Clinically Appropriate and Cost-Effective Placement (CACEP):

Improving Health Care Quality and Efficiency

Final Report

Dobson DaVanzo & Associates, LLC Vienna, VA 703.260.1760 www.dobsondavanzo.com

Clinically Appropriate and Cost-Effective Placement (CACEP):

Improving Health Care Quality and Efficiency

Submitted to:
Alliance for Home Health Quality and Innovation

Submitted by:

Dobson | DaVanzo

Allen Dobson, Ph.D.
Joan E. DaVanzo, Ph.D., M.S.W.
Audrey El-Gamil
Steven Heath, M.P.A.
Matthew Shimer, Ph.D.
Greg Berger
Anne Pick, M.P.H.
Nikolay Manolov, Ph.D.
Jean M. Freeman, M.A.

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Foreword

In 2009, staff at the Centers for Medicare & Medicaid Services (CMS) informally recommended that the Alliance for Home Health Quality and Innovation (Alliance) acquire research-identifiable Medicare claims data to rigorously study outcomes and Medicare payments for patients who receive home health care and other post-acute care services. The Alliance's objective in commissioning the study was to assess the quality and cost-effectiveness of post-acute and other care services provided to Medicare beneficiaries and to identify areas for potential Medicare savings under a variety of policy alternatives.

After careful deliberation, the Alliance commissioned Dobson DaVanzo & Associates, LLC (Dobson | DaVanzo) in April 2010 to develop a research protocol, obtain Medicare claims data, and conduct a series of descriptive and statistical modeling analyses. The Alliance Research Working Group, comprised of clinicians and health care professionals, oversaw the project and advised the research team on clinical issues. The Alliance's work was also informed by the Center for Medicare & Medicaid Innovation's (CMMI) Bundled Payments for Care Improvement (BPCI) initiative, which solicited applications in the spring of 2012.

This project is known as the Clinically Appropriate and Cost-Effective Placement (CACEP) study. The attached report contains the research findings. Under the guidance of the Alliance Research Working Group, the project has moved through four distinct phases. In the first phase, Dobson | DaVanzo requested and was granted a data use agreement (DUA) from CMS to obtain and make use of three years of Medicare Parts A, B, and D patient-level claims and post-acute care patient assessment data. The second phase consisted of a literature review, which identified many viable home-based approaches that have been, and are being, developed to improve patient care coordination across sites of care and reduce patient difficulties during care transitions.

In the third phase, Dobson | DaVanzo developed four working papers around three different types of patient episodes. The four working papers explored: 1) frequencies of

patient episodes, 2) Medicare payments, 3) patient pathways across care settings, and 4) hospital readmissions – all by different beneficiary clinical and demographic characteristics. The use of three types of episodes (e.g., both before and after an "index" hospital stay, and after a community admission to home health) provides insight as to how patients currently navigate our health care system, and informs consideration of various types of policies that might improve system performance. We shared our descriptive results with a wide range of policymakers and have incorporated their feedback into this document.

The data suggest that the mix of post-acute care services delivered and their associated payments are highly variable within and across Medicare Severity Diagnosis Related Groups (MS-DRGs) and regionally across patients with comparable clinical characteristics. Changes to the health care delivery system and payment reform will depend upon clinically appropriate placement of patients upon hospital discharge and improvements to managing the continuity of care as patients move from facility-based care settings to their homes. Improvements to transitional care interventions will be critical to the endeavor as well. To the extent that policy changes are pursued, it is important to note that successful changes to the payment system will require the careful development of various risk adjustments, payment system transitions and blends, and outlier payment strategies as CMS moves away from its current system of separate siloed prospective payment systems to more integrated payment models.

In the last phase of the study, Dobson | DaVanzo formulated and calibrated a series of economic simulation models, informed by the study's descriptive statistics and the published literature, in order to examine how a redesign of post-acute care service payment and delivery could affect health care expenditures annually and cumulatively over the next 10 years.

As we look ahead to future projects, the Alliance is committed to sharing our research findings with policymakers and extending our research to support the development of innovative and value-based care. These innovations will be built upon the health care system's emerging capacity to deliver high-quality cost-effective care in the home setting.

Teresa Lee, Executive Director, Alliance for Home Health Quality and Innovation

Richard MacMillan, Senior Vice President & Senior Counsel, Legislative and Regulatory Affairs, LHC Group, Inc.; Project Officer

Key Concepts and Terms

This section introduces key concepts and terms that are used throughout this report.

Key Concepts

Index (Anchor) Short Term Acute Care Hospitalization: Short term acute care hospital admission that initiates the post-acute care episode. Hospitalization is preceded by 15 days of no facility-based or home health care.

Episode Types:

1) Post-acute care episode – Episode that includes all care provided during a fixed 60-day period after discharge from the index acute care hospitalization. Payments presented for the post-acute care episodes include the index acute care hospitalization.
2) Pre-acute care episode – Episode that includes all care provided during a fixed 60-day period prior to the index acute care hospital admission. Payments presented for the pre-acute care episodes include the index acute care hospitalization.
3) Non-post-acute care community-based episode – Episode that includes all care provided nine months following discharge from an admission to home health from the community (community-referred admission as opposed to one following discharge from a facility-based setting). Payments presented include the initial home health admission.

