to LTCHs have longer lengths of stay in the LTCH, and upon leaving the LTCH, the CCI/MC are less likely to return home and more likely to need continued inpatient care than the non-CCI/MC.

SECTION 3
SIMULATIONS OF THE EFFECT OF THE ALTERNATIVE CCI/MC LTCH PAYMENT MODEL ON LTCH PAYMENTS, MARGINS, AND DISCHARGES

3.1 Introduction

This chapter presents the results of a series of simulations of the impacts of an alternative model to pay LTCHs. Under this alternative CCI/MC payment model, which is discussed in more detail in Section 3.2, LTCH patients who are identified as chronically critically ill or medically complex (CCI/MC) based upon their referring acute care hospital (ACH) claim would continue to receive payments under the current LTCH-PPS policies. However, patients who are not identified as CCI/MC—either because their clinical characteristics in the referring ACH claim did not meet the CCI/MC criteria or because there was no referring ACH claim—would receive an "IPPS-comparable" payment.

Section 3.2 discusses the FY10 data file that RTI constructed for these analyses and the important assumptions we made in simulating the effects of the alternative CCI/MC payment model. The first set of static simulations examines the impact of the alternative CCI/MC LTCH payment model assuming no change in LTCH admission patterns. The impact on LTCHs is discussed in Section 3.3 and the impact by MS-LTC-DRG is described in Section 3.4. Sections 3.5-3.9 discuss behavioral simulations of the impacts of the alternative CCI/MC payment model under the assumption that LTCHs change their admission patterns in response to the alternative payment model.

3.2 Methodology for Static Simulations

3.2.1 Data and Assumptions

Starting with 100 percent of fiscal year (FY) 2010 Medicare Provider Analysis and Review (MedPAR) LTCH claims (see Appendix B for details on sample exclusion criteria), we used the admission dates and beneficiary identifiers on the LTCH claims to search for ACH claims where the ACH discharge occurred within one day of the LTCH admission. For LTCH claims that were admitted in FY 2009 but discharged in FY 2010, we looked back into the FY 2009 MedPAR to identify referring ACH claims. We then identified which of the referring ACH claims qualified as CCI/MC using the CCI/MC definition discussed in Chapter 1. LTCH claims with a referring ACH claim that met the CCI/MC criteria were identified as CCI/MC and all other LTCH claims were identified as non-CCI/MC.

We simulated LTCH facility-level payments for FY 2010 using the LTCH information available in the FY 2010 Final Rule—LTCH Impact File Public Use File.[11] Payments reported include both CMS program payments and beneficiary liabilities. We then simulated the total payments under the alternative CCI/MC payment model, with IPPS-comparable payments for non-CCI/MC LTCH claims. We also calculated LTCH costs and LTCH-level aggregate margins to analyze the distributional consequences across the 419 LTCHs in the analysis and to identify

[11] Available at http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/LongTermCareHospitalPPS/LTCHPPS-Historical-Impact-Files.html

which types of facilities would face the greatest financial impact from the alternative CCI/MC payment model.

We simulated the alternative CCI/MC payment model under two different assumptions about outlier payments. In the first set of results, presented in Section 3.3.1, we simulated the level of outlier payments that would occur using the fixed loss outlier threshold in effect for FY 2010. In the second set of results, presented in Section 3.3.2, we adjusted the fixed loss threshold so that outlier payments would equal 8 percent of total LTCH payments (Medicare payments plus beneficiary liabilities).

The static simulations assume that LTCHs make no changes in their admission patterns in response to the alternative LTCH payment model. This is unrealistic, but allows one to see the effect that the alternative model would have if there were no behavioral changes. Sections 3.5-3.9 discuss the simulations which assume behavioral changes by LTCH in response to the alternative payment model.

3.2.2 Calculating Payment Rates Under the Alternative Payment Model

After we used the FY10 MedPAR file to identify the CCI/MC patients who were discharged from ACH hospitals to LTCHs, we simulated IPPS-comparable payments for the non-CCI/MC patients in the LTCH by assuming that:

- admission counts, lengths of stay, and charges would be exactly the same as they appeared on the claims files for FY 2010;
- current short-stay outlier (SSO) policies would remain in effect for the CCI/MC patients in LTCHs;
- the non-CCI/MC would receive a per diem payment based on the IPPS amount if their length of stay (LOS) was less than the ACH average LOS and the full IPPS amount if their LOS was equal to or exceeded the ACH average length of stay;
- current high-cost outlier policies would remain in effect for all patients; and
- the 25-day-average LOS requirement would apply to all Medicare LTCH patients, both CCI/MC and non-CCI/MC.

In the first set of static simulations, we used the fixed loss threshold amount that was in effect for FY 2010, $18,425, to identify high-cost outliers (HCOs). For a discharge to be designated as an HCO, the difference between the diagnosis-related group (DRG) payment and the covered costs (as calculated by applying the LTCH-specific CCR available in the LTCH Impact Files to the total covered charges on the claims) had to exceed the fixed loss threshold of $18,425, after which CMS would make outlier payments equal to 80 percent of additional losses. CMS sets the fixed loss threshold amount each year with the goal of having total outlier payments equal to 8 percent of total payments (Medicare program payments and beneficiary liabilities). In the second set of static simulations, we adjusted the fixed loss threshold amount so that the outlier payments would equal 8 percent of total LTCH payments. In the first set of static

simulations, the payments for the CCI/MC patients would remain the same under both the current payment system and the alternative CCI/MC payment model; but in the second set of static simulations, when the fixed loss threshold amount is adjusted to $48,936, those CCI/MC claims that previously qualified for HCO payments would have reduced payments under the alternative CCI/MC payment model.

3.3 Facility-Level Results of the Static Simulations

3.3.1 Static Simulation 1—Fixed Loss Threshold Set to FY 2010 Level of $18,425

We simulated the payment amounts for each of the 419 LTCHs in our FY 2010 sample under the current LTCH-PPS and under the alternative CCI/MC payment model. We calculated payment amounts for all claims within the LTCH and then subdivided them into CCI/MC and non-CCI/MC claims. We also calculated LTCH costs and margins, using LTCH costs that we estimated from LTCH- and service-specific cost-to-charge ratios (CCRs) based on data from the Healthcare Cost Report Information System (HCRIS) cost reports. We used this method of cost calculations because it more closely reflects the true claim-level costs. The overall results for the LTCH industry as a whole are summarized in ***Table 3-1***.

Table 3-1
Simulated changes in total payments and aggregate margins for LTCHs resulting from the alternative CCI/MC payment model—Payment and cost amounts in millions: Static Simulation 1 Results: No behavioral change

LTCH financial variables	All LTCH	CCI/MC	Non-CCI/MC
Count of LTCH claims	132,407	37,943	94,464
Total LTCH payments—current payment system	$5,022	$1,942	$3,080
Total LTCH payments—alternative payment model	$3,603	$1,942	$1,660
Percentage change in total LTCH payments	-28%	0%	-46%
Total outlier payments—current payment system	$345	$164	$182
Total outlier payments—alternative payment model	$787	$164	$624
Percentage change in LTCH outlier payments	128%	0%	243%
Total LTCH costs	$4,614	$1,711	$2,902
Aggregate average margins—current payment system	8.1%	11.9%	5.8%
Aggregate average margins—alternative payment model	-28.1%	11.9%	-74.8%

NOTE: CCI/MC, chronically critically ill or medically complex; CMS, Centers for Medicare & Medicaid Services; LTCH, long-term care hospital.

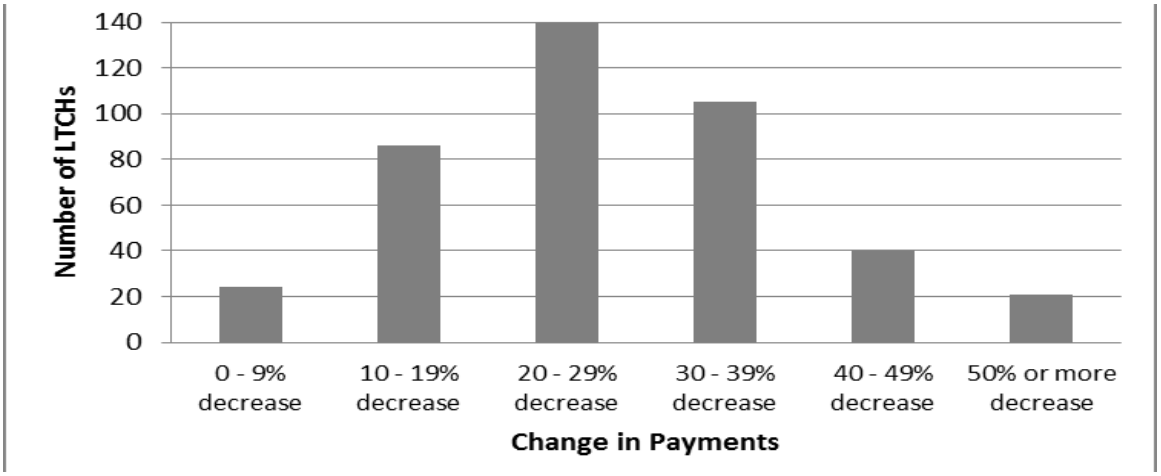
SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims.

Compared to the current LTCH-PPS and assuming no changes in LTCH admission patterns, the alternative CCI/MC payment model would reduce payments to LTCHs from $5.0 billion to $3.6 billion, a 28 percent decrease. Payments for non-CCI/MC patients would be 46 percent lower while payments for CCI/MC patients would remain unchanged. Although total payments would decrease, outlier payments would increase substantially, from $345 million to $787 million, a 128 percent increase in outlier payments. Aggregate average margins for all LTCH patients would fall from 8.1 percent to -28.1 percent, and for non-CCI/MC patients, LTCH margins would decline from 5.8 percent to -74.8 percent. This means that, in aggregate, the costs to the LTCH of the non-CCI/MC patients would be much higher than the IPPS-comparable payments for these patients. These significant losses would discourage LTCHs from admitting non-CCI/MC patients. Consequently, we conducted simulations assuming changes in LTCH admission patterns (the behavioral simulations presented in Sections 3.5–3.9).

In examining the impact on individual LTCHs, we found that all 419 LTCH facilities included in the payment simulations would experience a decrease in payments (combined Medicare payments and beneficiary liabilities) if the alternative CCI/MC payment model were implemented and there were no changes in LTCH admission patterns. The simulated percentage payment change at the LTCH level ranged from -72.3 percent to -1.9 percent, with a median payment decrease of 27.5 percent in the first static simulation. ***Figure 3-1*** shows that 24 LTCHs (about 5 percent of LTCHs) would have a decrease in payment of 0–9 percent and that about one-fifth of all LTCHs would have a decrease in payment of 10–19 percent. About one-third of LTCHs (143 out of 419) would have payment decreases of 20–29 percent and about one-quarter would have decreases of 30-39 percent or more, assuming no changes in the patient populations. Of the LTCHs with the largest simulated decrease in payments, one is in Michigan, one in Oklahoma, three in Texas, and sixteen in Louisiana. In all 21 of these LTCHs, fewer than 15 percent of their Medicare discharges in FY 2010 were classified as CCI/MC (on the basis of patient characteristics in the referring ACH hospitalization) and in 17 of these 21 facilities, the proportion of CCI/MC patients was less than 10 percent.

This first static simulation assumed that payments received for the CCI/MC patients in LTCHs would not change and that the only payment changes would be for the non-CCI/MC patients, who would receive IPPS-comparable payments instead of LTCH-PPS payments. ***Figure 3-2*** graphs the number of LTCHs whose non-CCI/MC payments would decrease by the specified percentages. The median payment change for non-CCI/MC patients would be -47.6 percent, but the impacts vary considerably: four LTCHs would have a decrease of 0–9 percent while 27 would have payment reductions of 70 percent or more for their non-CCI/MC patients.

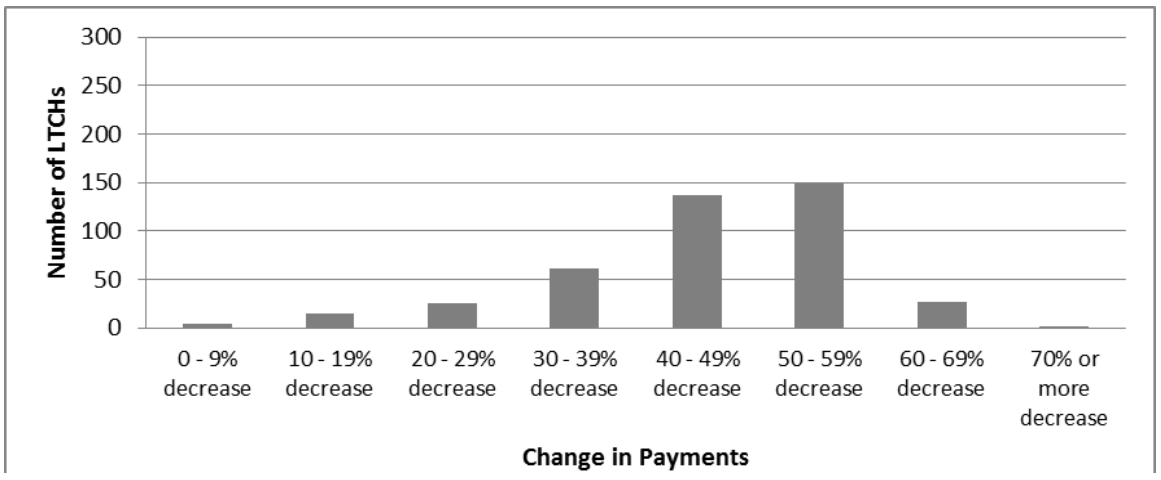
Figure 3-1
Simulated percentage change in total payments for LTCHs resulting from the alternative CCI/MC payment model—Number of LTCHs with specified percent change: Static Simulation 1 Results: No behavioral change



NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims.

Figure 3-2
Simulated percentage change in LTCH payments for non-CCI/MC patients resulting from the alternative CCI/MC payment model with current fixed loss threshold— Number of LTCHs with specified percent change: Static Simulation 1 Results: No behavioral change



NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

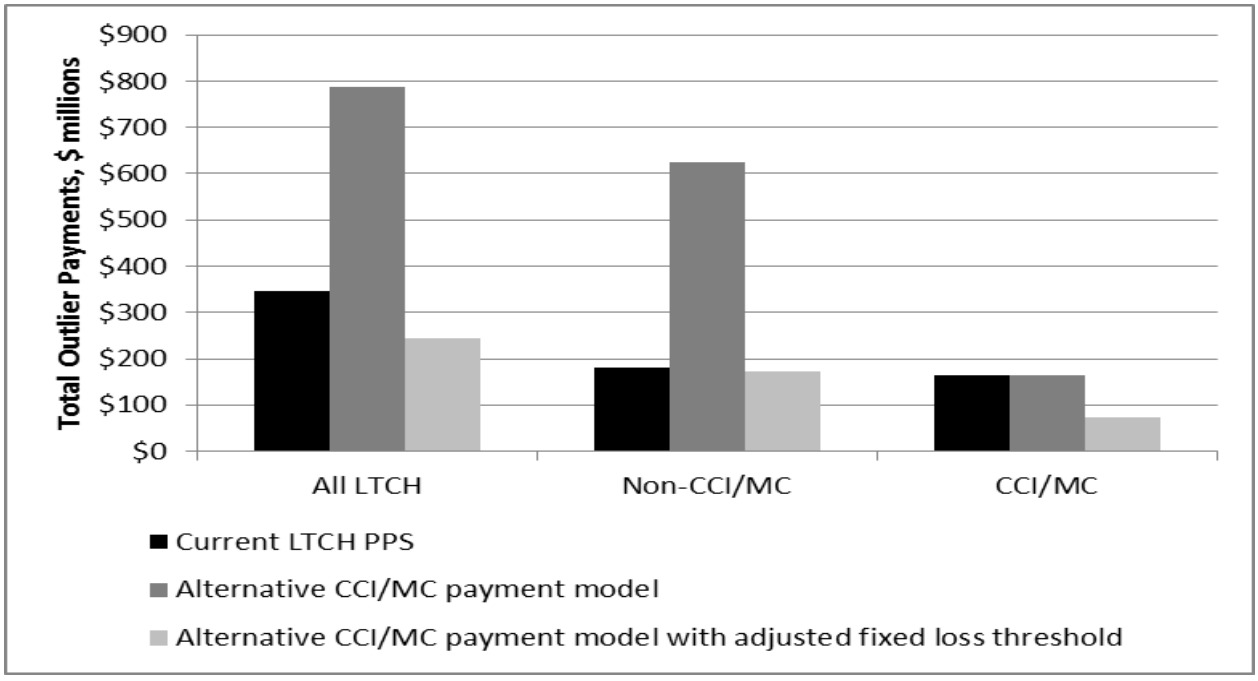
3.3.2 Static Simulation 2—Fixed Loss Threshold Adjusted to $48,936

The static simulations discussed above in 3.3.1 assumed that high-cost outlier (HCO) payments would be calculated using the fixed loss threshold amount that was in effect for FY 2010, $18,425. This means that the difference between the diagnosis-related group (DRG) payment and the covered costs (as calculated by applying the LTCH-specific CCR available in the LTCH Impact Files to the total covered charges on the claims) had to reach $18,425 before any outlier payments would be paid by CMS. This fixed loss amount is set each year with the goal of having total outlier payments equal to 8 percent of total payments (Medicare program payments and beneficiary liabilities). Our simulations indicate that the alternative CCI/MC payment model would lead to significant reductions in the DRG payments for the non-CCI/MC patients, meaning that more of these patients would reach the fixed loss threshold and significantly more outlier payments would be paid. Under the FY 2010 fixed-loss outlier threshold and assuming no changes in admission practices by LTCHs, we simulated that outlier payments would equal about 22 percent of total LTCH payments.