First Setting: The first setting a patient enters following discharge from the index acute care hospitalization.

- HHA - Home health agency
- IRF - Inpatient rehabilitation facility
- SNF - Skilled nursing facility
- LTCH - Long-term care hospital
- STACH - Short term acute care hospital; patient was discharged home and readmitted to the hospital before receiving care from any other setting (readmission)
- Community - Physician or outpatient visit; patient was discharged home and received a physician or outpatient visit (including hospital outpatient department visit or ambulatory surgical center visit) prior to any other care setting
- ER - Emergency room
- OP Therapy - Outpatient therapy
- Hospice - Hospice care
- Other IP - Other inpatient hospital, such as psychiatric hospital admission
- No Care - Patient returned home and received no inpatient or ambulatory care during the episode

Readmission: Any hospitalization during the 60-day post-acute care episode following the index acute care hospitalization.

All payment estimates presented are for the Medicare program and exclude beneficiary co-payments and deductibles.

Key Concepts and Terms

Select Key Terms

ACA	Patient Protection and Affordable Care Act
ACO	Accountable care organization
ADLs	Activities of Daily Living
Admission	Acute care hospital admission during the nine-month non-post-acute care community-based episode
Antecedent Setting	The care setting immediately preceding an acute care hospital admission, readmission, or prior admission
BPCI	Bundled Payment for Care Improvement initiative; developed by the Center for Medicare & Medicaid Innovations
CARE Tool	Continuity Assessment Record and Evaluation tool; developed by RTI International as part of the Post Acute Care Payment Reform Demonstration (PAC-PRD); standardized patient assessment tool developed for use at acute hospital discharge and at post-acute care admission and discharge
CBO	Congressional Budget Office
CBOs	Community-based organizations
CC	Complications/Comorbidities; severity level of MS-DRG
CCW Data	Chronic Condition Warehouse Dataset provided by CMS that flags each beneficiary for the presence of 21 chronic conditions
CHF	Congestive Heart Failure
Clean Period	Period prior to the index acute care hospitalization that does not contain any facility-based care or home health care
CMMI	Center for Medicare & Medicaid Innovation
CMS	Centers for Medicare & Medicaid Services
Community	First Setting; includes physician or outpatient visits
Community-Referred Home Health Admission	Admission to home health from the community, not from a facility-based care setting
COPD	Chronic Obstructive Pulmonary Disease
ER	Emergency Room
First Setting	First care setting patient enters following discharge from index acute care hospitalization
FFS	Fee-for-Service
Formal First Setting	Refers to LTCH, SNF, IRF, and HHA first settings
HBPC	Home Based Primary Care; Veterans Affairs program to provide home and community-based services to beneficiaries
HCC	Hierarchical Condition Category
HHA	Home Health Agency; refers to First Setting
Hospice	First Setting; Hospice care
HRR	Hospital Referral Region
Index (Anchor) Short Term Acute Care Hospitalization	Hospital admission that initiates the post-acute care episode. Hospitalization is preceded by 15 days of no facility-based or home health care. Also referred to as “Index acute care hospitalization” or “Index STACH”
IRF	Inpatient Rehabilitation Facility; refers to First Setting
IRF-PAI	Assessment tool used for patients in IRFs
LTCH	Long-Term Care Hospital; refers to First Setting

Key Concepts and Terms

MCC	Major Complications/Comorbidities; severity level of MS-DRG
MDS	Assessment tool used for patients in SNFs
MedPAC	Medicare Payment Advisory Commission
MS-DRG	Medicare Severity Diagnosis Related Group
No Care	First Setting; patient did not receive any care following discharge from index acute care hospitalization for length of episode
Non-Post-Acute Care Community-Based Episode	Episode Type 3: Nine months following discharge from first community-referred home health admission
OASIS	Assessment tool used for patients in HHAs
Other IP	First Setting; other inpatient setting such as psychiatric hospitals
PAC	Post-Acute Care
PCMH	Patient-centered medical home
Post-Acute Care Episode	Episode Type 1: 60-days following index acute care hospital discharge
Post-Discharge	Portion of post-acute care episode following discharge from the index acute care hospitalization
Pre-Acute Care Episode	Episode Type 2: 60-days prior to index acute care hospital admission
Primary Chronic Condition	Chronic condition identified by the highest community-risk score
Prior Admission	Acute care hospital admission during the 60-day pre-acute care episode preceding the index acute care hospitalization
Readmission	Acute care hospital admission following discharge from the index acute care hospital admission within the 60-day post-acute care episode
SNF	Skilled Nursing Facility; refers to First Setting
STACH	Short Term Acute Care Hospital; refers to First Setting and indicates patient was readmitted to the hospital before receiving care from another setting
VA	U.S. Department of Veterans Affairs

Overview and Summary of the Study

The projected trajectory of U.S. health care spending is unsustainable.[1] In 2010, national health expenditures were $2.7 trillion or 17.6 percent of the gross domestic product (GDP) – the highest of the developed countries. By 2021, national health care expenditures are expected to be 19.6 percent of GDP, of which the federal government's share will be nearly 50 percent.[2] Growth of this magnitude increases financial pressures on the U.S. economy and all groups of stakeholders – employers, payers, providers, patients – and the federal budget.

In light of this challenge, policymakers are exploring opportunities to achieve cost efficiency with better management of chronically ill patients who are receiving significant attention. Persons with chronic conditions are a large contributor to growth in health care spending. It is estimated that 25 percent of the U.S. population have one or more of five major chronic health conditions – diabetes, heart disease, hypertension, mental illness, and asthma. Care for persons with these conditions (who often have other chronic conditions as well) collectively represent 49 percent of total health care costs.[3] Pulmonary disorders, heart disease, cancer, trauma, and mental disorders also account for health care spending. The Medicare beneficiaries presented in our analyses have on average 5.1 chronic conditions.

Under current law and intermediate cost assumptions (not accounting for changes to the Sustainable Growth Rate [SGR] formula for physician payment), the Medicare trust fund is expected to become insolvent in 2024.[4] Because chronic conditions tend to drive health

[1] Thorpe, KE, Howard, DH. (2006). The rise in spending among Medicare beneficiaries: The role of chronic disease prevalence and changes in treatment intensity. *Health Affairs* 25(5): 378-388.

[2] Keehan SP, Cuckler GA, Sisko AM, Madison AJ, Smith SD, Lizonitz JM, Poisal JA, Wolfe CJ. (2012). National health expenditure projections: Modest annual growth until coverage expands and economic growth accelerates. *Health Affairs* 31(7): w1-13.

[3] Agency for Healthcare Research and Quality. (2006). High concentration of U.S. health care expenditures. Issue #19. Retrieved from: http://www.ahrq.gov/research/ria19/expendria.pdf

[4] The Board of Trustees. (2012). 2012 Annual Report of the Board of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds. Retrieved from: https://www.cms.gov/ReportsTrustFunds/downloads/tr2012.pdf

care expenditures, utilization of lower cost health care alternatives, together with reduced hospital readmissions, are being recognized as ways to extend the life of the trust fund.[5]

As the proportion of the economy allocated to health care services increases, both the public and private sectors have fewer resources to pay for other goods and services. This "opportunity cost" will remain a major social issue until health care expenditure growth is brought under control, either through increased efficiency or restricted access. Reflecting the unsustainable rate of growth in health care expenditures, the role of the health care entitlement programs – Medicare and Medicaid – has been prominently featured in federal budget deficit reduction discussions. It is expected that these programs will continue to dominate these discussions.

In late 2009, staff at the Centers for Medicare & Medicaid Services (CMS) informally recommended that the Alliance for Home Health Quality and Innovation (Alliance) investigate how home health could be used to improve the quality and cost-effectiveness of care provided to Medicare beneficiaries. CMS staff recommended that the Alliance obtain Medicare administrative claims data and study the issue in a rigorous and controlled manner. The Alliance commissioned Dobson DaVanzo & Associates, LLC (Dobson | DaVanzo) to use beneficiary-level Medicare claims data to explore the potential ways that the Medicare program could be restructured to improve quality. The study also aimed to determine how post-acute care settings could serve as a platform for improved and more efficient coordination of care.

The purpose of this study – Clinically Appropriate and Cost-Effective Placement (CACEP) – is to better understand how episodes of care are currently provided and to model uses of the home health benefit that are potentially more effective within the Medicare program. Another study purpose is to inform the health policy community of opportunities in which more effective and innovative use of post-acute care settings could transform the delivery system and enable a more efficient use of resources. Although home health, in particular, has been identified as a cost-effective care setting with positive clinical outcomes for patients,[6] it has not previously been examined as a means of accomplishing program-wide quality improvement and cost reduction.

As a home-based service, home health can be utilized to improve outcomes and achieve savings by managing patient transitions to and from facility-based care, teaching patients to self-manage their conditions in order for them to remain at home, and coordinating care across settings to ensure overall patient safety. As evidenced in published literature and the findings from integrated care programs referenced in this report, careful attention

[5] The Board of Trustees. (2010). 2010 Annual Report of the Board of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds. Retrieved from: https://www.cms.gov/ReportsTrustFunds/downloads/tr2010.pdf

[6] Buntin MB, Deb P, Escarce JJ, et al. (2005). Comparison of Medicare spending and outcomes for beneficiaries with lower extremity joint replacements. Working Paper. RAND Corporation (WR-271-MedPAC). Retrieved from: http://www.rand.org/pubs/working_papers/2005/RAND_WR271.pdf

to these aspects of patient care can help reduce overall health care payments and the reliance on facility-based care. Due to the management and cost structure of home-based care delivery, home health agencies can adapt care delivery to better focus on these issues. The basic concept for integrated care management to date, consistent with the CMS "triple aim," is to provide the right care to the right patient at the right time, within a system of payment incentives that encourage providers to be more cost-conscious. (Appendix A contains a list of several ACA demonstration provisions that may change the way facility and home-based care are delivered, and would test new and innovative models of delivering care.)