In the second set of static simulations, we adjusted the fixed loss threshold amount so that LTCH outlier payments would equal 8 percent of total LTCH payments under the alternative CCI/MC payment model. This fixed loss threshold was $48,936. The DRG prices calculated in both simulations are the same; only the simulated outlier payments are different. Although DRG payments for CCI/MC patients in the first set of static simulations do not change between the current payment simulations and the alternative CCI/MC payment model, when the fixed loss threshold amount is increased to $48,936, some CCI/MC claims that previously qualified for HCO payments would have reduced payments because they would no longer qualify for outlier payments. ***Figure 3-3*** shows the simulated total amount of outlier payments under the current LTCH-PPS system, under the alternative CCI/MC system with no change in the fixed loss threshold, and under the alternative CCI/MC model where the fixed loss threshold is adjusted. For all LTCH claims, simulated outlier payments in FY 2010 under the current LTCH-PPS were $345 million. Under the alternative CCI/MC payment model, the outlier payments would more than double to $787 million. When the fixed loss threshold amount is adjusted to equal 8 percent of total payments, outlier payments would fall below the current LTCH-PPS amounts to $245 million. Figure 3-3 also shows graphically how the non-CCI/MC patients would be responsible for all of the increase in outlier payments under the alternative CCI/MC payment model. Going from the current system to the alternative CCI/MC payment model with the adjusted fixed loss threshold, however, it is the CCI/MC patients who would experience most of the decline in outlier payments relative to the current LTCH-PPS.

A more detailed presentation of the payment simulations for the alternative CCI/MC payment model with adjusted fixed loss threshold is shown in Table 3-2. Compared to the current LTCH-PPS, the alternative LTCH payment model with adjusted fixed loss threshold would result in LTCH payments that are 39 percent lower, with payments for CCI/MC patients that are 5 percent lower and payments for non-CCI/MC patients that are 61 percent lower. The change in payments for CCI/MC patients would result entirely from the 55 percent reduction in outlier payments, whereas the change in payments for non-CCI/MC patients is due both to the change to IPPS-comparable payments and a reduction in outlier payments. Aggregate average margins for all patients would decrease from 8.1 percent to -50.8 percent and for non-CCI/MC patients the margins would decline from 5.8 percent to -140.2 percent.

Figure 3-3
Total outlier payments for FY 2010 LTCH claims, under LTCH-PPS, under the alternative CCI/MC payment model with no change in fixed loss threshold, and under the alternative CCI/MC payment model with adjusted fixed loss threshold



NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; PPS, prospective payment system.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

A more detailed presentation of the payment simulations for the alternative CCI/MC payment model with adjusted fixed loss threshold is shown in ***Table 3-2***. Compared to the current LTCH-PPS, the alternative LTCH payment model with adjusted fixed loss threshold would result in LTCH payments that are 39 percent lower, with payments for CCI/MC patients that are 5 percent lower and payments for non-CCI/MC patients that are 61 percent lower. The change in payments for CCI/MC patients would result entirely from the 55 percent reduction in outlier payments, whereas the change in payments for non-CCI/MC patients is due both to the change to IPPS-comparable payments and a reduction in outlier payments. Aggregate average margins for all patients would decrease from 8.1 percent to -50.8 percent and for non-CCI/MC patients the margins would decline from 5.8 percent to -140.2 percent.

Table 3-2
Simulated changes in total payments and Aggregate Margins for LTCHs resulting from the alternative CCI/MC Payment model with adjusted fixed loss threshold—Payment and cost amounts in millions of dollars:
Static Simulation 2 Results: No behavioral changes, but change in outlier policy

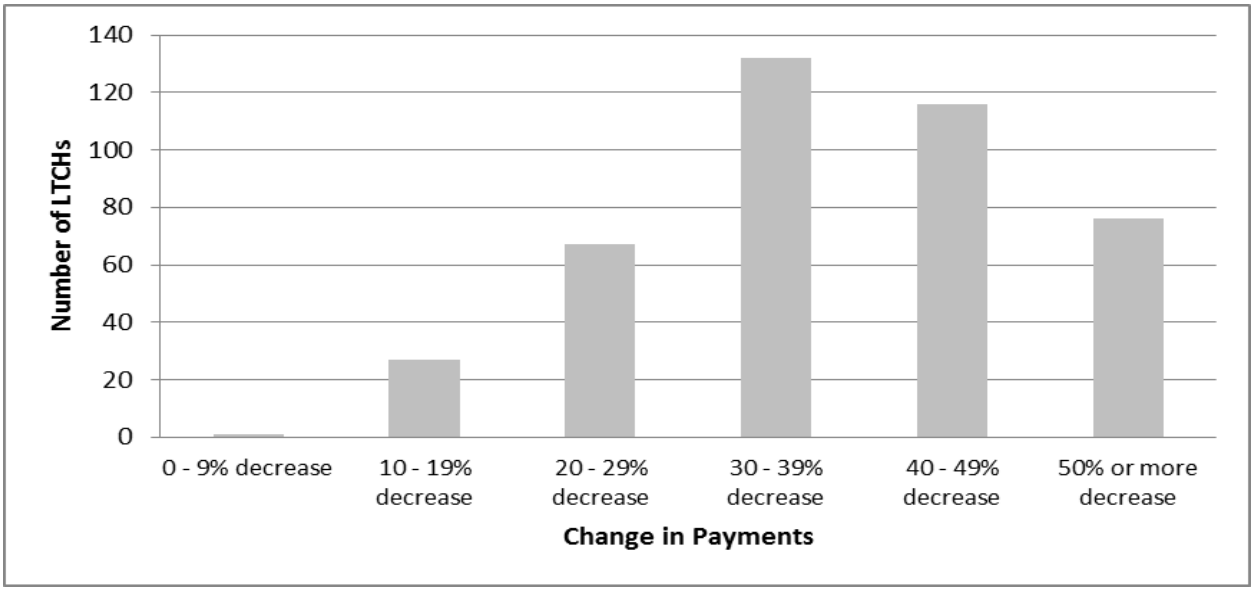
LTCH financial variables	All LTCH	CCI/MC	Non-CCI/MC
Count of LTCH claims	132,407	37,943	94,464
Total LTCH payments—current payment system	$5,022	$1,942	$3,080
Total LTCH payments—alternative model, adjusted FLT	$3,060	$1,852	$1,208
Percentage change in total LTCH payments	-39%	-5%	-61%
Total outlier payments—current payment system	$345	$164	$182
Total outlier payments—alternative model, adjusted FLT	$245	$73	$172
Percentage change in LTCH outlier payments	-29%	-55%	-5%
Total LTCH costs	$4,614	$1,711	$2,902
Aggregate average margins—current payment system	8.1%	11.9%	5.8%
Aggregate average margins—alternative model, adjusted FLT	-50.8%	7.6%	-140.2%

NOTE: CCI/MC, chronically critically ill or medically complex; FLT, fixed loss threshold; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

The distribution of percentage payment changes across LTCHs under the alternative CCI/MC payment model with the adjusted fixed loss threshold is summarized in ***Figure 3-4***. The payment decreases at the LTCH level would be considerably higher than those shown in Figure 3-1, as 132 LTCHs would have a 30–39 percent decrease in payments and 116 would have a 40–49 percent decrease in payments and only one LTCH would have a payment decrease between 0 and 9 percent. Seventy-six LTCHs would see their payments decrease by one half or more if the alternative CCI/MC payment model with the adjusted fixed loss threshold were applied to their FY 2010 claims (assuming no change in LTCH admission patterns).

Figure 3-4
Simulated percentage change in total payments for LTCHs resulting from the alternative CCI/MC payment model with adjusted fixed loss threshold—Number of LTCHs with specified percent change:
Static Simulation 2 Results: No Behavioral Changes, but change in outlier policy



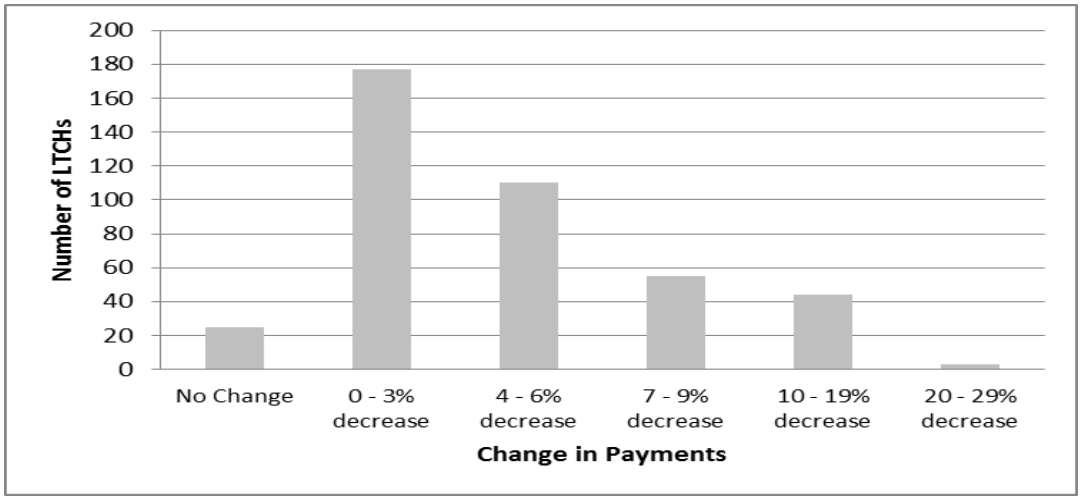
NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

Figures 3-5 and ***3-6*** show the distribution of payment changes across LTCHs for the CCI/MC patients and for the non-CCI/MC patients, respectively under static simulation 2. Under the first set of static simulations, the payments for CCI/MC patients would remain unchanged, but if the fixed loss threshold were adjusted so that the sum of outlier payments is equal to 8 percent of total payments, LTCH payments would be reduced for CCI/MC patients that were HCOs under the current LTCH-PPS.

We found in Figure 3-5 that for CCI/MC patients, twenty-five LTCHs would have no change in payments, while 177 LTCHs would have a 0- to 3-percent decrease in their payments, and 110 more would have a 4- to 6-percent decrease in payments. For non-CCI/MC patients (***Figure 3-6***), under the unlikely assumption that LTCHs would make no changes in their admission patterns of non-CCI/MC patients, 122 LTCHs would have a 50- to 59-percent decrease in payments, but most of the remaining LTCHs would have even larger simulated losses, with losses of 60–69 percent for 263 LTCHs and losses greater than 70 percent for 7 LTCHs.

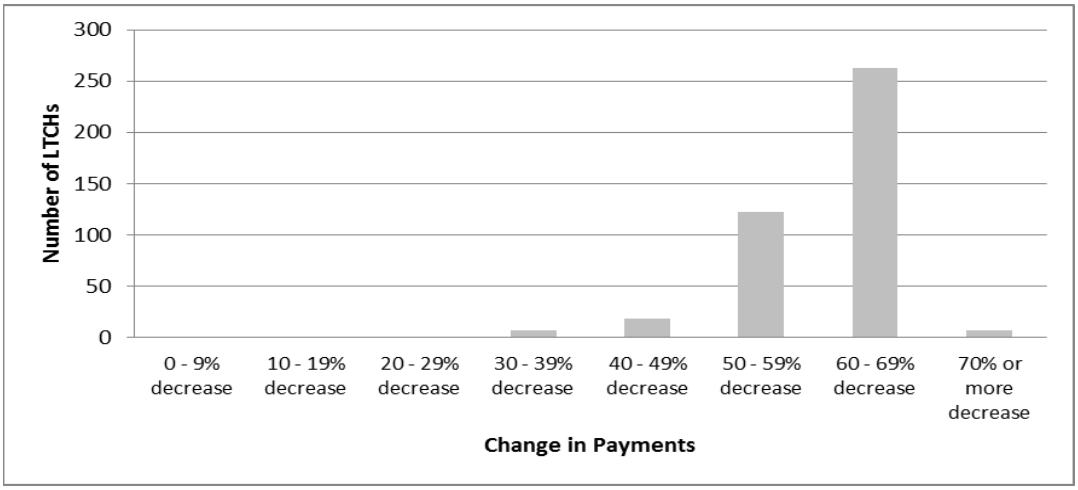
Figure 3-5
Simulated percentage change in LTCH-level payments for CCI/MC patients resulting from the alternative CCI/MC payment model with adjusted fixed loss threshold— Number of LTCHs with specified percent change: Static Simulation 2 Results: No behavioral changes, but change in outlier policy



NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

Figure 3-6
Simulated percentage change in LTCH-level payments for non-CCI/MC patients resulting from the alternative CCI/MC payment model with adjusted fixed loss threshold— Number of LTCHs with specified percent change: Static Simulation 2 Results: No Behavioral Changes, but Change in Outlier Policy



NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims.

3.3.3 Simulated Changes in High-Cost Outliers

We described the changes in high-cost outlier (HCO) payments in Figure 3.3 in 3.3.2. ***Table 3-3*** provides greater detail on the changes in HCOs that would result from the alternative CCI/MC payment model. For reference, we provide the fixed loss threshold for each payment model simulated—the current LTCH-PPS, the alternative CCI/MC payment model, and the alternative CCI/MC payment model with the fixed loss outlier threshold adjusted to 8 percent of total payments—in the first three rows of Table 3-3. This threshold is $18,425 for LTCH-PPS and the alternative CCI/MC payment model, and it is $48,936 for the alternative CCI/MC payment model with adjusted fixed loss threshold. The number of HCO claims would increase substantially under the alternative CCI/MC payment model, more than tripling from 15,208 to 46,292, with HCO claims increasing from 11 percent to 35 percent of all claims. All of this increase is due to the non-CCI/MC claims, because payments would not change for the CCI/MC claims under the alternative CCI/MC payment model. However, when the fixed loss threshold is adjusted, the number of HCO claims would drop to 9,624, and HCO claims would now be only 7 percent of all LTCH claims.

HCO payments would increase from $345 million to $787 million under the alternative CCI/MC payment model, but with the adjusted fixed loss threshold, the outlier payments would drop to $245 million. The CCI/MC claims would have outlier payments that are less than half the size of the outlier payments under the other payment models simulated. Under LTCH-PPS, the goal is to have an HCO threshold such that outlier payments equal 8 percent of total payments. Because the threshold is chosen in advance, outlier payments can fluctuate as a proportion of total payments. When we simulated outlier payments for the current payment system using the FY 2010 outlier threshold, we found that outlier payments were equal to 7 percent of total payments. Under the alternative CCI/MC payment model, the FY 2010 threshold would produce outlier payments that are 22 percent of total payments and 38 percent of total payments for the non-CCI/MC claims. When we adjust the fixed loss threshold, outlier payments would be 8 percent of total payments, but they would vary from 4 percent for the CCI/MC to 14 percent for the non-CCI/MC.

A third option not explicitly modeled here would be to have two separate fixed loss threshold amounts, one applicable to the CCI/MC population and another applicable to the non-CCI/MC population, each set so that total outlier payments within the subgroup of patients (CCI/MC or non-CCI/MC) is equal to 8 percent of total payments for that subgroup. From the simulations in Table 3-3, we see that the FY 2010 fixed loss threshold of $18,425 would produce CCI/MC outlier payments that are 8 percent of total CCI/MC payments. However, for this population of non-CCI/MC patients, the fixed loss threshold would need to be larger than the adjusted value of $48,936 to achieve the desired ratio of outlier payments to total payments.

Table 3-3
Simulated changes in high-cost outliers in LTCHs under the static simulations

LTCH financial variables	All LTCH	CCI/MC	Non CCI/MC
Fixed outlier threshold LTCH-PPS FY 2010	$18,425	$18,425	$18,425
Alternative CCI/MC payment model	$18,425	$18,425	$18,425
Alternative model with adjusted FLT	$48,936	$48,936	$48,936
Number of high-cost outlier claims LTCH-PPS FY 2010	15,208	5,934	9,274
Alternative CCI/MC payment model	46,292	5,934	40,358
Alternative model with adjusted FLT	9,624	2,247	7,377
High-cost outliers as percent total claims LTCH-PPS FY 2010	11%	16%	10%
Alternative CCI/MC payment model	35%	16%	43%
Alternative model with adjusted FLT	7%	6%	8%
High-cost outlier payments (millions) LTCH-PPS FY 2010	$345	$164	$182
Alternative CCI/MC payment model	$787	$164	$624
Alternative model with adjusted FLT	$245	$73	$172
High-cost outlier payments as percent of total LTCH payments LTCH-PPS FY 2010	7%	8%	6%
Alternative CCI/MC payment model	22%	8%	38%
Alternative model with adjusted FLT	8%	4%	14%

NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; PPS, prospective payment system, FLT, fixed loss threshold.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

3.4 MS-LTC-DRG Level Results

We also simulated the payment, cost, margin, and outlier payment results at the level of the MS-LTC-DRG assigned in the LTCH. This analysis allows us to determine which types of LTCH patients, on average, would experience the largest payment impacts due to the alternative CCI/MC LTCH payment model. The tables in this section focus on the 10 most frequent MS-LTC-DRGs in LTCHs in FY 2010, which are presented in ***Table 3-4*** for reference. Together, these 10 MS-LTC-DRGs accounted for 42 percent of all LTCH claims in FY 2010 and 46 percent of total LTCH payments. MS-LTC-DRG 207, respiratory system diagnosis with more than 96 hours of ventilator support, is by far the most frequent condition group seen in LTCHs,

with more than 15,000 claims in FY 2010. Other respiratory conditions are among the top 10, as well as other diagnoses that require extended care, such as skin ulcers and osteomyelitis.