In this Overview and Summary of the Study, we first provide a summary of our datasets and the analytic structure within which we conducted our quantitative analyses and comprehensive literature review. Following a high-level review of study components, we summarize findings from the descriptive statistics of our four working papers and the methodology and findings from our simulation modeling. The modeling simulates possible innovative uses of home health in a variety of different scenarios that are based on findings from our literature review. We conclude with a brief discussion of the implications of our research and those study areas that merit further exploration.

Data and Methods

CACEP makes use of research identifiable files (RIF) obtained through a data use agreement with CMS (DUA #21007). These data contain all Medicare claims for a representative five percent sample of Medicare beneficiaries from 2007 to 2009, and include claims information for the following settings: inpatient and outpatient hospital, emergency room, home health agencies (HHAs), skilled nursing facilities (SNFs), inpatient rehabilitation facilities (IRFs), long-term care hospitals (LTCHs), physicians, hospice, and durable medical equipment (DME). Part D claims data are also available for those beneficiaries in our sample who are enrolled in a Part D prescription drug plan. (DME and Part D data are not included in our descriptive statistics).

We also requested and received data for numerous patient assessment variables for patients who received care in HHAs, SNFs, and IRFs (OASIS, MDS, and IRF-PAI assessment data, respectively).[7] Selected variables indicating basic functionality that are reported in all three datasets were identified and rescaled to an eight-point scale (0-7) in order to develop a consistent measure of functional status across care settings. Each functional status score was summed to represent the overall functional ability of a patient (on a 0 to 56 scale). These data were used to augment the claims data in order to better understand patient clinical characteristics and independence in performing key activities of daily living (ADLs). Appendix B contains additional information on our methodology.

[7] OASIS stands for Outcome and Assessment Information Set, MDS stands for Minimum Data Set, and IRF-PAI stands for Inpatient Rehabilitation Facility Patient Assessment Instrument.

Claims and assessment data for each patient were linked across settings using encrypted patient identifiers to create three types of patient episodes, each capturing a different aspect of patient care.

1) **EPISODE TYPE 1: POST-ACUTE CARE EPISODE** – all care provided 60-days *after* discharge from an index acute care hospital admission. Episode payments include the index hospital stay.
2) **EPISODE TYPE 2: PRE-ACUTE CARE EPISODE** – all care provided 60-days *prior to* the index acute care hospital admission. Episode payments include the index hospital stay.
3) **EPISODE TYPE 3: NON-POST-ACUTE CARE COMMUNITY-BASED EPISODE** – all care provided nine-months *after* discharge from a home health admission that was not preceded by a hospital stay (community-referred home health admission). Episode payments include the first home health admission.

The index acute care hospital admission is defined as an admission preceded by a 15-day "clean" period in which no facility-based or home health care is provided. Each episode also contains a 60-day "look-back" period that allows us to access additional information useful for risk adjustment. Episodes are administratively defined by the first setting that the patient enters immediately following discharge from the index acute care hospital (e.g. a HHA first setting episode is an episode in which the beneficiary is discharged from the hospital and receives care from a HHA before receiving care from any other type of provider).

Information from external databases such as the Dartmouth Atlas, Medicare Provider of Service (POS) File, and Area Resource File (ARF) are linked to each patient episode and stored in a relational database that supports the calculation of descriptive statistics and simulations. The episode databases were periodically updated, modified, or rebuilt during the project to reflect lessons learned from our data analyses and feedback from the Alliance's Research Working Group, as well as our experience with the application process for the Center for Medicare & Medicaid Innovation's (CMMI) Bundled Payments for Care Improvement (BPCI) initiative.

Descriptive Statistics

To better understand the care and Medicare payments represented by patient episodes, we calculated a series of descriptive statistics and reported them in four working papers.[8] These statistics focus on episode frequency, episode payments, patient care pathways, and readmissions. The key descriptive findings we present below primarily focus on post-acute care episodes (Episode Type 1). (We include several key findings from pre-acute

[8] Working papers and summary documents are available online at: http://www.ahhqi.org.

care [Episode Type 2] and non-post-acute community-based care [Episode Type 3] in Appendix C).

60-DAY POST-ACUTE CARE EPISODES: FREQUENCY AND PAYMENTS

- **In 2008, Medicare post-acute care episode payments represented about 58 percent of Medicare fee-for-service payments ($180.1 billion of $313.0 billion) and 39 percent of overall Medicare payments ($180.1 billion of $460.5 billion).** Thus, study episodes contain a significant amount of Medicare fee-for-service spending.