Table 3-4
Top 10 MS-LTC-DRGs in LTCHs, FY 2010

Rank	MS-LTC-DRG	MS-LTC-DRG Description	Total number in LTCH	Percent of total in LTCH
1	207	Respiratory system diagnosis w ventilator support 96+ hours	15,534	11.7
2	189	Pulmonary edema & respiratory failure	10,928	8.3
3	871	Septicemia w/o MV 96+ hours w MCC	7,382	5.6
4	177	Respiratory infections & inflammations w MCC	5,019	3.8
5	592	Skin ulcers w MCC	3,501	2.6
6	949	Aftercare w CC/MCC	3,034	2.3
7	193	Simple pneumonia & pleurisy w MCC	2,835	2.1
8	208	Respiratory system diagnosis w ventilator support <96 hours	2,814	2.1
9	190	Chronic obstructive pulmonary disease w MCC	2,644	2.0
10	539	Osteomyelitis w MCC	2,362	1.8

NOTE: CC/MCC, [major] complication or comorbidity; LTCH, long-term care hospital; MS-LTC-DRG, Medicare severity long-term care diagnosis-related group; MV, mechanical ventilation.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

The total payments and outlier payments for the ten most frequent MS-LTC-DRGs in LTCHs in FY 2010 are presented in Tables 3-5a and 3-5b. The first two columns of each table provide the MS-LTC-DRG number and the frequency with which these MS-LTC-DRGs appear in LTCHs. The third column reports the percentage of LTCH claims within each MS-LTC-DRG that meet the CCI/MC criteria (for LTCH transfers from ACHs based on their characteristics in the ACH). The proportion of CCI/MC admissions within each MS-LTC-DRG ranges from 9 percent for MS-LTC-DRG 539 (osteomyelitis) to 83 percent for MS-LTC-DRG 207 (respiratory diagnosis with 96 or more hours ventilator support). In columns four through six of Table 3-5a, we report the total FY 2010 payments (Medicare payments plus beneficiary liabilities) for these 10 MS-LTC-DRGs under the current payment system, the simulated payments under the alternative CCI/MC payment model, and the percentage change in payments from the current system to the alternative model. The static simulations indicate that all 10 of these MS-LTC-DRGs would experience a decrease in payments under the alternative CCI/MC payment model and the assumptions used here. As we would expect, because the payments for the CCI/MC did not change under this first simulation, the MS-LTC-DRGs with the highest percentage of CCI/MC patients—207 and 208—would have the lowest percent change in payments under the

alternative CCI/MC payment model—decreases of 5 and 13 percent, respectively. The MS-LTC-DRGs with lower proportions of CCI/MC patients would have much larger decreases in payments, up to 48 percent for MS-LTC-DRG 190 (chronic obstructive pulmonary disease with a major complication or comorbidity). The last two columns report the payments and percentage change in payments when the fixed loss threshold is adjusted; the payment changes would range from -11 percent to -62 percent.

Table 3-5b presents information on outlier payments. The first three columns of Table 3-5b are the same as those in ***Table 3-5a***. Columns four through six show the outlier payments under the current and alternative CCI/MC payment models systems and the percent change in outlier payments. Column four shows the outlier payments simulated using LTCH-PPS rules. We report outlier payments under the alternative CCI/MC system using the fixed loss threshold amount that was in effect for FY 2010 ($18,425); these simulated outlier payments are presented in column five, and the percent change is in column six. All of the top 10 MS-LTC-DRGs would have increased outlier payments under the alternative CCI/MC payment model, and some would have outlier payments that are more than 200 percent higher than the outlier payments under the current payment system. Columns seven and eight present the outlier payments under the current payment system. Columns seven and eight present the outlier payments and the percent change in outlier payments relative to the current payment system for the alternative CCI/MC payment model with the fixed loss threshold adjusted to $48,936. The decrease in outlier payments would range from 20 percent to 50 percent.

We also simulated the aggregate margins by MS-LTC-DRG and found that only 15 out of the 514 MS-LTC-DRGs would have positive aggregate margins under the alternative CCI/MC payment model, and only 5 of those with positive margins would have more than 50 observations in the FY 2010 LTCH claims files. In ***Table 3-6***, we show the frequencies and aggregate margins under the alternative CCI/MC payment model for the 5 MS-LTC-DRGs with positive margins and with more than 50 observations. Note that all 5 are respiratory conditions, and 4 of the 5 involve more than 96 hours of mechanical ventilation. Previous research by Kennell/RTI International under contract to CMS (Dalton, Kandilov, Kennell & Wright, 2012) has shown that LTCHs have steadily increased their admissions of ventilator and respiratory patients and decreased their admissions of other types of patients since the introduction of LTCH-PPS.[12] ***Table 3-6*** suggests that the alternative CCI/MC payment model would only reinforce this movement toward ventilator and respiratory conditions.

[12] Previous research by RTI International under contract to CMS (Gage et al. 2007) has shown that the LTCH payment weights are biased in favor of (that is, are overstated for) respiratory conditions with intensive respiratory therapy charges. LTCH weights are generated using standardized charges from the LTCH claims that have been adjusted by the facility's average mark-up, which is the facility CCR. This does not take into account the considerable variation in mark-up within each facility across different services. CCRs for respiratory therapy tend to have the lowest CCRs (indicating the highest mark-up), and thus costs for respiratory MS-LTC-DRGs are overstated and their weights (and thus their payments) are higher relative to their true costs compared to other MS-LTC-DRGs, which use more services with lower mark-ups.

Table 3-5a
MS-LTC-DRG level payments under current and alternative CCI/MC payment models, total payments for All LTCH claims, in millions of dollars

MS-LTC-DRG	Total Number in LTCH	Percent CCI/MC	Current payment system	Alternative CCI/MC payment model			
				No change in loss threshold		Fixed loss threshold adjusted	
				Payments	% change from current	Payments	% change from current
207	15,534	83%	$1,085	$1,026	-5%	$966	-11%
189	10,928	42%	$340	$236	-31%	$199	-41%
871	7,382	25%	$218	$137	-37%	$113	-48%
177	5,019	22%	$156	$99	-37%	$81	-48%
592	3,501	11%	$110	$63	-43%	$48	-57%
949	3,034	25%	$71	$42	-41%	$32	-55%
193	2,835	15%	$73	$40	-45%	$31	-57%
208	2,814	70%	$80	$70	-13%	$64	-20%
190	2,644	10%	$66	$35	-48%	$25	-62%
539	2,362	9%	$87	$52	-40%	$39	-56%

NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; MS-LTC-DRG, Medicare severity long-term care diagnosis-related group.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

Table 3-5b
Outlier payments under current and alternative CCI/MC payment models, by MS-LTC-DRG, in millions of dollars

MS-LTC-DRG	Total Number in LTCH	Percent CCI/MC	Current payment system	Alternative CCI/MC payment model			
				No change in loss threshold		Fixed loss threshold adjusted	
				Payments	% change from current	Payments	% change from current
207	15,534	83%	$86	$115	35%	$55	-36%
189	10,928	42%	$18	$47	170%	$10	-41%
871	7,382	25%	$12	$31	154%	$7	-45%
177	5,019	22%	$8	$22	179%	$4	-43%
592	3,501	11%	$6	$20	210%	$5	-29%
949	3,034	25%	$5	$13	170%	$2	-47%
193	2,835	15%	$3	$11	209%	$2	-46%
208	2,814	70%	$5	$8	79%	$2	-50%
190	2,644	10%	$4	$12	217%	$2	-37%
539	2,362	9%	$5	$18	234%	$4	-23%

NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; MS-LTC-DRG, Medicare severity long-term care diagnosis-related group.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

Table 3-6
Five MS-LTC-DRGs with positive margins under the alternative CCI/MC payment model

MS-LTC-DRG	MS-LTC-DRG description	Total number in LTCH	Aggregate margin under alternative CCI/MC model
003	ECMO or trach w MV 96+ hrs or PDX excl w maj O.R.	297	16%
207	Respiratory system diagnosis w ventilator support 96+ hours	15,534	15%
870	Septicemia w MV 96+ hours	1,529	13%
004	Trach w MV 96+ hrs or PDX exc face, mouth & neck w/o maj O.R.	1,591	11%
166	Other resp system O.R. procedures w MCC	1,789	7%

NOTE: ECMO, extracorporeal membranous oxygen; LTCH, long-term care hospital; MCC, major complication or comorbidity; MS-LTC-DRG, Medicare severity long-term care diagnosis-related group; MV, mechanical ventilation; O.R., operating room; PDX, primary diagnosis.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

In ***Table 3-7***, we present the simulated MS-LTC-DRG-level margins for the 10 most frequent MS-LTC-DRGs in FY 2010. We compute the margins under three different payment models: the current payment system, the alternative CCI/MC payment model with no change in the fixed loss outlier threshold, and the alternative CCI/MC payment model where the fixed loss outlier threshold is adjusted to $48,936, such that total outlier payments are equal to 8 percent of total payments. Aggregate margins for CCI/MC patients are reported separately from those of the non-CCI/MC patients, because the alternative CCI/MC payment model would have a much larger financial impact on the non-CCI/MC claims in LTCHs. Under the current payment system, nine of the ten most frequent MS-LTC-DRGs in LTCHs have positive margins for their non-CCI/MC claims, and for all ten of the most frequent MS-DRGs, the non-CCI/MC margins are higher than the CCI/MC margins. This is to be expected—within an MS-LTC-DRG, the CCI/MC patients are likely to have greater care needs and be more costly than non-CCI/MC patients with the same diagnosis.

Table 3-7
MS-LTC-DRG level aggregate average margins under current payment system and alternative CCI/MC payment model with and without an adjustment to the fixed loss threshold

MS-LTC-DRG	Total number in LTCH	Percent CCI/MC	Aggregate average MS-LTC-DRG margin					
			Current payment system		Alternative CCI/MC payment model			
					No change in loss threshold		Fixed loss threshold adjusted	
			CCI/MC	Non-CCI/MC	CCI/MC	Non-CCI/MC	CCI/MC	Non-CCI/MC
207	15,534	83.8%	19%	21%	19%	-18%	15%	-46%
189	10,928	50.9%	5%	12%	5%	-96%	0%	-205%
871	7,382	26.2%	-2%	9%	-2%	-79%	-9%	-138%
177	5,019	25.9%	2%	10%	2%	-69%	-4%	-122%
592	3,501	12.1%	-6%	4%	-6%	-86%	-13%	-161%
949	3,034	31.9%	-14%	-6%	-14%	-134%	-22%	-274%
193	2,835	20.3%	-5%	5%	-5%	-100%	-11%	-178%
208	2,814	72.7%	8%	9%	8%	-57%	4%	-111%
190	2,644	16.9%	-7%	3%	-7%	-105%	-12%	-205%
539	2,362	10.2%	-5%	2%	-5%	-74%	-12%	-149%

NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; MS-LTC-DRG, Medicare severity long-term care diagnosis-related group.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims

In static simulations of the alternative CCI/MC payment model assuming no change in fixed loss threshold, the margins for the non-CCI/MC claims in all of the 10 most frequent MS-LTC-DRGs would be negative. On average, accepting these patients would no longer be profitable for LTCHs. The margins for the non-CCI/MC claims would range from −17 percent for MS-LTC-DRG 207 (Respiratory system diagnosis with ventilator support for 96 or more hours) to −100 percent or more for three MS-LTC-DRGs. Under the alternative CCI/MC payment model with an adjusted fixed loss outlier threshold, the losses would be even greater, and the margins would range from −46 percent to −274 percent. Note that the margins for the CCI/MC patients would be negative across all three payment models for 6 of the 10 most frequent MS-LTC-DRGs, although the losses that the LTCHs would experience for these patients would not be nearly as great as the losses for the non-CCI/MC patients under the alternative CCI/MC payment model.

Examining the full set of MS-LTC-DRG margins (results not shown), it is clear that the alternative CCI/MC payment model would create strong financial incentives for LTCHs to avoid admitting all types of non-CCI/MC patients, regardless of their diagnoses. Under the current payment model, aggregate margins for non-CCI/MC claims in LTCHs were positive in about half of MS-LTC-DRGs. These 232 MS-LTC-DRGs with positive margins contain about two-thirds of all non-CCI/MC patients in LTCHs and 71 percent of all LTCH patients. However, under the alternative CCI/MC payment model and the simulation assumptions used here, only 6 MS-LTC-DRGs would continue to have profitable margins for non-CCI/MC patients, and only 1 of these 6 has more than five claims in FY 2010. The only profitable MS-LTC-DRG of significant size for non-CCI/MC patients would be MS-LTC-DRG 003 (extracorporeal membranous oxygen or tracheotomy with mechanical ventilation for 96 or more hours or primary diagnosis excluding face, mouth, and neck with major operating room), which has the highest simulated IPPS-comparable payments among all MS-LTC-DRGs. With the exception of this MS-LTC-DRG, virtually all non-CCI/MC patients would be expected to have negative LTCH margins, and these losses would be quite large, in some instances, ranging from -4 percent to -450 percent.

The negative LTCH margins would be even greater once the fixed loss threshold was adjusted. Only three MS-LTC-DRGs would have profitable margins for non-CCI/MC patients, and none of these MS-LTC-DRGs has more than five non-CCI/MC claims. The negative margins for the non-CCI/MC patients would be even larger in magnitude, ranging to more than -650 percent.

3.5 Behavioral Simulations of the Alternative CCI/MC LTCH Payment Model

After examining how the alternative CCI/MC LTCH payment model would be expected to affect the payments and margins received by LTCHs if LTCHs made no changes in their admission practices, we then simulated how LTCHs might reasonably be expected to respond to the payment changes. Because the alternative CCI/MC payment model would substantially reduce the payments for non-CCI/MC LTCH patients, making these patients unprofitable, it is reasonable to assume that LTCHs would change their admissions criteria in response to the alternative CCI/MC payment model. One likely response is that LTCHs would reduce the number of non-CCI/MC patients they admit. In the following sections, we present the results of two simulations of the alternative LTCH payment model. In these two behavioral simulations,

we assumed that LTCHs would reduce their non-CCI/MC patients by: (1) 75 percent; or (2) 90 percent, and that in both cases they would increase the number of CCI/MC patients admitted, subject to both facility- and state-level constraints.

3.6 Methodology for Behavioral Simulations

We started with the same FY10 data that was described in Section 3.2.1 and used in the static simulations discussed in Sections 3.3 – 3.4. We simulated the total LTCH payments under the alternative CCI/MC payment model under two different sets of behavioral assumptions about the reduction in non-CCI/MC patients in LTCHs. We also calculated LTCH costs and LTCH-level aggregate margins to analyze the distributional consequences across the 419 LTCHs and to identify which facilities would face the greatest impacts from the alternative CCI/MC payment model.

We simulated the alternative CCI/MC payment model changes under two different assumptions about how LTCHs would reduce their non-CCI/MC patients:

- In the first set of behavioral simulations (Sim75), we assumed that LTCHs would reduce their non-CCI/MC populations by 75 percent.

- In the second set of behavioral simulations (Sim90), we assumed that LTCHs would reduce their non-CCI/MC populations by 90 percent.

In both behavioral simulations, we assumed that LTCHs would increase their CCI/MC patient admissions by an amount that is constrained by: 1) the reduction in non-CCI/MC patients; and 2) by the number of CCI/MC patients identified in hospitals within the state that are available for LTCH transfer (meaning that they did not die in the hospital or were not already discharged to an LTCH). Specifically, for these behavioral simulations, we assumed that:

- LTCHs would reduce their non-CCI/MC patients by 75 percent (90 percent), and this reduction would be applied proportionally across all non-CCI/MC patients, such that the case-mix of the non-CCI/MC patients within each LTCH would remain the same;

- LTCHs would increase their CCI/MC patients proportionally across all CCI/MC patients, such that the case-mix of the CCI/MC patients within each LTCH would remain the same (however, the overall case-mix would change because the non-CCI/MC would be reduced and the CCI/MC would be increased);

- 25 percent of CCI/MC patients discharged alive from ACH hospitals and who are not currently transferred to LTCHs in each state would be available for transfer to LTCHs subject to two constraints:

  - the increase in CCI/MC patients could not be greater than the decrease in non-CCI/MC patients within an LTCH, and

  - the increase in CCI/MC patients could not be greater than the LTCH's share of the CCI/MC patients in the state available for LTCH transfer;

- lengths of stay and charges would be exactly the same as they appeared on the claims files for FY 2010;

- current short-stay outlier policies would remain in effect for the CCI/MC patients in LTCHs, but the non-CCI/MC would receive a per diem payment based on the ACH amount if their length of stay (LOS) was less than the ACH average LOS;

- current high-cost policies would remain in effect for all patients; and

- the 25 day average LOS requirement would be applied to all Medicare LTCH patients, CCI/MC and non-CCI.

To calculate the number of additional CCI/MC patients available to each LTCH, we first identified all of the CCI/MC patients with claims in ACH hospitals in FY 2010. We assumed that each LTCH would only receive additional CCI/MC patients from ACH hospitals within the same state (in the FY 2010 data, we found that 97 percent of LTCH admissions from an ACH hospital came from hospitals within the same state as the LTCH). We calculated the total number of CCI/MC patients within each state and subtracted the CCI/MC patients who either died in the ACH hospital or who were already discharged to LTCHs. We assumed that only 25 percent of the remaining CCI/MC patients in ACH hospitals could potentially be discharged to LTCHs, which allows a greater proportion of additional CCI/MC transfers to LTCHs to occur in states where current LTCH transfer rates are lower. We allocated the available CCI/MC patients across LTCHs based on the ratio of each LTCH's claims to the total number of LTCH claims within each state.