- **Episode payments are highly concentrated within a relatively few MS-DRGs.** Twenty percent of index acute care hospitalization MS-DRGs represent approximately 80 percent of Medicare episode payments overall and by first setting.

- **Rankings of MS-DRGs by total Medicare episode payments are often relatively consistent across HHA, SNF, and IRF episodes but are different for LTCH first setting episodes.** For example, MS-DRG 470 (major joint replacement or reattachment of lower extremity w/o MCC, e.g. hip replacement) is ranked first for HHA, SNF, and IRF episodes and ranked 34th for LTCHs.

- **Average Medicare episode payments are highly variable across first settings within a single index acute care hospital MS-DRG.** This finding implies that MS-DRGs may not adequately account for differences in severity across first post-acute care settings. We also note that different first settings have different cost structures for seemingly comparable patients. These facts are critical to understanding how patients might be effectively placed within the continuum of post-acute care.

- **The index acute care hospitalization and related services – including outpatient, ER, and physician visits during the index stay – represent approximately one-half of overall Medicare episode payments on average.** For example, in MS-DRG 470, services provided during the index hospitalization represent $13,373 of an average episode payment of $22,986.

- **Primary chronic conditions[9] do not explain variation in Medicare episode payments across first settings or within MS-DRGs**. For example, within MS-DRG 470 the primary chronic condition of rheumatoid arthritis/osteoarthritis or osteoporosis is ranked first (by total Medicare episode payments) across all formal first settings (e.g., HHA, SNF, IRF, LTCH).

[9] Primary chronic condition represents the patient's chronic condition with the highest community-risk score, as identified by hierarchical condition categories used by Medicare Advantage. For more information, see Appendix B.

- **Average episode payments and distributions across first settings vary by beneficiary demographic (e.g., dually eligible, live alone, aged over 85) and clinical characteristics.** For example, episode payments increase markedly with increases in the number of beneficiary chronic conditions for episodes with the same MS-DRG.

60-DAY POST-ACUTE CARE EPISODES: PATIENT PATHWAYS

- **The average number of "sequence stops" in an episode pathway and the mix of facility- and ambulatory-based care varies overall and across first setting episodes and primary chronic conditions.** Pathways are also influenced by the number of chronic conditions, by MS-DRG, and by beneficiary demographic and clinical characteristics. Pathway complexity is directly related to Medicare episode payments.

- **The most frequent patient pathways across first settings have a lower average Medicare episode payment than the overall average across first settings.** This suggests common pathways (typically containing fewer sequence stops) do not drive episode payments. Therefore, simplifying patient pathways could reduce Medicare payments.

60-DAY POST-ACUTE CARE EPISODES: READMISSIONS

- **Average episode payments are more than twice as high for episodes that contain a readmission.** Across MS-DRGs and primary chronic conditions, we observe the same doubling in average Medicare payments for episodes that contain one or more readmissions versus those that do not. Reducing readmission rates could substantially reduce Medicare episode payments, but the effort required to reduce readmissions could be costly.

- **The percent of episodes containing a readmission is relatively consistent by first setting across MS-DRGs. However, the percent of episodes with a readmission by first setting varies significantly by primary chronic condition.** Therefore, avoiding readmissions, particularly for beneficiaries with high-severity primary chronic conditions through use of additional ambulatory-based care and care coordination, could result in significant Medicare savings.

60-DAY POST-ACUTE CARE EPISODES: REGIONAL VARIATION

- **Index acute care hospitalization and readmission days of care per 1,000 fee-for-service beneficiaries vary widely across the 10 CMS administrative regions**. Regions with greater index acute care hospitalization days of care per 1,000 fee-for-service beneficiaries tend to have disproportionately more readmission days of care per 1,000 beneficiaries as well.

60-DAY PRE-ACUTE CARE AND NINE-MONTH NON-POST-ACUTE CARE COMMUNITY-BASED EPISODES

- **Similar to the post-acute care episodes, average Medicare episode payments vary by primary chronic condition, beneficiary clinical and demographic characteristics, patient pathways, and readmissions.** Medicare payments during pre-acute care episodes are dominated by the index hospitalization and any prior hospital admissions, while Medicare payments in the non-post-acute care community-based episodes are more evenly divided among HHAs, hospital admissions, SNFs, and physicians.

IMPLICATIONS OF DESCRIPTIVE STATISTICS

Our descriptive statistics suggest differences in episode payments are driven in large part by beneficiary clinical and demographic characteristics. The rankings of primary chronic condition (by total Medicare episode payments) are highly consistent across first settings (including LTCHs), indicating some degree of clinical comparability across care settings despite large differences in average payments.

To the extent that MS-DRGs do not account for differences in payments across care settings, our data suggest that many patients can be safely and economically treated in lower cost settings (e.g., many patients with a hip replacement can safely and effectively be treated and recover in the home). Alternatively, to the extent that certain MS-DRGs show differences in ranking across first settings, certain patients typically should be treated in the more intense facility-based treatment settings (e.g., tracheostomy patients on mechanical ventilators are appropriately treated in an LTCH or acute care hospital intensive care unit). Knowing this distribution of patients across settings is essential to understanding Medicare episode payments and how care efficiencies can ultimately be achieved.

In addition, the literature indicates that, while much of the regional variation in Medicare payments is driven by differences in practice patterns, a large share of regional variation appears to be driven by patient characteristics. The findings of our descriptive analyses are consistent with the literature cited in this report.

Literature Review

The literature review is critically important to the study, as it summarizes what is currently known about continuity of care and transitional care, providing context and a rationale for the study's various analytic activities. Additionally, the literature explores how home health care can be used in a scalable fashion to improve the quality and efficiency of health care delivery, for example, by playing an enhanced and integrative role in patient care. (A complete review of our literature is presented as an evidence table in Appendix D.)

Overview and Summary of the Study

There are four key assumptions based on the findings of studies in the literature that drive our simulations. These findings enabled the research team to better understand the overall landscape and guided us in modeling how home health could be used as a cost-effective way to deliver care for clinically appropriate patients:

- **ASSUMPTION 1:** Although there are a limited number of randomized controlled trials comparing home care to other types of care, there are numerous observational studies that identify "enormous inefficiencies" in the health care system and demonstrate ways that health care can be improved and costs reduced through the use of home care.[10,11,12,13]

- **ASSUMPTION 2:** Some proportion of patients currently treated in facility-based post-acute care settings can be safely and effectively treated in the home.[14,15,16,17] That is, there is overlap in comparable patients across post-acute care settings, suggesting that some settings would substitute for each other.[18]

- **ASSUMPTION 3:** Provider payment incentives can influence both the care settings patients enter following an acute care hospitalization and the future follow-up care they receive.[19,20] Therefore, provider incentives could be developed to support more cost-effective care.

- **ASSUMPTION 4:** Regional variation in the cost and amount of care provided to beneficiaries results from differences in patient populations as well as different practice patterns across providers.[21]

[10] Wajnberg A, Wang KH, Aniff M, et al. (2010). Hospitalizations and skilled nursing facility admissions before and after the implementation of a home-based primary care program. *Journal of the American Geriatrics Society* 58(6): 1144-1147.

[11] Frick KD, Burton LC, Clark R, et al. (2009). Substitutive hospital at home for older persons: Effects on costs. *American Journal of Managed Care* 15(1): 49-56.

[12] Phillips CO, Wright SM, Kern DE. (2004). Comprehensive discharge planning with post discharge support for older patients with congestive heart failure. *JAMA* 91(11): 1358-1367.

[13] Anderson C, Mhurchu CN, Rubenach S, et al. (2000). Home or hospital for stroke rehabilitation? Results of a randomized controlled trial: II: Cost minimization analysis at 6 months. *Stroke* 31(5): 1032-1037.

[14] Boling PA. (2009). Care transitions and home health care. *Clinics in Geriatric Medicine* 25: 135-148.

[15] Leff B, Burton JR. (2001). The future history of home care and physician house calls in the United States. *Journal of Gerontology* 56A(10): M603-M608.

[16] Harrison MB, Brown GB, Roberts J, et al. (2002). Quality of life of individuals with heart failure: S randomized trial of the effectiveness of two models of hospital-to-home transition. *Medical Care* 40: 271-282.

[17] Stewart S, Horowitz JD. (2002). Home-based intervention in congestive heart failure: Long term implications on readmission and survival. *Circulation* 105(24): 2861-2866.

[18] Gage, B., et. al. (2011). Post-Acute Care Payment Reform Demonstration Report to Congress Supplement – Interim Report. RTI.

[19] DeJonge KE, Taler G, Boling PA. (2009). Independence at home: Community-based care for older adults with severe chronic illness. *Clinics in Geriatric Medicine* 25(1):155-69.

[20] Beales JL, Edes T. (2009). Veteran's Affairs home based primary care. *Clinics in Geriatric Medicine* 25(1): 149-154.

[21] Bernstein J, Reschovsky JD, White C. (2011). Geographic variation in health care: Changing policy directions. National Institute for Health Care Reform – Policy Analysis 4: 1-14.

Consistent with our assumptions, Cutler and colleagues believe that the "effect of multiple large policy changes may differ substantially from the effects of small trials of single interventions. In such a situation, it is imperative to cast a wider net than traditional standards do."[23] Echoing Cutler's observation, Thorpe and colleagues note that, "Reform-based initiatives could produce major gains in a relatively short period of time." Reform, ". . . demands bold initiatives that are based on the best evidence available and swiftly implemented."[24]

"Effective home care for persons with complex chronic disease must be comprehensive, not problem-focused. It must be longitudinal, not episodic. It must be interdisciplinary, not delivered by one or two providers. Moreover, it must integrate primary care. If complex chronic disabling disease is the question, home care is the answer, and VA HBPC experience now provides the United States with substantial evidence to support this view."[22]

The Patient Protection and Affordable Care Act (ACA) contains several demonstration provisions that may change the way facility and home-based care are delivered, and would test new models of ways to deliver care (Appendix A). The ACA does, in this way, explicitly recognize that sustained cost control will only occur with more coordinated care that prevents avoidable complications for patients with chronic conditions.