In the both sets of behavioral simulations, we adjusted the fixed loss threshold amount so that the outlier payments would equal 8 percent of total LTCH payments (Medicare program payments and beneficiary liabilities combined). When LTCHs reduced their non-CCI/MC patients by 75 percent (90 percent), the fixed loss threshold was adjusted to $29,389 ($23,603).

As LTCHs reduce their non-CCI/MC patients and increase their CCI/MC patients, the overall case-mix of LTCHs would change significantly. Under the current LTCH-PPS payment rules, the MS-LTC-DRG weights are adjusted annually to reflect the relative changes in costliness of the MS-LTC-DRGs. Because CCI/MC patients are more costly (on average) than non-CCI/MC patients in the same MS-LTC-DRG, MS-LTC-DRGs that currently have a larger proportion of non-CCI/MC would be expected to have larger increases in their average costs with the shift from non-CCI/MC patients to CCI/MC patients. For example, about 50 percent of LTCH patients in MS-LTC-DRG 189 (Pulmonary edema & respiratory failure) were CCI/MC in FY 2010, while only about 20 percent of LTCH patients in MS-LTC-DRG 193 (Simple pneumonia & pleurisy w MCC) were CCI/MC in FY 2010. MS-LTC-DRG 189 had a weight of 0.9736 and MS-LTC-DRG has a weight of 0.7620. If non-CCI/MC patients decline by 75 percent (90 percent), we expect that the average cost difference between these two MS-LTC-DRGs would also decline, and their payment weights would likely get closer together. CMS requested that for these exploratory simulations, we not model the weight changes. Instead, we used the FY 2010 MS-LTC-DRG weights for all payment simulations. However, it is important to note that if this alternative CCI/MC payment model were implemented, the MS-LTC-DRG

weights would be expected to change as the proportions of CCI/MC and non-CCI/MC within the MS-LTC-DRGs changed.

3.7 LTCH Industry-level Results Under the Behavioral Simulations

We simulated current payment amounts under the LTCH-PPS for each of the 419 LTCHs in the FY 2010 sample, and then we simulated payment amounts under the alternative CCI/MC payment model under the 75 percent non-CCI/MC and 90 percent non-CCI/MC reduction assumptions. We then calculated the level and percent differences between the LTCH-PPS amounts and the alternative CCI/MC payment amounts. The overall results are summarized in ***Table 3-8***. These results reflect both decreases in the non-CCI/MC patients and increases in the CCI/MC patients.

In contrast to the static simulations reported in Sections 3.3 and 3.4, these behavioral simulations assume that LTCHs adjust their admission patterns in response to the change in the alternative CCI/MC payment model. This means that the overall number of LTCH discharges is likely to change. In the first three rows of ***Table 3-8***, we report the current number of LTCH discharges, the simulated number of discharges if the non-CCI/MC are reduced by 75 percent and CCI/MC are increased, and the simulated number of discharges if the non-CCI/MC are reduced by 90 percent and the CCI/MC are increased. These values are reported for all LTCH claims and for CCI/MC claims and non-CCI/MC claims separately. Overall, we estimate that the number of LTCH discharges would fall from 132,407 under the current payment system to 99,432 (25 percent decrease) if non-CCI/MC claims were reduced by 75 percent and to 88,238 (33 percent decrease) if non-CCI/MC claims decreased by 90 percent.

Compared to the current LTCH-PPS, the alternative CCI/MC payment models would reduce payments to LTCHs from $5.0 billion to $4.2 billion (Sim75) and $4.1 billion (Sim90), respectively. Overall, payments to LTCHs would be 17 percent lower under both behavioral simulations, with payments for CCI/MC patients approximately doubling and payments for non-CCI/MC patients dropping by 90 percent or more. Because we adjust the fixed loss outlier threshold in order to constrain outlier payments to 8 percent of total payments, we estimate relatively small changes in outlier payments for LTCHs. Aggregate average margins for all patients would fall from 8.1 percent to 0.1 percent for all LTCH patients under the Sim75 assumptions, and would fall to 7.2 percent under Sim90. These behavioral simulations indicate that for LTCHs in aggregate to "break even" on their Medicare patients under the alternative CCI/MC payment model, they would need to reduce their non-CCI/MC patients by 75 percent and double their admission of CCI/MC patients. For LTCHs to return to roughly their current industry average level of profitability, they would need to reduce their non-CCI/MC patients by 90 percent and more than double their number of CCI/MC patients.

Table 3-8
Behavioral simulations of LTCH payments, costs, and margins under current payment system and the alternative CCI/MC LTCH payment model assuming changes in LTCH admission patterns

Simulated outcome	All LTCH claims	Percentage change from current payment system	CCI/MC	Percentage change from current payment system	Non CCI/MC	Percentage change from current payment system
Claim count: Current payment system	132,407	—	37,943	—	94,464	—
Alternative payment model, 75% reduction in Non CCI/MC	99,432	-25%	75,816	100%	23,616	-75%
Alternative payment model, 90% reduction in Non CCI/MC	88,238	-33%	78,791	108%	9,446	-90%
Total LTCH payments ($ millions): Current payment system	$5,022	—	$1,942	—	$3,080	—
Alternative payment model, 75% reduction in Non CCI/MC	$4,152	-17%	$3,800	96%	$351	-89%
Alternative payment model, 90% reduction in Non CCI/MC	$4,144	-17%	$3,992	106%	$152	-95%
Total outlier payments ($ millions): Current payment system	$345	—	$164	—	$182	—
Alternative payment model, 75% reduction in Non CCI/MC	$335	-3%	$243	48%	$92	-49%
Alternative payment model, 90% reduction in Non CCI/MC	$342	-1%	$294	80%	$48	-74%
Total LTCH costs ($ millions): Current payment system	$4,614	—	$1,711	—	$2,902	—
Alternative payment model, 75% reduction in Non CCI/MC	$4,147	-10%	$3,422	100%	$726	-75%
Alternative payment model, 90% reduction in Non CCI/MC	$3,846	-17%	$3,555	108%	$290	-90%
Aggregate average margins: Current payment system	8.1%	—	11.9%	—	5.8%	—
Alternative payment model, 75% reduction in Non CCI/MC	0.1%	—	10.0%	—	-106.6%	—
Alternative payment model, 90% reduction in Non CCI/MC	7.2%	—	10.9%	—	-91.2%	—

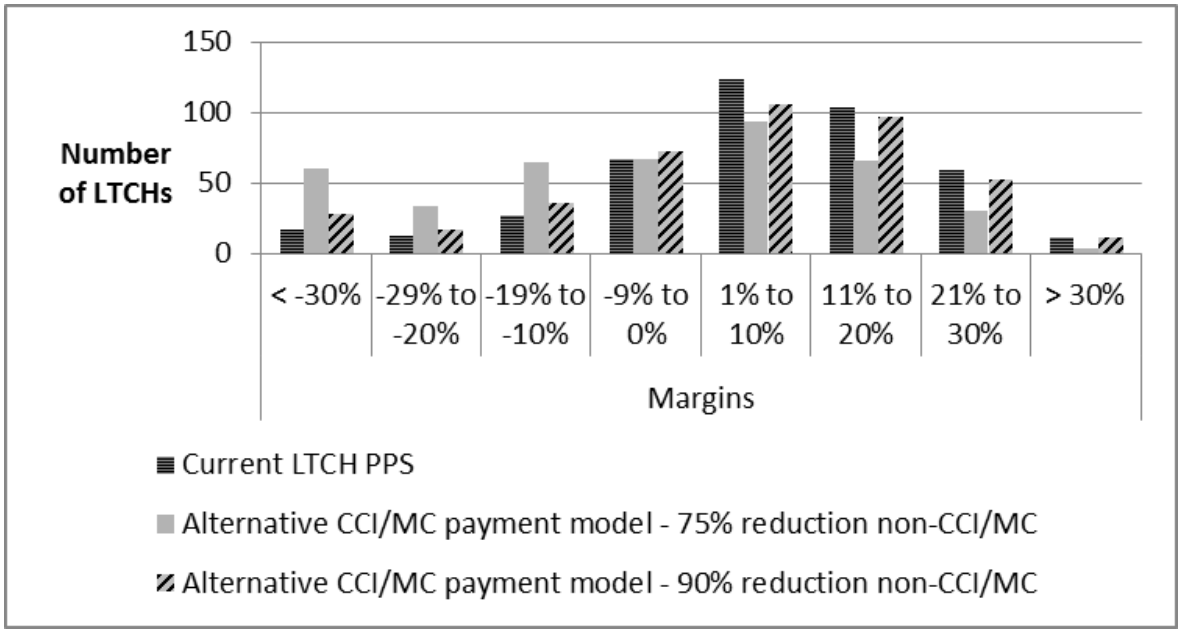
NOTE: LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex;

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of LTCH claims

3.8 Facility-level Results Under the Behavioral Simulations

The profitability of LTCHs under the alternative CCI/MC payment models with 75 percent and 90 percent reductions in non-CCI/MC patients is further illustrated in ***Figure 3-7***, which shows the distribution of facility-level aggregate margins under the current LTCH-PPS and under the two simulations of the alternative CCI/MC payment models. Under the current LTCH-PPS, we find 17 LTCHs with aggregate margins below -30 percent. When the non-CCI/MC patients are reduced by 75 percent, the number of LTCHs with margins below -30 percent would be 60 and under the 90 percent simulation it would be 28. At the higher end of the margins distribution, the number of LTCHs with margins above 30 percent is 11 under the current LTCH-PPS, but would drop to 4 and 11 respectively under the alternative CCI/MC payment model with the non-CCI/MC patients reduced by 75 (90) percent. The distribution of LTCH-level aggregate margins would be lower for the alternative CCI/MC payment models than for LTCH-PPS, although if LTCHs were able to reduce their non-CCI/MC patients by 90 percent and more than double their CCI/MC patients, then they would return to a distribution of facility-level aggregate margins that is similar to the distribution of margins under the current LTCH-PPS.

Figure 3-7
Simulated LTCH-level aggregate margins under current payment system and the alternative LTCH payment model with simulated changes in LTCH admission patterns – Number of LTCHs with specified margin

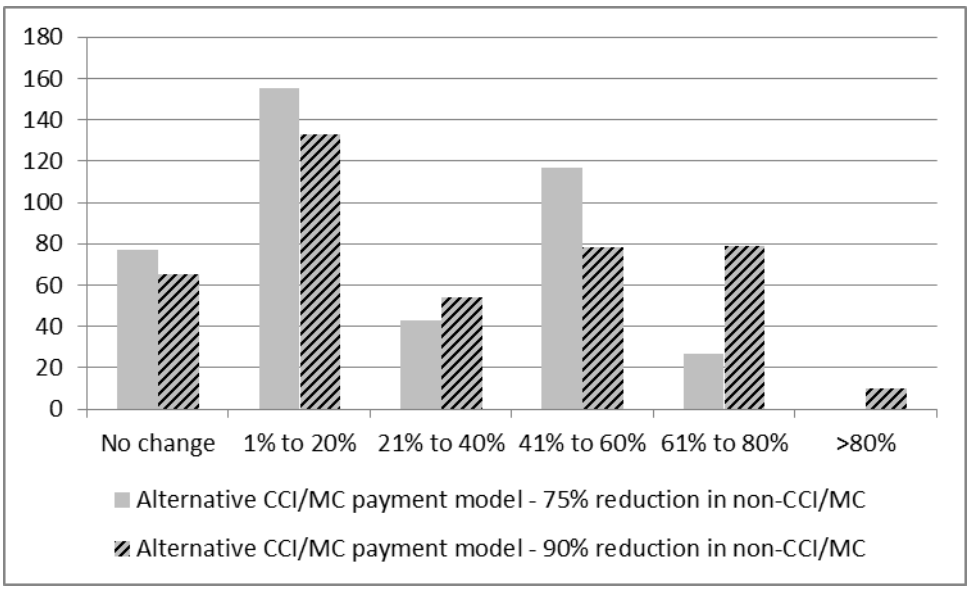


NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of LTCH claims

In addition to aggregate average margins, another concern is that LTCHs would have significant decreases in their number of discharges and occupancy rates. While we did not look specifically at occupancy rates for LTCHs, we did model the expected changes in the number of discharges, both for the industry as a whole and for individual LTCHs. In ***Figure 3-8***, we graph the number of LTCHs with the specified percentage decreases in discharges.

Figure 3-8
Simulated decreases in LTCH-level discharges relative to the current payment system – Number of LTCHs with specified decrease in discharges



NOTE: CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of LTCH claims

Under Sim75 (Sim90), there are 77 (65) LTCHs which would have no change in their annual number of discharges. Under these assumptions, these facilities would be able to increase their CCI/MC patients by the same number that they reduce their non-CCI/MC patients. Out of the 419 LTCHs in our simulations, over 30 percent (155 in Sim75 and 133 in Sim90) would lose less than 20 percent of their patient totals. Just 27 LTCHs would have a decrease of 60 percent or more in their number of discharges under Sim75, but under Sim90, there are 89 LTCHs that would experience a decline of 60 percent or more. These LTCHs with the largest decreases in patient populations have higher-than-average proportions of non-CCI/MC patients, and so lose a larger proportion of patients when they reduce their non-CCI/MC patients. Also, these LTCHs with the largest decreases in patients are located in states where a large fraction of CCI/MC patients in acute hospitals are already being discharged to LTCHs, so there are fewer CCI/MC patients available to replace the non-CCI/MC who are no longer admitted to LTCHs.

Table 3-9
Behavioral simulations of LTCH payments and margins under current payment system and alternative CCI/MC payment model with changes in LTCH admission patterns, subdivided by selected LTCH characteristics

State	Number of LTCHs	Current payment system		Alternative CCI/MC payment model, 75% reduction in non-CCI/MC		Alternative CCI/MC payment model, 90% reduction in non-CCI/MC	
		Payments ($ millions)	Margin	Payments ($ millions)	Margin	Payments ($ millions)	Margin
Bed size	37	$214	3.6%	$138	-8.1%	$135	3.0%
0-24 beds							
25-49 beds	195	$1,617	7.8%	$1,389	1.9%	$1,398	8.9%
50-74 beds	103	$1,317	8.0%	$1,075	0.4%	$1,062	7.5%
75-124 beds	49	$832	5.4%	$744	-1.5%	$754	4.8%
125-199 beds	20	$511	7.2%	$409	-4.7%	$410	3.0%
200+ beds	15	$531	16.4%	$396	3.7%	$384	11.0%
Urbanicity							
Large urban area	202	$3,010	9.0%	$2,599	1.3%	$2,596	7.7%
Other urban area	191	$1,815	7.7%	$1,447	-0.6%	$1,448	7.2%
Rural area	26	$197	-1.2%	$106	-18.9%	$99	-5.8%
Ownership							
Government	12	$66	-8.3%	$74	-13.1%	$79	-6.6%
Voluntary	77	$702	-0.5%	$595	-6.3%	$601	1.3%
Proprietary	300	$3,989	10.3%	$3,256	2.0%	$3,232	9.0%
Unknown	30	$264	2.1%	$227	-5.6%	$231	1.6%

NOTES: Data on bed size, urbanicity, and ownership from the RY 2009, RY 2010, FY 2011, and FY 2012 LTCH Impact Files.

CCI/MC, chronically critically ill or medically complex; LTCH, long-term care hospital; FY, fiscal year; RY, rate year.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of LTCH claims

LTCH facilities with certain characteristics (size, location, ownership) may do better or worse than other LTCHs under the alternative CCI/MC payment model. ***Table 3-9*** presents the aggregate payments and aggregate average margins for LTCHs subdivided by the number of beds; by their location in large urban, other urban, or rural areas (as defined by the LTCH Impact files), and by their ownership, whether they are government-owned, non-profit, or for-profit. The smallest LTCHs (0-24 beds) have the lowest margins under the current payment system (3.6 percent) and under the assumptions of Sim75 (-8.1 percent), and the assumptions of Sim90 (3.0%). In contrast, the largest LTCHs (200+beds) have the highest margins under the current payment system (16.4 percent) and would have the highest margins under Sim75 (3.7 percent) and under Sim90 (11.0 percent). However, there is no clear pattern of margins increasing as size increases, since the 75-124 bed LTCHs and the 125-199 bed LTCHs have lower margins in all three scenarios than the 25-49 bed LTCHS and the 50-74 bed LTCHs. Urbanicity has the a similar relationship with LTCH profitability both before and after the simulated implementation of the alternative CCI/MC payment model, with urban LTCHs receiving much higher margins than rural ones, though it should be noted that there are few rural LTCHs. Proprietary LTCHs have higher margins than government and voluntary LTCHs under both the current LTCH PPS and under the alternative CCI/MC payment model.

3.9 State-level Results Under the Behavioral Simulations

We also simulated how the alternative CCI/MC payment model would affect the LTCHs in various states. We excluded eight states – Hawaii, Maine, Maryland, New Hampshire, New York, Rhode Island, Vermont, and Wyoming –from these analyses because there are no LTCHs paid under the MS-LTC-DRG system in the study sample in these states.

Table 3-10 presents summary measures of LTCH payments and margins for three groupings of states. The states are classified into three groups based on the percentage of CCI/MC patients in ACH hospitals within the state that are transferred to an LTCH within 0-1 day of the ACH discharge date: 1) those with 20 percent or more CCI/MC transferred to LTCH; 2) those with 10-20 percent CCI/MC transferred to LTCH; and 3) those with 3 to 10 percent CCI/MC transferred to LTCH.