These reform initiatives are based on several decades of experimentation with new models of care coordination that better align provider incentives to provide quality care. The Veterans Affairs (VA) Home-Based Primary Care (HBPC) program, for example, has shown that a national program using existing clinical care tools is able to use home care to produce sizeable savings. In 2002, the VA achieved overall net savings of 24 percent through the HBPC program, and later replicated these results in 2007. In addition to substantial savings, the HBPC program achieved a 31 percent reduction in hospital admissions and a 25 percent reduction in nursing home admissions.[25] The HBPC program also reduced hospital days of care by approximately 80 percent and nursing home days of care by 90 percent.[26] The Virginia Commonwealth University and Inspiris, two programs similar to the Independence at Home Demonstration authorized by the ACA, have also shown overall cost reductions of 63 percent and 42 percent respectively over multiple-year time frames.[27]

Simulation Models

Our analytic models are based on post-acute care episode payments for 2008, which overall represent $180.1 billion (58 percent) of Medicare fee-for-service payments.[28] While our episodes are built using 2007 through 2009 claims, we relied on 2008 episodes for simulation due to the truncation of data in 2007 and 2009 from the required 60-day

[22] Beales JL, Edes T. (2009). Veteran's Affairs home based primary care. *Clinics in Geriatric Medicine* 25(1): 149-154.

[23] Cutler DM, Davis K, Stremikis K. (2010). The impact of health reform on health system spending. Center for American Progress and The Commonwealth Fund: 8.

[24] Thorpe KE, Ogden LL. (2010). The foundation that health reform lays for improved payment, care coordination, and prevention. *Health Affairs* 29(6): 1183-87.

[25] Holsinger JW. (2011). Holsinger: Veterans health care program could be model for Medicare. Roll Call.

[26] Beales JL, Edes T. (2009). Veteran's Affairs home based primary care. *Clinics in Geriatric Medicine* 25(1): 149-154.

[27] Butcher L. (2010, December 6). Putting a doctor in the house. Retrieved from: http://www.modernphysician.com/article/20101206/MODERNPHYSICIAN/312069996

[28] Represents Medicare payments for all fee-for-service beneficiaries, including those with end-stage renal disease (ESRD).

"look-back" period or episode length, respectively. A complete year of data is required for these analyses as we examine the rate of care per 1,000 Medicare fee-for-service beneficiaries.

The analytic models in our study are limited to high expenditure MS-DRGs and those in which home health represents at least 10 percent of the post-acute care episode payment. As a result of this filtering process, our simulations include 635 of the 747 total MS-DRGs. This process excludes, for example, MS-DRG episodes for tracheostomy patients with mechanical ventilators (MS-DRG 003), which are not often treated in the home setting. All analyses for the 89 high-expenditure and high utilization MS-DRGs are conducted individually and all "Other MS-DRGs" are combined and analyzed in aggregate. Several of the simulations also include a series of functional status variables based on assessment data to ensure that patients with severely limited mobility are not transferred out of facility-based care settings and also have caregiver support at home.

ANALYTIC METHODOLOGY

Based on the findings of our literature review and descriptive statistics, we developed three types of analytic models that capture potential changes to the delivery system as financial incentives are set in place to encourage: 1) restructuring through clinically appropriate and cost-effective patient placement; 2) reduction in hospitalizations for ambulatory care sensitive conditions; and 3) reduction in readmissions within HHA first setting episodes. A list of the models is contained below.

1) Restructuring through Clinically appropriate and Cost-Effective Placement (CACEP) Models
Model 1A: Cascade of Care to Most Clinically appropriate and Cost-Effective Setting Model
Model 1B: Moderate Restructuring of Care Beyond CACEP
Model 1C: Aggressive Restructuring of Care Beyond CACEP
2) Hospital Reduction Model for Ambulatory Care Sensitive Conditions
Model 2: Hospital Reduction Model for Ambulatory Care Sensitive Conditions
3) Hospital Readmission Reduction Models Within HHA First Setting Episodes
Model 3: Regional Readmission Reduction Model
Model 4A: National Readmission Reduction Model (25%)
Model 4B: National Readmission Reduction Model (50%)
Model 4C: National Readmission Reduction Model (75%)

Our first type of model reflects changes to make care delivery processes more efficient and to increase value to the patient and the Medicare program. Many of CMS' payment and delivery reform initiatives will provide incentives to transform the way patient care is provided, with an emphasis on streamlining and reducing transitions across settings. The cascade of care to the most clinically appropriate and cost-effective setting (Model 1A) simulates a new payment system that incentivizes the placement of patients into the most

cost-effective setting within the current structures and processes of care delivery. Models 1B and 1C extend beyond Model 1A to estimate the additional post-discharge payment changes needed to achieve alternative savings targets. Bundled payment initiatives that move beyond the siloed fee-for-service payment systems could provide the appropriate incentives for the system changes that would be required to achieve these savings targets.