Six states including Louisiana, Oklahoma, Texas, Massachusetts, Nevada, and Mississippi had more than 20 percent of their ACH CCI/MC patients transferred to an LTCH. These states would experience substantial decreases in Medicare payments under the alternative CCI/MC payment model; for example, payments to these states would decrease from their FY 2010 level of $2.05 billion to $1.02 billion under Sim75 and $937 million under Sim90. LTCH margins on CMS patients would also decline considerably under the alternative CCI/MC payment model. Average margins would fall from 9.7 percent to -13.1 (-0.2) percent under Sim75 (Sim90). These states already have high transfer rates for their CCI/MC patients, and as a result, there are fewer CCI/MC patients not already being treated in LTCHs available in these states for LTCH transfer when the LTCHs respond to the alternative CCI/MC payment model by reducing their non-CCI/MC discharges.

Table 3-10
Simulated State-Level LTCH payments and margins under current payment system and alternative CCI/MC payment model with changes in LTCH admission patterns

State	Percent CCI/MC in ACH transferred to LTCH	Current payment system		Alternative CCI/MC payment model, 75% reduction in non-CCI/MC		Alternative CCI/MC payment model, 90% reduction in non-CCI/MC	
		Payments ($ millions)	Margin	Payments ($ millions)	Margin	Payments ($ millions)	Margin
States with 20% or more CCI/MC transferred to LTCH	25.2%	$2,048	6.4%	$1,022	-13.1%	$937	-0.2%
States with 10-20% CCI/MC transferred to LTCH	14.1%	$1,879	8.1%	$1,933	4.0%	$1,976	9.2%
States with 3-10% CCI/MC transferred to LTCH	8.8%	$1,095	11.5%	$1,197	5.1%	$1,231	9.5%

NOTES: Hawaii, Maine, Maryland, New Hampshire, New York, Rhode Island, Vermont, and Wyoming are excluded because these states had no LTCHs in the sample. States with 5 or fewer LTCHs in the sample were grouped together based on the state level rate of LTCH referral for CCI/MC patients. LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex. States with 20 percent or more CCI/MC transferred to LTCH include LA, OK, TX, MA, NV, and MS. States with 10-20 percent CCI/MC transferred to LTCH include IN, AR, CO, OH, MI, GA, PA, AZ, MO, TN, AL, IL, SC, AK, DC, DE, ID, KS, KY, MN, ND, NE, NM, UT, WI, and WV. States with 3-10 percent CCI/MC transferred to LTCH include CA, FL, NC, CT, IA, MT, NJ, OR, SD, VA, and WA.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of LTCH claims.

In the middle group of 26 states where between 10-20 percent of CCI/MC patients were transferred to LTCHs in FY 2010, we simulated that many states would have stable or even increasing payments under the alternative CCI/MC payment model. We estimate that these LTCHs received $1.88 billion in payments for Medicare patients in FY10. Under Sim75 (Sim90), we simulated that the LTCHs in these states LTCHs would reduce their admissions of non-CCI/MC patients by 75 (90) percent. The increased payments that we simulated in many states occur because many of the non-CCI/MC that are no longer transferred to LTCHs are less costly and in lower-weighted MS-LTC-DRGs while the increased CCI/MC admissions are more likely to be in higher-weighted MS-LTC-DRGs. As a result, LTCH payments would actually increase to $1.93 ($1.98) billion under Sim75 (Sim90). The margins for the LTCHs in these 26 states would remain positive under the alternative CCI/MC payment model and actually increase from 8.1 percent to 9.2 percent under Sim90.

We simulated that the 11 states which transferred between 3-10 percent of CCI/MC discharges to LTCH would experience an aggregate increase in LTCH payments under the alternative CCI/MC payment model. Margins under Sim75 would be generally lower (5.1 percent) than current LTCH-PPS margins (11.5 percent), but Sim90 margins would be almost equal to current LTCH-PPS margins (9.5 percent).

3.10 Conclusions and Discussion

We simulated payments to LTCHs under five different combinations of assumptions and payment models:

- the current LTCH-PPS;
- two static simulations of the alternative CCI/MC payment model which assumed no changes in the admitting practices of LTCHs:
  - one simulation assumed no changes in the fixed loss threshold for outliers
  - the second assumed that the fixed loss threshold would be set so that outlier payments are eight percent of total payments;
- two behavioral simulations of the alternative CCI/MC payment model:
  - one which assumed that LTCHs would reduce their non-CCI/MC patients by 75 percent; and
  - one which assumed that LTCHs would reduce their non-CCI/MC patients by 90 percent.

Using costs calculated from LTCH- and service-specific CCRs, we simulated the aggregate margins that LTCHs would have received under each payment model. We simulated that the alternative CCI/MC payment model would result in significant decreases in payments to LTCHs. On the basis of FY 2010 LTCH claims, the simulations indicate that payments would drop from $5.0 billion to $3.6 billion if the alternative CCI/MC payment model was implemented and LTCHs made no changes in their case-mix. When we simulate the alternative

CCI/MC payment model and adjust the fixed loss threshold, payments fall even further, to $3.1 billion. When LTCHs are assumed to reduce their admission of non-CCI/MC patients by 75 (90) percent and increase their CCI/MC patients, overall Medicare payments (CMS payments plus beneficiary liabilities) are simulated to not decrease as much and are simulated to be $4.2 ($4.1) billion.

Aggregate average margins for LTCHs, simulated to be 8.1 percent under the current payment system, would fall to -28.1 percent or -50.8 percent under the alternative CCI/MC payment model assuming no change in LTCH admission patterns, without and with an adjustment of the fixed loss threshold, respectively. The results differ under the behavioral simulations: under the Sim75 assumptions, aggregate average margins would be near zero, and under the Sim90 assumptions, they would almost recover to their level under the current LTCH PPS at 7.5 percent.

Although aggregate margins for the CCI/MC patients would remain positive, non-CCI/MC patients in LTCHs would have large negative margins, and LTCHs would have little or no financial incentive to accept non-CCI/MC patients. As a result, the behavioral simulations assumed large declines in the number of non-CCI/MC patients in LTCHs. The simulations indicate that all LTCHs would face substantial payment reductions under the alternative CCI/MC payment model. Not surprisingly, those LTCHs with the highest proportion of non-CCI/MC patients would face the largest payment reductions.

In the analysis of the 10 most frequent MS-LTC-DRGs, we found that the margins for the non-CCI/MC would decline considerably under the alternative CCI/MC payment model (with no change in the LTCH admissions of non-CCI/MC) and that many of the aggregate average margins for the CCI/MC patients among the top 10 MS-LTC-DRGs would be negative. Only ventilator and respiratory conditions would remain profitable, and we expect LTCHs would continue to shift their admissions criteria to focus on ventilator and respiratory patients in response to the alternative CCI/MC payment model.

After assuming that LTCHs would shift their admissions from non-CCI/MC patients to CCI/MC patients, we explored groups of states by CCI/MC LTCH transfer rates and found that the states that already have a high percentage of CCI/MC transfers from ACH hospitals to LTCHs would experience the largest declines in LTCH payments and Medicare margins.

SECTION 4
SIMULATIONS OF THE EFFECT OF THE ALTERNATIVE CCI/MC LTCH PAYMENT MODEL ON ACUTE CARE HOSPITAL PAYMENTS, COSTS, AND MARGINS

4.1 Introduction to Simulations of ACH Charges, Costs, and Payments

The alternative payment model previewed in the FY14 LTCH rulemaking process by CMS for long-term care hospitals (LTCHs) would have impacts on both LTCHs, as discussed in Chapter 3, and on acute care hospitals (ACHs), as we discuss in this chapter. In this chapter, "acute care hospital" or ACH is used to denote hospitals that are paid under the inpatient prospective payment system (IPPS). Critical access hospitals and other hospitals not paid under IPPS are excluded from these analyses.

As described in Chapter 3, the alternative CCI/MC payment model for LTCHs would greatly reduce the LTCH payment for patients who are not identified as chronically critically ill or medically complex (CCI/MC) in their referring acute hospitalization; LTCHs would receive "IPPS-comparable" payments for their non-CCI/MC patients. Our analysis of the LTCH margins resulting from these IPPS-comparable payments suggests that LTCHs would likely attempt to significantly reduce the number of non-CCI/MC patients admitted if this policy were implemented. Because fewer non-CCI/MC patients would be accepted by LTCHs, ACHs would be more likely to keep many non-CCI/MC patients for the duration of their need for hospital-level care, which would lead to longer hospital stays. The following simulations explore how charges, costs, payments, and margins for ACHs might be affected by the extended stays of the non-CCI/MC patients who would otherwise have been discharged to an LTCH.

Section 4.2 discusses the FY10 data file that RTI constructed for these analyses and the important assumptions we made in simulating the effects of the alternative CCI/MC payment model on ACH costs and payments. The impact on the acute hospital industry as a whole is discussed in Section 4.3. Section 4.4 looks at the impact across ACH facilities, highlighting the facilities that would be most affected by the alternative CCI/MC payment model because they currently have large proportions of non-CCI/MC patients transferred to LTCHs. Section 4.5 concludes with a summary and discussion of the results.

4.2 Methodology for ACH Simulations

4.2.1 Data and Assumptions

Starting with 100 percent of fiscal year (FY) 2010 Medicare Provider Analysis and Review (MedPAR) inpatient claims, we excluded facilities that (1) were not included in the IPPS Impact Files, (2) that had no available HCRIS data, (3) that were not paid under IPPS, or (4) that were not located in one of the 50 states or D.C. Discharges with zero payments or utilization days, that were for Medicare managed care beneficiaries, or that had Medicare as a secondary payer were also excluded (see Appendix C for details on sample exclusion criteria and counts). From the remaining 10.2 million ACH claims, we used the admission dates and beneficiary identifiers to search for LTCH claims where the LTCH admission occurred within one day of the ACH discharge. Because LTCH claims following the FY 2010 ACH claims could have been

discharged from an LTCH in FY 2011, we used both FY 2010 MedPAR and FY 2011 MedPAR to identify subsequent LTCH claims.

Within the group of 10.2 million FY 2010 hospital discharges, we identified the subset of claims where (1) the ACH discharge would have been categorized as non-CCI/MC using the definition described in Chapter 1, and (2) the ACH discharge was followed by an LTCH admission within one day. We found over 81,000 non-CCI/MC ACH claims that were discharged to an LTCH. These are the ACH claims that would potentially be affected by admission pattern changes under the alternative CCI/MC payment model, assuming that LTCHs would admit very few (if any) of these patients and that these patients would likely complete their hospital-level care at the initial ACH.

We first calculated hospital payments using the CMS payment algorithm and information on the MS-DRG and the charges from the hospital claim and hospital-level information from the IPPS Impact Files.[13] We compared these baseline payments with the results from two sets of simulations, which both assumed that 100 percent of non-CCI/MC patients who are currently transferred to LTCHs would remain at the ACH under the alternative CCI/MC payment model. The first set of simulated payments also assumed that for LTCH discharges that were not LTCH short-stay outliers (SSOs), 50 percent of the LTCH days would be added to the acute care stay. For those LTCH stays that were LTCH SSOs, we assumed that 100 percent of LTCH days would have been added to the ACH stay. In the second set of simulated payments, we assumed that 100 percent of the LTCH days for all LTCH patients would have been added to the ACH stay. We consider it highly unlikely that 100 percent of LTCH days for all non-CCI/MC patients would be spent in the ACH, for the reasons described below, but we wanted to simulate this extreme case, which we note has also been used in previous research (see, for example, Koenig et al., 2010), which has compared payments for LTCH stays versus ACH stays assuming 100 percent of LTCH days were instead spent in the ACH.

We believe that these simulations represent an extreme "worst-case" scenario for ACHs. In particular, we think that assuming 100 percent of non-CCI/MC patients would remain in the ACH and that their ACH length of stay would be increased by 100 percent of the days spent in the LTCH would be likely to overstate the length of the new ACH stay, for the following reasons:

- Current LTCH-PPS rules on SSOs give LTCHs large financial incentives to keep patients longer than may be medically necessary. Previous research by Kennell/RTI International under contract to CMS (Dalton, Kandilov, Kennell, & Wright, 2012) has shown that, across all MS-LTC-DRGs, the average payment difference between discharging a patient a day or two before the SSO cut-off and a day or two after the SSO cut-off was $11,000 in 2010. As a result, this study found that LTCH discharges spike just after patients have reached the MS-LTC-DRG-specific SSO cut-off. It may have been medically appropriate to discharge many of those patients to a lower level of care after a shorter LTCH length of stay, but the LTCH kept the patients longer in

[13] The IPPS payment algorithm is available at http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/AcutePaymtSysfctsht.pdf

order to receive the full LTCH-PPS payment. ACHs would have no such financial incentive to keep these patients longer, and so would be unlikely to keep these patients the full length of the LTCH stay if another level of post-acute care could meet the care needs of the patients.

- LTCHs must also maintain a 25-day average length of stay for their Medicare patients in order to qualify for LTCH status and LTCH-PPS payments. This would also tend to lengthen LTCH stays beyond what may be medically necessary. ACHs do not have to meet that 25-day average length of stay rule, and so would likely discharge their non-CCI/MC patients who were formerly transferred to LTCHs as soon as they were appropriate for a lower level of medical care, such as a skilled nursing facility (SNF).

- Some non-CCI/MC patients who are currently discharged to LTCHs could also be appropriately transferred to SNFs or other inpatient settings.

These payment simulations may also overstate the impact of the policy change because they focus only on the non-CCI/MC patients who would remain in the ACH, and do not incorporate any positive impacts from the policy change on CCI/MC patients. As discussed in Chapter 3, we assume that LTCHs would respond to the alternative CCI/MC payment model by both reducing their admission of non-CCI/MC patients and increasing their admission of CCI/MC patients. Presumably, if increasing numbers of CCI/MC patients were completing their hospital-level care in LTCHs, these patients would incur fewer days and lower costs in the ACH and thus be more profitable (that is, have higher margins) than they currently are. These changes are not modelled as a part of our ACH payment simulations but would likely offset some of the higher costs to ACHs that would occur when the non-CCI/MC patients complete their hospital care in the ACH instead of the LTCH.

We simulated ACH facility-level payments for FY 2010 using the IPPS information available in the Impact File for IPPS FY 2010 Final Rule, Correction Notice and Implementation of ACA.[14] Payments reported include both CMS program payments and beneficiary liabilities. We first calculated current ACH payments using the information on the ACH claims, and then we simulated ACH payments assuming that either 50 percent (Sim50) or 100 percent (Sim100) of LTCH days for the non-CCI/MC patients would be spent in the ACH, and that the marginal costs and charges for each additional day in the ACH would be equal to the average daily cost of a subset of cost centers. We calculated ACH payments, charges, costs, and ACH-level aggregate margins to analyze the distributional consequences across the 3,308 ACH facilities in the analysis and to identify which facilities would face the greatest impact from the alternative CCI/MC payment model. In both simulations, we assumed that the fixed-loss threshold would remain at $24,240, the level set for FY 2010.[15]

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[14] Available at http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Historical-Impact-Files-for-FY-1994-through-Present.html

[15] Unlike Chapter 3, where in some of the simulations we adjusted the fixed loss threshold to set outlier payments to 8 percent of total payments, in these ACH simulations, the fixed loss threshold was kept at $24,240, which

4.2.2 Calculating Charges, Costs, and Payments

For all ACH discharges that were not transferred to an LTCH, and for the ACH discharges that met the CCI/MC criteria and were transferred to an LTCH, we used the charges on the MedPAR claims in the payment simulations. As discussed in Section 4.2.1, for all non-CCI/MC discharges from ACHs that were transferred to an LTCH in FY 2010, we simulated additional ACH charges, assuming first that 50 percent of LTCH days would be added to the ACH stay (100 percent for the short-stay outliers), and for the second simulation assuming that 100 percent of LTCH days would be added to the ACH stay. We used the utilization days from the LTCH claim and calculated a marginal charge per day based on the charges on the ACH claim. We calculated the marginal charges per day by:

- Calculating the charges per routine day on the ACH claim by dividing routine charges by non-ICU/CCU utilization days;

- If an ACH claim had only ICU/CCU days and no routine days, we assigned the routine charge per day to be the median routine charge per day for all Medicare claims for that hospital;

- Calculating service charges per day by summing charges for drugs, supplies, therapy, inhalation, laboratory, and other, and dividing by the total number of days on the ACH claim.

- Summing the routine charges per day and the service charges per day and multiplying them by either 50 percent of LTCH days (Sim50), or 100 percent of LTCH days (Sim100).

Previous work by Koenig et al. (2010) assumed that the per-diem cost of an additional day in the acute care hospital was equal to the average cost per day over the entire stay up to the point of discharge to LTCH. This assumption ignores the fact that inpatient per-diem costs typically decline over the course of a hospital stay, particularly among patients who have costly critical care days in their hospital stays. It is unsurprising, then, that Koenig et al. (2010) estimate that patients with ICU use generate lower payments when they are discharged to LTCHs than if they were to remain in the acute care hospital, because the estimates of the additional outlier payments of a longer acute care hospital stay are biased upwards by the assumption that the marginal acute care hospital costs would be equal to the average costs that include intensive care days. In contrast to Koenig et al. (2010), our calculation of the marginal cost of an additional day in the ACH excludes charges for intensive care, operating room, labor and delivery, cardiology, radiology, emergency, and blood. We assume that the majority if not all of these charges for a patient who was sufficiently stabilized to be transferred to an LTCH would occur at the beginning of the ACH stay and would not continue in the latter part of the ACH stay.

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was the fixed loss threshold in effect for FY 2010 payments. The ACH fixed loss threshold was chosen so that outlier payments to ACHs would be 5.1 percent. See 74 FR 43754.

We calculated costs from charges using two methods, two purposes:

- The ACH costs reported in the tables in the following sections were calculated using ACH-and cost-center-specific cost-to-charge ratios calculated from HCRIS cost reports covering the relevant dates of discharge, which better reflect the true costs experienced by the ACH and are more appropriate for calculating facility-level margins.

- For the purposes of calculating the additional outlier payments that could result from the additional ACH days when the non-CCI/MC patients are not discharged to LTCH, we applied the facility-level cost-to-charge ratios that are available in the Impact File for IPPS FY 2010 Final Rule, Correction Notice and Implementation of ACA; these are the same costs used to calculate outlier payments in the CMS IPPS algorithm.

Finally, we calculated the baseline ACH payments and simulated ACH payments assuming that either 50 percent (Sim50) or 100 percent (Sim100) of LTCH days would be added to the ACH stay. As a result, changes in simulated hospital payments were due to increases in outlier payments, because the MS-DRG and all of the hospital characteristics remained the same across all three sets of payments.

4.3 Results Across All Acute Care Hospitals

We first present the results of the cost and payment simulation across all ACH claims; these cost and payment simulations reflect the costs and payments of all patients discharged from ACHs in FY 2010. We assumed that the alternative CCI/MC payment model, by discouraging the transfer of non-CCI/MC patients from the ACH to the LTCH, would result in increases in ACH costs for all of the 81,294 non-CCI/MC patients who were discharged to an LTCH in FY 2010. We found that if 50 percent of LTCH days for the non-CCI/MC (100 percent for SSOs) were added to the ACH stay, then total ACH costs for all 10.2 million ACH discharges would increase by 1.6 percent, from $117.3 billion to $119.1 billion (***Table 4-1***). If 100 percent of LTCH days for the non-CCI/MC were added to the ACH stay, then total ACH costs would increase by 2.7 percent, from $117.3 billion to $120.5 billion. Because of the increase in costs, more of the non-CCI/MC claims would qualify as high-cost outliers. As a result, CMS payments (including beneficiary liabilities) would increase. Under the current payment system, ACH claims for the 10.2 million ACH discharges generate $110.2 billion in Medicare payments, but under Sim50, those payments would increase by 1.0 percent to $111.4 billion (***Figure 4-1***). We present the outlier payments separately so that one can see that the increases in simulated payments are due solely to increases in outlier payments. Outlier payments are 3.4 percent of total payments under the current system, rising to 3.9 percent under Sim50 and 4.6 percent under Sim100. Although we did not include any changes in the fixed loss threshold in the simulations, were this alternative CCI/MC payment model to be implemented, the payments would need to be adjusted upwards in order to maintain a set proportion of outlier payments to total payments.

Table 4-1
Simulated ACH payments, costs, and margins under current payment system and alternative CCI/MC payment model with non-CCI/MC patients remaining in the ACH instead of transferring to an LTCH

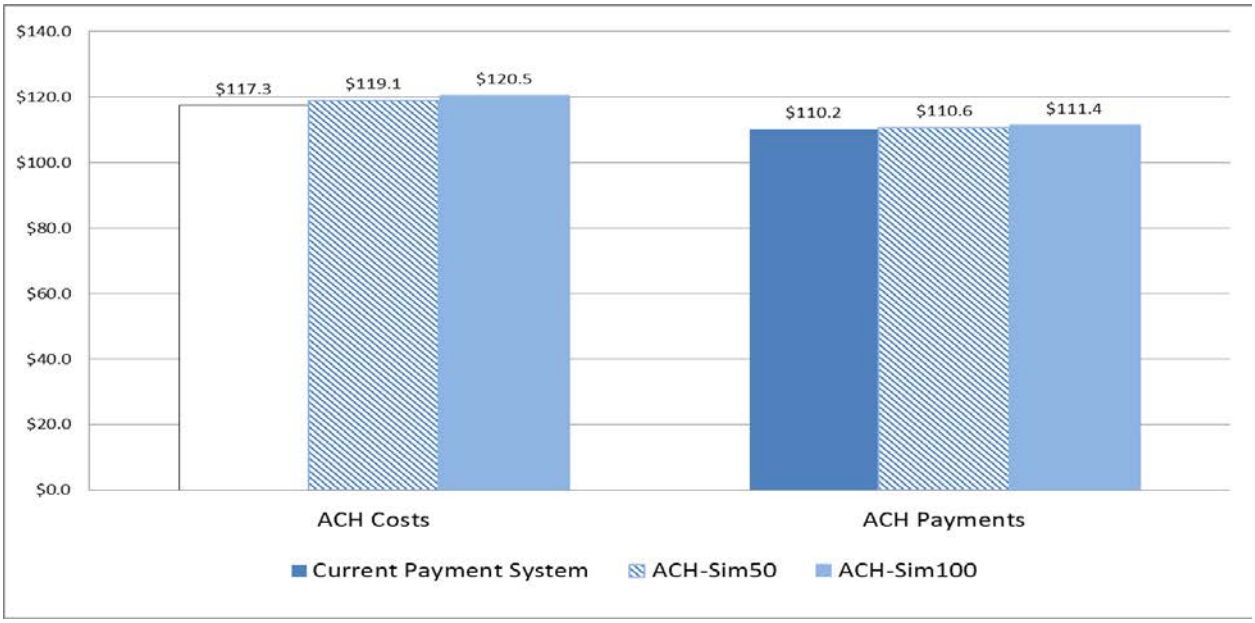
ACH financial variable	Value
Total ACH Discharges	10,199,563
Number ACH Discharged to LTCH	119,778
Number of Non-CCI/MC Discharged from ACH to LTCH	81,294
Current ACH Payments ($ billions)	$110.2
Total ACH Payments - 50% of LTCH Days Spent in ACH ($ billions)	$110.6
Total ACH Payments - 100% of LTCH Days Spent in ACH ($ billions)	$111.4
Current ACH Outlier Payments ($ billions)	$3.8
Total ACH Outlier Payments - 50% of LTCH Days Spent in ACH ($ billions)	$4.3
Total ACH Outlier Payments - 100% of LTCH Days Spent in ACH ($ billions)	$5.1
Current ACH Costs ($ billions)	$117.3
Total ACH Costs - 50% of LTCH Days Spent in ACH ($ billions)	$119.1
Total ACH Costs - 100% of LTCH Days Spent in ACH ($ billions)	$120.5
Current ACH Aggregate Average Margins	-6.4%
ACH Aggregate Average Margins - 50% of LTCH Days Spent in ACH	-7.7%
ACH Aggregate Average Margins - 100% of LTCH Days Spent in ACH	-8.2%

NOTES: ACH, acute care hospital; LTCH, long-term care hospital; CMS, Centers for Medicare & Medicaid Services; CCI/MC, chronically critically ill or medically complex. Payment and cost simulations calculated for all ACH claims. All changes in payments and costs are due to payment and cost changes for the non-CCI/MC claims discharged from ACH to LTCH.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

Figure 4-1
Simulated impacts on ACH Medicare inpatient costs and payments of the CMS-potential LTCH payment policy

($ billion)



NOTE: ACH-Sim50 assumes that all non-CCI/MC patients discharged from ACHs to LTCHs would remain in the ACH and that 50 percent of their LTCH days would be added to their ACH stay (except for LTCH short stay outliers where 100 percent of the LTCH days would be added to the ACH stay). ACH-Sim100 is the same except that 100 percent of the LTCH days would be added to the ACH stay.

SOURCE: Kennell/RTI analysis of FY2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY2010 or FY2011.

The payment increases due to an increased number of outlier claims and increased outlier payments for those claims that are already outliers would offset some, but not all of the additional costs to the ACH of keeping the non-CCI/MC patients for longer periods. As reported in Table 4-1, aggregate average margins for ACHs, simulated to be –6.4 percent under the current payment system, would fall to –7.7 percent under Sim50 or to –8.2 percent under Sim100. The margins reported in Table 4-1 are averaged over all ACH patients in FY 2010, and they do not change dramatically due to the changes in costs and payments that we simulate.

Table 4-2 presents the simulated payments, costs, and margins for the 81,294 non-CCI/MC patients in the ACHs who were discharged to LTCHs in FY 2010. Under the current payment system, these non-CCI/MC patients have margins of –26 percent, but their margins would drop to –96 percent (–87 percent) under Sim50 (Sim100). One reason the margins are lower under Sim50 than under Sim100 is that a greater proportion of these ACH claims become outliers and thus generate outlier payments under Sim100. Under the current payment system, just 7.6 percent of the non-CCI/MC patients transferred to LTCHs are ACH outliers. The number

of outliers increases to 41.7 percent under Sim50 and 67.4 percent under Sim100. If the non-CCI/MC patients were to spend 100 percent of their LTCH days in the ACH instead, more than two-thirds of them would qualify for ACH outlier payments.

Table 4-2
Simulated ACH Payments, Costs, and Margins for Non-CCI/CM Claims Transferred to LTCH, FY 2010

	Current payment system	50 percent of LTCH days in ACH	100 percent of LTCH days in ACH
Non-CCI/MC Discharged to LTCH	81,294	81,294	81,294
Number of high cost outliers in ACH	6,152	33,915	54,768
Percent of high cost outliers in ACH	7.6%	41.7%	67.4%
Total payments (ACH plus LTCH), $ millions	$3,876	$1,761	$2,566
ACH payments, including outlier payments, $ millions	$1,275	$1,761	$2,566
ACH outlier payments, $ millions	$99	$586	$1,391
LTCH payments, $ millions	$2,601	-	-
ACH costs, $ millions	$1,608	$3,443	$4,793
ACH aggregate margins	-26%	-96%	-87%

NOTES: ACH, acute care hospital; LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex. ACH payments include outlier payments.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

Table 4-2 also compares the increased ACH payments with the current IPPS and LTCH payments for these patients. The ACH payments under Sim50, at $1.761 billion, are larger than the $1.295 billion in ACH payments under the current system. But, when compared to total ACH and LTCH payments of $3.876 billion under current policy, the non-CCI/MC as a whole would be less costly to CMS under the alternative CCI/MC payment model.

Even with 100 percent of LTCH days added to the ACH stay, the reduction in CMS payments would be over $1.3 billion dollars compared to the current payment system where CMS makes both an ACH and an LTCH payment for these patients. Because we do not account for any changes in any further post-acute care or readmissions that may be associated with LTCH care, these estimates provide an upper boundary of the likely changes in CMS payments. Longer stays in a skilled nursing facility (SNF) following an ACH discharge compared to an ACH discharge to LTCH discharge would reduce the CMS payment difference in these simulations, if some LTCH care displaces some SNF care.

4.4 ACH Facility-Level Results

Non-CCI/MC patients discharged to LTCHs are not uniformly distributed across ACH facilities. Many ACHs transfer few or none of their non-CCI/MC patients to LTCHs, while others transfer many. **Table 4-3** indicates that 914 ACH hospitals transferred none of their non-CCI/MC patients to LTCHs and that another 809 transferred just 1-4 non-CCI/MC patients. Thus, over half of the ACHs will face minimal or no changes in their costs and payments under the alternative CCI/MC payment model for LTCHs. At the other end of the distribution, there are 229 ACH facilities that transferred 100 or more non-CCI/MC patients to LTCHs; these facilities are the ones which are likely to experience the largest impact from the alternative CCI/MC payment model.

Table 4-3
Frequencies of Non-CCI/MC Transfers to LTCH among Acute Care Hospitals

Number of non-CCI/MC discharges transferred to LTCH	Number of ACH facilities	Percent of ACH facilities
0	914	27.6
1-4	809	24.5
5-19	711	21.5
20-99	645	19.5
100+	229	6.9
Total IPPS facilities in sample	3,308	100.0

NOTES: ACH, acute care hospital; LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

Table 4-4 presents the number of ACHs by their rate of LTCH transfer. Over 900 facilities transferred none of their non-CCI/MC patients to LTCHs, and for another 913 hospitals, non-CCI/MC transfers to LTCHs were less than 0.25 percent of their discharges. The financial impact of the alternative CCI/MC payment model for LTCHs would likely be minimal at both of these groups of hospitals. But, for the 282 ACHs for which non-CCI/MC patients transferred to LTCHs are greater than or equal to 2.5 percent of their total number of discharges, we expect that the financial impacts would be larger.

Table 4-4
Proportions of non-CCI/MC transfers to LTCH among Acute Care Hospitals

Proportion of ACH claims which are non-CCI/MC discharges transferred to LTCH	Number of ACH facilities	Percent of ACH facilities
0%	914	27.6
>0% and <=0.25%	913	27.6
>0.25% and <=0.75%	640	19.3
>0.75% and <=2.5%	559	16.9
>2.5%	282	8.5
Total ACH facilities in sample	3,308	100.0

NOTES: ACH, acute care hospital; LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex.

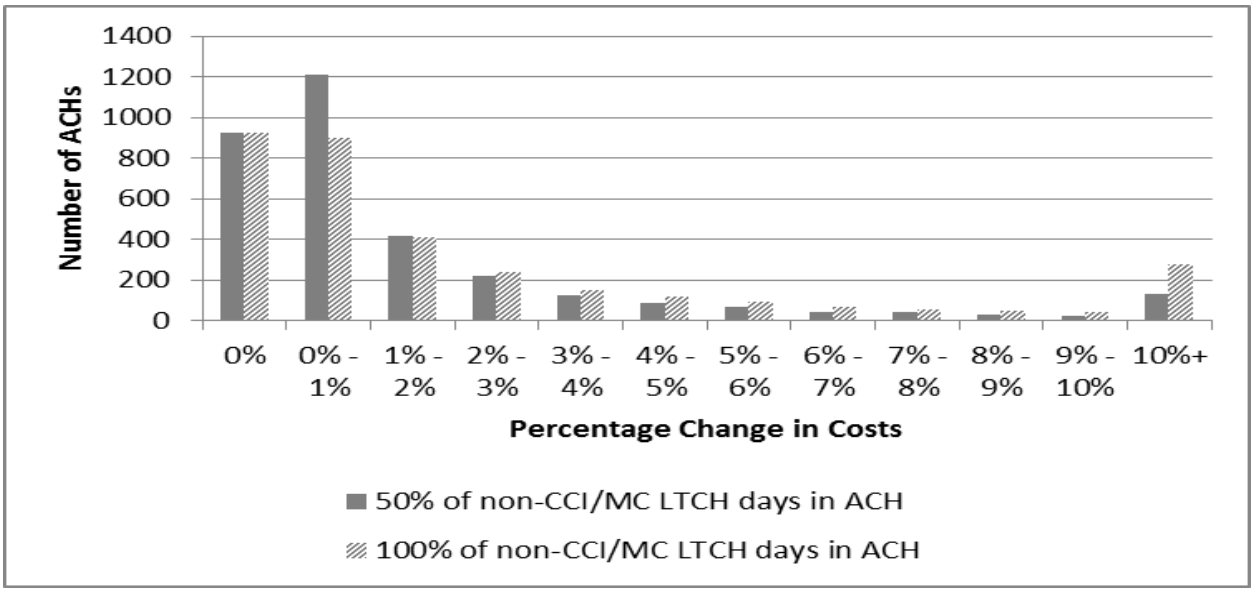
SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

Not only does the distribution of non-CCI/MC patients transferred to LTCH vary across ACHs, but the distribution of ACHs with a large proportion of non-CCI/MC claims transferred to LTCH varies across the country. Of the 282 ACH facilities for which non-CCI/MC transfers to LTCHs are greater than or equal to 2.5 percent of their total discharges, 107 are in Texas (out of 315 ACHs that are located in Texas), 47 are in California (out of 274 ACHs in California), and 46 are in Louisiana (out of 91 ACHs in Louisiana). Another 15 (out of 61) are in Massachusetts and 14 (out of 86) are in Oklahoma.

As one would expect, given the distribution of non-CCI/MC transfers across ACHs, the percentage change in costs would vary across ACHs. ***Figure 4-2*** presents the number of ACH facilities with the specified percentage increase in costs, under the assumptions of Sim50 (solid gray bars) and under the assumptions of Sim100 (diagonally-striped bars). There is no change in costs for the 914 ACHs with no non-CCI/MC patients transferred to LTCHs. Another 1,209 (901) facilities have less than a 1 percent increase in costs under Sim50 (Sim100) and more than 400 facilities have increased costs between 1 and 2 percent under both simulations. However, there are 128 (276) ACHs where costs would increase more than 10 percent under Sim50 (Sim100).

Figure 4-3 shows how these increased costs would affect the facility-level aggregate average margins. While the previous graphs showed changes in costs, this one shows the distribution of the facility-level margins, under the current payment system (solid black bars), under the assumption that 50 percent of LTCH days for the non-CCI/MC would be added to the ACH stay (solid gray bars), and under the assumption that 100 percent of LTCH days for the non-CCI/MC would be added to the ACH stay (striped). Compared to the distribution of margins under the current system, both simulations indicate that facility-level margins would decline overall for ACHs, but the distributions are fairly similar in all three cases.

Figure 4-2
Distribution of the change in total costs among Acute Care Hospitals under simulations where non-CCI/MC patients are not discharged to LTCHs



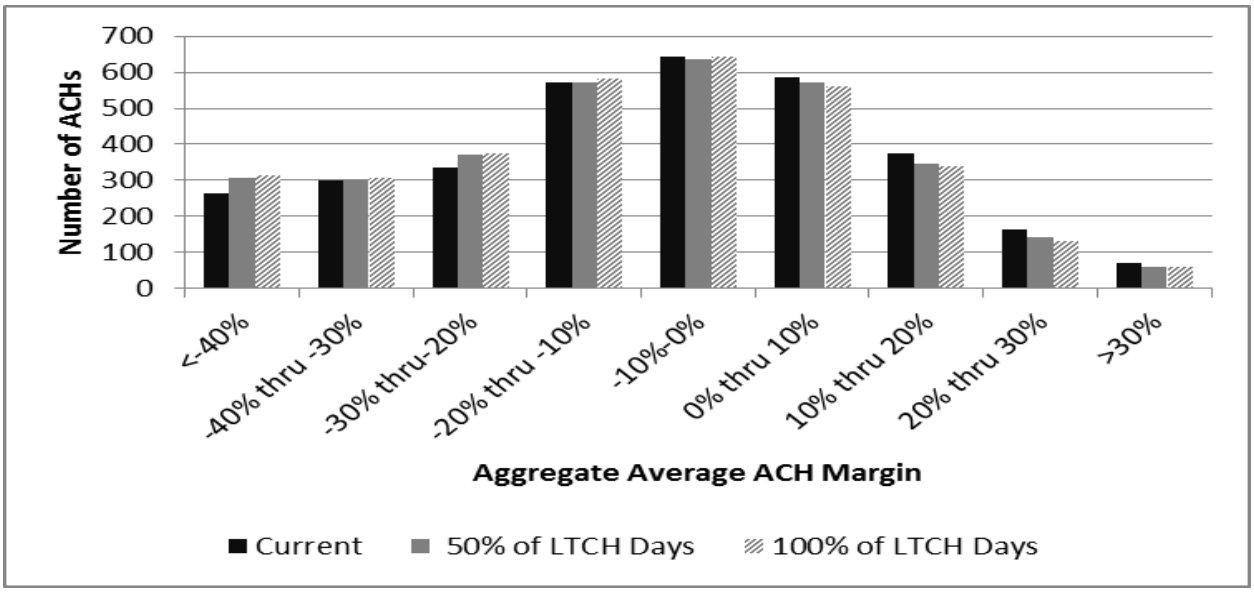
NOTES: ACH, acute care hospital; LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

ACH facilities with certain characteristics (size, location, ownership) may do better or worse than other ACHs under the alternative CCI/MC payment model. ***Table 4-5*** presents the aggregate payments and aggregate average margins for ACHs categorized by the number of beds; by their geographic region; by the proportion of non-CCI/MC patients in the state discharged to LTCHs; by their location in large urban, other urban, or rural areas (as defined by the IPPS Impact files); and by their ownership, whether they are government-owned, non-profit, or for-profit.

The smallest ACHs (0-49 beds and 50-99 beds) have the lowest margins under the current payment system, with -14.4 percent and -13.4 percent margins respectively, and under the assumptions of both of the simulations. In contrast, the largest ACHs (500+beds) have the highest margins under the current payment system (-3.5 percent) and would have the highest margins under Sim50 (-4.6 percent) and under Sim100 (-5.0 percent). Smaller hospitals have a somewhat smaller proportion of non-CCI/MC patients transferred to LTCHs as a percent of the total. However, for all sizes of hospitals, the difference in margins between the current payment system and Sim100 is between 1.5 and 2 percentage points.

Figure 4-3
Distribution of the Aggregate Average Margins among Acute Care Hospitals under Simulations where Non-CCI/MC Patients are not Discharged to LTCHs



NOTES: ACH, acute care hospital; LTCH, long-term care hospital; CCI/MC, chronically critically ill or medically complex.

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

We found significant variation across geographic region in both the proportion of non-CCI/MC patients as a percent of total patients discharged to LTCHs and in the decrease in simulated payments and margins under the alternative CCI/MC payment system. The West South Central region (Texas, Louisiana, Oklahoma, and Arkansas) in particular was simulated to have aggregate margins decline from –5.5 percent under the current payment system to –9.7 percent under Sim50 or –11.2 under Sim100. Note that these states together have the highest transfer rate of any region, with 2.81 percent of all patients being non-CCI/MC claims transferred to LTCHs. For comparison, the Middle Atlantic, South Atlantic, East North Central, East South Central, and West North Central regions each have a non-CCI/MC LTCH transfer rate below 0.4 percent; ACHs in these regions would have much smaller changes in margins under the alternative CCI/MC payment model compared to the West South Central region.

We also grouped the states based on the state-level transfer rate for non-CCI/MC patients as a proportion of all patients. The states with the highest non-CCI/MC LTCH transfer rates, above 1.5 percent of all patients, were simulated to have margins fall from -4.5 percent under the current payment system to -8.9 percent under Sim50 and -10.3 percent under Sim100. These six states – Louisiana, Texas, Nevada, Oklahoma, Massachusetts, and Mississippi – have much higher rates of non-CCI/MC LTCH transfer than other states, rates which may not reflect appropriate use of LTCH care. The 14 states with LTCH transfer rates of non-CCI/MC patients

below 0.3 percent were simulated to have very small changes in margins under our two simulations.

Almost 1 percent of patients in large urban hospitals are non-CCI/MC patients discharged to LTCHs, compared to just 0.5 percent in rural hospitals. As a result, the decrease in margins under the simulations of the alternative CCI/MC payment model for LTCHs is largest for the large urban ACHs.

Non-profit hospitals have both higher proportions of non-CCI/MC patients discharged to LTCHs and higher margins than either government or for-profit hospitals. The non-profit hospitals have larger decreases in their margins, but even their lowest margins, at -4.3 percent under Sim100, are still higher than the margins for government or for-profit hospitals.

4.5 Conclusions and Discussion

We simulated payments to ACHs under three different combinations of assumptions and payment systems. First, we estimated the impacts under the current IPPS. Second, we conducted simulations of the alternative CCI/MC payment model in which non-CCI/MC patients in LTCHs would receive IPPS-comparable payments and in which we assumed that all non-CCI/MC patients would complete their hospital-level care in the acute care hospital instead of being transferred to LTCH. In the first of these two policy simulations we assumed that 50 percent of LTCH days would be added to the ACH length of stay (Sim50). In the second, we assumed that 100 percent of LTCH days for all patients would be added to the ACH length of stay (Sim100). Using costs calculated from ACH- and service-specific CCRs, we simulated the aggregate margins that ACHs would have received under each payment system.

We simulated that the alternative CCI/MC payment model, by discouraging the transfer of non-CCI/MC patients from the ACH to the LTCH, would result in increases in ACH costs that would be only partly offset by increases in CMS payments under IPPS. The simulations indicate that costs for all ACH discharges in FY 2010 would increase from $117.3 billion to $119.1 billion ($120.5 billion) under Sim50 (100). These increases are less than three percent of costs. The increased costs would cause more of the non-CCI/MC claims to qualify as high-cost outliers in the ACH, which would result in higher CMS payments for these claims. Under the current payment system, acute care hospitals receive a total of $110.2 billion in Medicare payments, but under Sim50, those payments would increase to $110.6 billion and under Sim100, the payments would increase to $111.4 billion. Thus, while costs would increase up to three percent, payments would increase up to one percent. Aggregate average margins for ACHs, simulated to be –6.4 percent under the current payment system, would fall to –7.7 percent (Sim50) or –8.2 percent (Sim100) under the alternative CCI/MC payment model.

Table 4-5
Simulated ACH payments and margins under current payment system and CMS proposed payment system, subdivided by selected ACH characteristics

State	Number of ACHs	Non-CCI/MC discharged to LTCH as percentage of total	Current payment system		50 percent of LTCH days in ACH		100 percent of LTCH days in ACH	
			Payments ($ billions)	Margin	Payments ($ billions)	Margin	Payments ($ billions)	Margin
Bed size								
0-49 beds	625	0.63	2.3	-14.4	2.4	-15.8	2.4	-16.3
50-99 beds	645	0.58	6.5	-13.4	6.4	-14.5	6.5	-14.8
100-149 beds	563	0.84	10.5	-6.9	10.5	-8.4	10.6	-9.0
149-249 beds	642	0.82	21.9	-6.9	22.0	-8.2	22.2	-8.7
250-499 beds	638	0.79	41.6	-6.4	41.8	-7.5	42.0	-7.9
500+ beds	195	0.86	27.4	-3.5	27.5	-4.6	27.7	-5.0
Region								
New England	143	0.92	6.6	-2.6	6.6	-4.1	6.6	-4.7
Middle Atlantic	385	0.37	17.2	-4.4	17.2	-4.9	17.3	-5.2
South Atlantic	539	0.38	20.6	-7.2	20.7	-7.8	20.8	-8.0
East North Central	512	0.58	18.9	-8.1	18.9	-9.0	19.0	-9.4
East South Central	324	0.57	8.0	0.4	8.0	-0.5	8.1	-0.9
West North Central	264	0.37	7.7	-7.2	7.8	-7.7	7.8	-7.9
West South Central	539	2.81	11.9	-5.5	12.0	-9.7	12.3	-11.2
Mountain	229	0.71	5.4	-6.4	5.4	-7.6	5.5	-8.0
Pacific	373	0.77	13.9	-11.5	13.9	-12.5	14.0	-12.9

(continued)

Table 4-5 (continued)
Simulated ACH payments and margins under current payment system and CMS proposed payment system, subdivided by selected ACH characteristics

State	Number of ACHs	Non-CCI/MC discharged to LTCH as percentage of total	Current payment system		50 percent of LTCH days in ACH		100 percent of LTCH days in ACH	
			Payments ($ billions)	Margin	Payments ($ billions)	Margin	Payments ($ billions)	Margin
State-level proportion non-CCI/MC discharged to LTCH as a percent of total								
High (>1.5%)	643	2.6	16.0	-4.5	16.2	-8.9	16.6	-10.3
Medium (0.3% – 1.5%)	2,097	0.6	71.2	-6.7	71.4	-7.7	71.8	-8.0
Low (<0.3%)	568	0.2	23.0	-6.6	23.0	-6.9	23.0	-7.0
Urbanicity								
Large urban area	1,262	0.93	56.9	-7.4	57.1	-8.7	57.5	-9.2
Other urban area	1,082	0.74	41.9	-5.4	42.1	-6.5	42.4	-6.9
Rural area	964	0.51	11.4	-5.2	11.4	-6.1	11.5	-6.4
Ownership								
Government	513	0.75	11.9	-4.3	11.9	-5.5	12.0	-5.9
Non-profit	787	1.17	18.6	-2.0	18.5	-3.7	18.7	-4.3
For profit	2,005	0.71	79.8	-7.7	80.1	-8.8	80.6	-9.2

NOTES: Data on bed size, region, and urbanicity from the RY 2009, RY 2010, FY 2011, and FY 2012 ACH Impact Files. Data on ownership from the 2010 Provider of Service file. Three hospitals with unknown ownership excluded; these hospitals had no cost or payment changes.

ACH, acute care hospital; LTCH, long-term care hospital; CMS, Centers for Medicare & Medicaid Services; CCI/MC, chronically critically ill or medically complex. Regions, here, are the subdivisions of Census regions: New England (Connecticut, Maine, Massachusetts, New Hampshire, Vermont, Rhode Island), Middle Atlantic (New Jersey, New York, Pennsylvania), South Atlantic (Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, Washington D.C., West Virginia), East North Central (Illinois, Indiana, Michigan, Ohio, Wisconsin), East South Central (Alabama, Kentucky, Mississippi, Tennessee), West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota), West South Central (Arkansas, Louisiana, Oklahoma, Texas), Mountain (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah Wyoming) and Pacific (Alaska, California, Hawaii, Oregon, Washington)

SOURCE: Kennell/RTI analysis of FY 2010 MedPAR data, 100 percent sample of ACH claims linked to subsequent LTCH claims in FY 2010 or FY 2011.

The increased costs would not be evenly distributed across acute care hospitals. Those hospitals that have a larger proportion of non-CCI/MC patients discharged to LTCH would face the most significant increases in their costs. However, the majority of ACHs discharge less than five non-CCI/MC patients to LTCHs annually. Thus, for the majority of ACHs, even using the extreme assumptions in these simulations, the resulting impact will be negligible. For the hospitals where our simulations indicate that the alternative CCI/MC payment model will have larger impacts, the implementation of such a model may serve as an incentive to reduce inappropriate transfers to LTCHs and decrease the geographic variation seen in transfer patterns.

APPENDIX A
CCI/MC FINAL DEFINITION

Admission must meet at least one Clinical Condition and have at least 8 or more Critical Care Days

Clinical Condition	Admission must have at least one of the Codes in the Clinical Condition Category to Qualify	Description of Codes
PMV	MS-DRG 207	Respiratory system diagnosis w ventilator support 96+ hours
	MS-DRG 870	Septicemia with mechanical ventilation 96+ hours
	MS-DRG 933	Extensive burns or full thickness burns with mechanical ventilation 96+ hours w/o skin graft
	MS-DRG 927	Extensive burns or full thickness burns with mechanical ventilation 96+ hours w skin graft
	ICD-9 Procedure Code 96.72	Continuous invasive mechanical ventilation for more than 96+ consecutive hours
Tracheostomy	MS-DRG 003	ECMO or Trach with mechanical ventilation 96+ hours or PDX EXC face
	MS-DRG 004	Trach with mechanical ventilation 96+ hours or PDX EXC face
Sepsis, and Other Severe Infections	MS-DRG 871	Septicemia w/o mechanical ventilation 96+ hours w/MCC
	MS-DRG 094	Bacterial & tuberculosis infections of nervous system w MCC
	MS-DRG 097	Non-bacterial infect of nervous system exc viral meningitis w MCC
	MS-DRG 177	Respiratory infections & inflammations w MCC
	MS-DRG 539	Osteomyelitis w MCC
	MS-DRG 856	Postoperative or post-traumatic infections w O.R. proc w MCC
	MS-DRG 862	Postoperative and post-traumatic infections w MCC
	ICD-9 Procedure Code 37.66	Insertion of implantable heart assist system
	ICD-9 Diagnosis Code 785.52	Septic shock
	ICD-9 Diagnosis Code 995.91	Sepsis
	ICD-9 Diagnosis Code 995.92	Severe sepsis
	ICD-9 Diagnosis Code 995.94	Systemic inflammatory response due to noninfections process with acute organ dysfunction
	ICD-9 Diagnosis Code 348.31	Metabolic encephalopathy
	ICD-9 Diagnosis Code 286.6	Defibrination syndrome
Wounds	MS-DRG 463	Wound debrid & skin graft exc hand with MCC
	MS-DRG 573	Skin graft &/OR debrid for skin ulcer or cellulitis with MCC
	MS-DRG 576	Skin graft &/OR debid exc for skin ulcer or cellulitis with MCC
	MS-DRG 592	Skin ulcers with MCC
	MS-DRG 622	Skin grafts and wound debrid fore endoc with MCC
	MS-DRG 901	Wound debridement for injuries with MCC
	MS-DRG 928	Full thickness burn with skin graft for inhalation with CC /MCC
	MS-DRG 329	Major small and large bowel procedures w/MCC
	ICD-9 Procedure Code 85.82	Split-thickness graft to breast
	ICD-9 Procedure Code 85.83	Full-thickness graft to breast
	ICD-9 Procedure Code 85.84	Pedicle graft to breast
	ICD-9 Procedure Code 85.85	Muscle flap graft to breast
	ICD-9 Procedure Code 86.22	Excisional debridement of wound, infection, or burn
	ICD-9 Procedure Code 86.3	Other local excision or destruction of lesion or tissue of skin and sub tissue
	ICD-9 Procedure Code 86.4	Radical excision of skin lesion
	ICD-9 Procedure Code 86.60	Free skin graft nos
	ICD-9 Procedure Code 86.61	Full-thickness skin graft to hand
	ICD-9 Procedure Code 86.62	Other skin graft to hand
	ICD-9 Procedure Code 86.63	Full thickness skin graft to other sites
	ICD-9 Procedure Code 86.65	Heterograft to skin
	ICD-9 Procedure Code 86.66	Homograft to skin
	ICD-9 Procedure Code 86.67	Dermal regenerative graft
	ICD-9 Procedure Code 86.69	Other skin graft to other sites
	ICD-9 Procedure Code 86.70	Pedicle or flap graft, not otherwise specified
	ICD-9 Procedure Code 86.71	Cutting and preparation of pedicle grafts or flaps
	ICD-9 Procedure Code 86.72	Advancement of pedicle graft
	ICD-9 Procedure Code 86.73	Attachment of pedicle or flap graft to hand
	ICD-9 Procedure Code 86.74	Attachment of pedicle or flap graft to other sites
	ICD-9 Procedure Code 86.75	Revision of pedicle or flap graft
	ICD-9 Procedure Code 86.83	Size reduction plastic operation
	ICD-9 Procedure Code 86.91	Excision of skin for graft
	ICD-9 Procedure Code 86.93	Insertion of tissue expander
	ICD-9 Diagnosis Code 707.23	Pressure ulcers stage III
	ICD-9 Diagnosis Code 707.24	Pressure ulcers stage IV

Admission must meet at least one Clinical Condition and have at least 8 or more Critical Care Days (Continued)

Clinical Condition	Admission must have at least one of the Codes in the Clinical Condition Category to Qualify	Description of Codes
	ICD-9 Diagnosis Code 428.23	Acute on chronic systolic heart failure
	ICD-9 Diagnosis Code 428.33	Acute on chronic diastolic heart failure
	ICD-9 Diagnosis Code 428.41	Acute combined systolic and diastolic heart failure
	ICD-9 Diagnosis Code 482.43	Acute on chronic combined systolic and diastolic heart failure
	ICD-9 Diagnosis Code 570	Acute and subacute necrosis of liver
	ICD-9 Diagnosis Code 584.5	Acute kidney failure with lesion of tubular necrosis
	ICD-9 Diagnosis Code 584.6	Acute kidney failure with lesion of renal cortical necrosis
	ICD-9 Diagnosis Code 584.7	Acute kidney failure with lesion of renal medullary (papillary) necrosis
	ICD-9 Diagnosis Code 584.8	Acute kidney failure with other specified pathological lesion in kidney
	ICD-9 Diagnosis Code 585.6	End stage renal disease
	ICD-9 Diagnosis Code 518.81	Acute respiratory failure
	ICD-9 Diagnosis Code 518.84	Acute and chronic respiratory failure
	MS-DRG 190	COPD with MCC
	ICD-9 Diagnosis Code 430	Subarachnoid hemorrhage
	ICD-9 Diagnosis Code 431	Intracerebral hemorrhage
	ICD-9 Diagnosis Code 432.0	Nontraumatic extradural hemorrhage (MCC)
	ICD-9 Diagnosis Code 432.1	Subdural hemorrhage (MCC)
	ICD-9 Diagnosis Code 433.01	Occlusion and stenosis of basilar artery (MCC)
	ICD-9 Diagnosis Code 433.11	Occlusion and stenosis of carotid artery (MCC)
	ICD-9 Diagnosis Code 433.21	Occlusion and stenosis of vertebral artery (MCC)
	ICD-9 Diagnosis Code 433.31	Multiple and bilateral artery (MCC)
	ICD-9 Diagnosis Code 433.81	Other specified precerebral artery (MCC)
	ICD-9 Diagnosis Code 433.91	Unspecified precerebral artery (MCC)
	ICD-9 Diagnosis Code 434.01	Cerebral thrombosis (MC)
Multiple Organ Failure (At least Two Failures: Heart, Liver, Kidney, Respiratory, or Brain Hemorrhage/ TBI)	ICD-9 Diagnosis Code 434.11	Cerebral embolism (MCC)
	ICD-9 Diagnosis Code 434.91	Cerebral artery occlusion, unspecified (MCC)
	ICD-9 Diagnosis Code Range 800.03-800.05	Fracture of the vault of skull codes (MCC)
	ICD-9 Diagnosis Code Range 800.1x- 800.3x	Fracture of the vault of skull codes (MCC)
	ICD-9 Diagnosis Code Range 800.43-800.45	Fracture of the vault of skull codes (MCC)
	ICD-9 Diagnosis Code Range 800.5x- 800.9x	Fracture of the vault of skull codes (MCC)
	ICD-9 Diagnosis Code Range 801.03-801.05	Fracture of the base of skull codes (MCC)
	ICD-9 Diagnosis Code Range 801.1x- 801.3x	Fracture of the base of skull codes (MCC)
	ICD-9 Diagnosis Code Range 801.43-801.44	Fracture of the base of skull codes (MCC)
	ICD-9 Diagnosis Code Range 801.5x- 801.9x	Fracture of the base of skull codes (MCC)
	ICD-9 Diagnosis Code Range 803.03-803.05	Other and unqualified skull fractures (MCC)
	ICD-9 Diagnosis Code Range 803.1x-803.3x	Other and unqualified skull fractures (MCC)
	ICD-9 Diagnosis Code Range 803.43-803.45	Other and unqualified skull fractures (MCC)
	ICD-9 Diagnosis Code Range 803.5x- 803.9x	Other and unqualified skull fractures (MCC)
	ICD-9 Diagnosis Code Range 804.03-804.05	Multiple fractures involving skull or face with other bones (MCC)
	ICD-9 Diagnosis Code Range 804.1x-804.3x	Multiple fractures involving skull or face with other bones (MCC)
	ICD-9 Diagnosis Code Range 804.43-804.45	Multiple fractures involving skull or face with other bones (MCC)
	ICD-9 Diagnosis Code Range 804.53-804.55	Multiple fractures involving skull or face with other bones (MCC)
	ICD-9 Diagnosis Code Range 804.6x- 804.8x	Multiple fractures involving skull or face with other bones (MCC)
	ICD-9 Diagnosis Code Range 804.93-804.95	Multiple fractures involving skull or face with other bones (MCC)
	ICD-9 Diagnosis Code 850.4x	Concussion with prolonged loss of consciousness without return to previous level
	ICD-9 Diagnosis Code 851.05	Cerebral cortex contusion without mention of open intracranial wound (MCC)
	ICD-9 Diagnosis Code Range 851.1x-851.3x	Cerebral laceration and contusion (MCC)
	ICD-9 Diagnosis Code 851.45	Cerebellar or brain stem contusion without mention of open intracranial wound (MCC)
	ICD-9 Diagnosis Code Range 851.5x-851.9x	Cerebral laceration and contusion (MCC)
	ICD-9 Diagnosis Code Range 852.0x - 852.5x	Subarachnoid, subdural, and extradural hemorrhage, following injury (MCC)
	ICD-9 Diagnosis Code Range 853.0x - 853.1x	Other and unspecified intracranial hemorrhage following injury (MCC)
	ICD-9 Diagnosis Code 854.05	Intracranial injury of other and unspecified nature, w/o mention of open intracranial wound (MCC)
	ICD-9 Diagnosis Code Range 854.1x	Intracranial injury of other and unspecified nature, with open intracranial wound (MCC)

NOTE: CCI/MC, chronically critically ill or medically complex; MS-DRG, Medicare seventy diagnosis-related group; ICD-9, International Classification of Diseases, ninth revision; MCC, major complications or comorbidities; COPD, chronic obstructive pulmonary disease; ECMO, extrac or poreal membranous oxygen; PDX, primary diagnosis code; Exc, excluding; O.R., operating room; PMV, prolonged mechanical ventilation; TBI, traumatic brain injury.

APPENDIX B
LTCH CLAIMS AND FACILITY SAMPLE SIZES AND EXCLUSION CRITERIA

Appendix Table B-1 details the sample exclusion criteria used to define our sample of FY 2010 LTCH claims. From an initial set of more than 150,000 FY 2010 claims in the LTCH MedPAR file and 440 facilities, we narrowed our sample to 132,407 claims and 419 LTCHs. Most excluded claims had $0 or negative payment amounts. Entire facilities were excluded because they were not paid under LTCH-PPS (four facilities excluded), did not have a cost report that we could use to compute costs and margins (seven facilities excluded), and or did not appear in the LTCH Impact Files (eight facilities excluded). Note that the exclusion criteria were applied sequentially, so the counts reflect the number excluded from the sample which had not already been excluded by the previous criteria.

Appendix Table B-1
LTCH Claims and Facility Sample Sizes and Exclusion Criteria

Exclusion criteria	Claims	Facilities
Total in FY 2010 LTCH MedPAR file	152,181	440
Claims exclusion criteria: CMS payment less than or equal to $0	12,895	—
No Medicare utilization days	211	1
Managed care claim	24	—
Medicare secondary payer	220	—
Facility not paid under LTCH-PPS	935	4
Total covered charges at least $5,000 less than total charges	2,170	1
No Healthcare Cost Report Information System (HCRIS) cost report for facility	1,871	7
Facility does not appear on LTCH Impact Files	1,448	8
Sum of all exclusion criteria	19,774	21
Total remaining after applying exclusions	132,407	419

NOTE: LTCH, long-term care hospital; PPS, prospective payment system; MedPAR, Medicare Provider Analysis and Review file.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of LTCH claims.

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APPENDIX C
ACH CLAIMS AND FACILITY SAMPLE SIZES AND EXCLUSION CRITERIA

Appendix Table C-1 details the sample exclusion criteria used to define the sample of FY 2010 ACH claims. From an initial set of more than 13 million FY 2010 claims in the MedPAR file and 3,647 facilities, we narrowed our sample to just over 10 million claims and 3,306 hospitals. Entire facilities were excluded because they did not appear in the IPPS Impact Files (32 facilities excluded), did not have a cost report that we could use to compute costs and margins (110 facilities excluded), were not paid under IPPS (46 facilities excluded), or were located in Puerto Rico (50 facilities excluded). Most excluded claims were managed care claims or had $0 or negative payment amounts. Note that the exclusion criteria were applied sequentially, so the counts reflect the number excluded from the sample which had not already been excluded by the previous criteria.

Appendix Table C-1
ACH Claims and Facility Sample Sizes and Exclusion Criteria

Exclusion criteria	Claims	Facilities
Total in FY 2010 IPPS MedPAR file	13,414,754	3,647
Facility does not appear on IPPS Impact Files	37,142	132
No Healthcare Cost Report Information System (HCRIS) cost report for facility	190,745	110
Claims exclusion criteria:		
CMS payment less than or equal to $0	1,180,205	1
No Medicare utilization days	75,216	—
Managed care claim	1,411,837	—
Facility not paid under IPPS	256,076	46
Medicare secondary payer	19,551	—
Total covered charges at least $5,000 less than total charges	8,948	—
Puerto Rico Hospital	35,471	50
Sum of all exclusion criteria	3,215,191	339
Total remaining after applying exclusions	10,199,563	3,308

NOTE: IPPS, inpatient prospective payment system; MedPAR, Medicare Provider Analysis and Review file.

SOURCE: Kennell/RTI International analysis of FY 2010 Medicare Provider Analysis and Review (MedPAR) data, 100 percent sample of acute hospital claims.

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BIBLIOGRAPHY/REFERENCES

Ahmed, Q., and Niederman, M. "Respiratory Infection in the Chronically Critically Ill Patient: Ventilator-Associated Pneumonia and Tracheobronchitis." *Clinics in Chest Medicine* 2001; Vol. 22(1): 71-85.

Ball, S., and Baudouin, S. "Endocrine Disorders in the Critically Ill: The Endocrine Response to Critical Illness." In: "Core topics in Endocrinology in Anesthesia and Critical Care," edited by GM Hall, JM. Hunger, and MS Cooper. Section 3 Chapter 13. Cambridge University Press 2010.

Brem, H., Nierman, D. M., & Nelson, J. E., "Pressure Ulcers in the Chronically Critically Ill Patient." *Critical Care Clinics* 2002; Vol. 18: 683–694.

Carson SS., "Chronic Critical Illness." In: "Principles of Critical Care." edited by JV Hall, GA Schmidt and LDH Wood. 3rd Edition. McGraw Hill 2005.

Carson, SS., & Bach, PB, "The Epidemiology and Costs of Chronic Critical Illness." *Critical Care Clinic* 2002; Vol. 18: 461 – 476.

Carson, SS., "Outcomes of Prolonged Mechanical Ventilation." *Curr Opin Critical Care* 2006; Vol. 12(5): 405 – 411.

Dalton, K., Kandilov, A. M., Kennell, D., & Wright, A. F. (2012, July). Determining medical necessity and appropriateness of care for Medicare long-term care hospitals (LTCHs). Prepared for Centers for Medicare and Medicaid Services.

Daly, BJ., Douglas, SL., Gordon, NH., Kelley, CG., O'Toole, E., Montenegro, H., & Higgins, P. "Composite Outcomes of Chronically Critically Ill Patients 4 Months After Hospital Discharge." *Am J Crit Care* 2009; Vol. 18: 456-464.

Daly, BJ., Rudy, EB., and Happ, MB. "Development of a Special Care unit for Chronically Critically Ill Patients." *Heart Lung* 1991; Vol. 20(1): 45-51.

De Jonghe, B., Lacherade, J.C., Durand, M.C., Sharshar, T. "Critical Illness Neuromuscular Syndromes." *Neurologic Clinics* 2008; Vol. 26(2): 507-520.

Donahoe, M. "Current Venues of Care and Related Costs for the Chronically Critically Ill." *Respiratory Care* 2012; Vol. 57(6): 867-888.

Douglas SL., Daly BJ., Kelley CG., et al., "Chronically Critically Ill Patients: Health-Related Quality of Life and Resource Use After a Disease Management Intervention." *Am J Crit Care* 2007; Vol. 16(5): 447-457.

Estenssoro, E., Reina, R., Canales, H., Saenz., MG., Gonzalez, F., Aprea, M., Laffaire, E., Gola, V., and Dubin, A. "The Distinct Clinical Profile of Chronically Critically Ill Patients: a Cohort Study." *Critical Care* 2006.

Gage, B. J., Pilkauskas, N. V., Dalton, K., Constantine, R. T., Leung, M. Y., Hoover, S., & Green, J. C. (2007, January). Long-term care hospital (LTCH) payment system monitoring and evaluation, phase II report. Prepared for Centers for Medicare and Medicaid Services.

Girard K. & Raffin T.A., "The Chronically Critically Ill: To Save or Let Die?" *Respir Care* 1985; Vol. 30: 339-347.

Hollander, J., and Mechanick, J., "Nutrition Support and Chronic Critical Illness Syndrome." *Nutrition in Clinical Practice* 2006.

Jeng, L., Yamshchikov, AV., Judd, S., Blumberg., HM. Martin, GS., Ziegler, TR., and Tanpricha, V. "Alterations in Vitamin D Status and Anti-Microbial Peptide Levels in Patients in the Intensive Care Unit with Sepsis." *Journal of Translational Medicine* 2009; Vol. 7:28.

Johnson, D. and Mayers, I., "Multiple Organ Dysfunction Syndrome: A Narrative Review." *Canadian Journal of Anesthesia* 2001; 502-509.

Kahn, J., Carson, S., Angus, D., Linde-Zwirble, W., and Iwashyna, T. "Development and Validation of an Algorithm for Identifying Prolonged Mechanical Ventilation in Administrative Data." *Health Services and Outcomes Research Methodology* 2009; Vol. 9(2): 117-1132.

Kahn, J., Werner, R., David, G., Ten Have, T., Benson, N., and Asch, D. "Effectiveness of Long-term Acute Care Hospitalization in Elderly Patients With Chronic Critical Illness." *Medical Care* 2013; Vol. 51(1): 4-10.

Kalb, T.H., and Lorin, S. "Infection in the Chronically Critically Ill: Unique Risk Profile In a Newly Defined Population." *Crit Care Clinics* 2002; Vol. 18: 529-552.

Koenig, L., Sen, M., Kirby, T., and Dollard, J. (2010, October). Do Long Term Care Hospitals Save Medicare Money? Findings and an Alternative to the 25% Threshold Rule. Final Draft Report. West Hartford, CT. National Association of Long Term Hospitals.

Levi, M., and Lowenberg, E. "Thrombocytopenia in Critically Ill Patients." *Seminars in Thrombosis and Hemostatis* 2008; Vol. 34(5): 417-424.

Levy, M., Fink, M., Marshall, J., Abraham, E., Angus, D., Cook, D., Cohen, J., Opal, S., Vincent, JL., and Ramsay, G. "2001 SCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference." *Intensive Care Medicine* 2003; Vol. 29(4): 530-538.

Levy, RJ. "Mitochondrial Dysfunction, Bioenergetic Impairment, and Metabolic Down-Regulation in Sepsis." *Shock* 2007; Vol. 28(1): 24-28.

MacIntyre, NR., Epstein, SK., Carson, S., et al., "Management of Patients Requiring Prolonged Mechanical Ventilation: Report of a NAMDRC Consensus Conference." *Chest* 2005; Vol. 128: 3937-3954.

Mechanick JI. & Brett EM., "Endocrine and Metabolic Issues in the Management of the Chronically Critically Ill Patient." *Critical Care Clinics* 2002; Vol. 18: 619–641.

Mechanick JI. & Brett EM., "Nutrition and the Chronically Critically Ill Patient." *Curr Opin Clinic Nutr Metab Care* 2005; Vol. 8(1): 33–39.

Nasraway, S., Button, G., Rand, W., Hudson, J., Therese, MSN and Gustafson, M. "Survivors of Catastrophic Illness: Outcome after Direct Transfer from Intensive care to Extended Care Facilities." *Critical Care Medicine* 2000.

Nelson, J., Cox, C., Hope, A., and Carson, S. "Concise Clinical review: Chronic Critical Illness." *Am. J. Respir. Crit. Care Med* 2010; Vol. 182(4); 446-454.

Nelson, J., Mercado, A., Camhi, S., Tandon, N., Wallenstein, S., August, G., Morrison, S. "Communication about Chronic Critical Illness." *Arch Intern Med* 2007; Vol 167(22); 2509-2515.

Nelson, J., Tandon, N., Mercado, A., Camhi, S., Dly, W., and Morrison, S. "Brain Dysfunction: Another Burdon for the Chronically Ill." *Arch Intern Med* 2006.

Nelson, JE., Meier, DE., Litke, A., Natale, DA., Siegel, RE., and Morrison, RS., "The Symptom Burden of Chronic Critical Illness." *Critical Care Medicine* 2004; Vol. 32(7): 1527–1534.

Nierman, D., Nelson, J. "Preface: Chronic Critical Illness." *Crit Care Clin* 2002.

Nierman, DM. & Mechanick, JI. "Bone Hyperresorption Is Prevalent in Chronically Critically Ill Patients." *Chest* 1998; 114: 1122 – 1128.

Nierman, DM. "A Structure of Care for the Chronically Critically Ill." *Critical Care Clinic* 2002; 18: 477 – 491.

Rudy, E., Daly, B., Douglas, S., Montenegro, H., Rhayun, S., and Dyer, M. "Patient Outcomes for the Chronically Critically Ill: Special Care Unit versus Intensive Care Unit." *Nursing Research* 1995; Vol. 44(6).

Singer, M., De Santis, V., Vitale, D., and Jeffcoate, W. "Multiorgan Failure is an Adaptive, Endocrine-Mediated, Metabolic Response to Overwhelming Systemic Inflammation." *The Lancet* 2004*;* Vol. 364(9433); 545-548.

Thomas, DC., Kreizman, I.J., Melchiorre, P., & Ragnarsson, K.T. "Rehabilitation of the Patient with Chronic Critical Illness." *Critical Care Clinics* 2002; 18: 695 – 715.

Van den Berghe, G., "Neuroendocrine Pathobiology of Chronic Critical Illness." *Critical Care Clinics* 2002; 18: 509–528.

Wiencek, C., and Winkelman, C. "Chronic Critical Illness: Prevalence, Profile, and Pathophysiology." *AACN Advanced Critical Care* 2010*;* Vol. 21(1); 44-61.