The remaining models (Models 2-4) explore hospital admissions for ambulatory care sensitive conditions and readmissions within HHA first setting episodes. The ultimate goal of all simulation models is to have providers deliver the best care to the patient at the lowest cost to Medicare.

RESTRUCTURING THROUGH CLINICALLY APPROPRIATE AND COST-EFFECTIVE PLACEMENT MODELS (Models 1A-1C): The three clinically appropriate and cost-effective placement models are based on the premise that financial incentives and payment policies could encourage providers to place patients into the most clinically appropriate and cost-effective settings. Model 1A serves as the base model that operates within the current delivery structure and care processes. Models 1B and 1C extend those structures and processes.

Cascade of Care to Most Clinically Appropriate and Cost-Effective Setting Model (Model 1A)

The goal of Model 1A is to investigate the extent to which patients are currently placed both in the most clinically appropriate and cost-effective formal first setting (LTCH, SNF, IRF, HHA, and OP Therapy) following an index acute care hospitalization for select MS-DRGs. We model savings to Medicare by modifying patient pathways to reflect more cost-effective care placement based on the clinical and demographic characteristics, and functional status of the patient. This model works within the confines of providers' current delivery structure and care processes, but also assumes that financial incentives could promote placement of patients into the most cost-effective setting.

Functional status upon discharge from the acute care hospital was initially determined for each patient episode that included HHA, SNF, or IRF care. Multinomial logistic regressions were then used in order to determine the propensity for a patient to receive care from a given setting. To align with current Medicare regulation and to limit inappropriate placement (mostly due to a lack of complete clinical data), the model was precluded from placing patients with certain more complex clinical conditions into particular settings.

Three different approaches were constructed within Model 1A to account for differing degrees of shifting from one setting to another. The first approach applies to the way existing care is currently being delivered and relies on the functional status of a patient to direct the referral whenever this information is available. The second, and least conservative, approach does not rely on functional status at all, and assumes that providers have significant financial incentives to place patients in lower cost settings

within the current structure and processes of care delivery. The final approach (which is presented in this report as Model 1A) is a hybrid that averages the patients' propensity scores from the first two approaches. Modeled episode payments for the MS-DRGs eligible for shifting are then aggregated with payments for all MS-DRGs to determine overall Medicare impact.

Restructuring of Care beyond CACEP (Model 1B-1C)

The goal of Models 1B and 1C is to extend changes to the post-acute care payment system simulated in Model 1A to achieve additional Medicare savings following discharge from the index acute care hospital. Based on the distribution of payments by care setting resulting from Model 1A, these models calculate the additional percentage change to aggregate post-discharge spending (post-acute care following discharge from the index acute care hospitalization) needed to achieve desired savings targets (i.e., $70 billion and $100 billion over 10 years). These models assume that an explicit policy to reduce post-discharge payments will encourage providers to further adjust the structure and processes for which care is provided. This can comprise a bundled payment or accountable care organization (ACO) scenario where the "convener" is responsible for the overall Medicare episode payment for a given patient over a fixed amount of time.

Due to the importance of maintaining or improving outcomes and controlling expenditures throughout the overall patient episode, there will be strong financial pressures for post-acute care providers to increase efficiency and reduce Medicare expenditures by modifying their price structures and reducing length of stay. CMS would provide for appropriate quality measures as a way to protect patients from care stinting (or the under-provision of care). CMS would also need to monitor volume to determine that volume increases do not undermine payment reduction efforts.

HOSPITAL REDUCTION MODEL FOR AMBULATORY CARE SENSITIVE CONDITIONS (Model 2): Model 2 investigates how financial incentives to provide additional home and ambulatory-based care during the pre-acute care episode could prevent avoidable index acute care hospitalizations and subsequent post-acute care spending while ensuring patient stability and safety in the home. Rather than a "readmission" reduction model, we are presenting an "admission" reduction model for ambulatory care sensitive conditions. These are conditions the Agency for Healthcare Research and Quality (AHRQ) and several researchers have identified as being ones that should seldom result in an acute care hospitalization as long as the patient is receiving quality, non-facility-based care.[29]

Based on the average Medicare spending for post-acute care episodes (which include the index acute care hospitalization), we model a 50 percent reduction in the number of post-acute care episodes for ambulatory care sensitive index hospitalizations. We also add

[29] O'Brien E. (2005). Long-term care: Understanding Medicaid's role for the elderly and disabled. The Kaiser Commission on Medicaid and the Uninsured: 3.

additional payments for home health and other ambulatory care in order to avoid the hospitalization and maintain patient safety. Additional expenditures for HHA and other care are assumed to be 75 percent of gross savings from ambulatory care sensitive conditions and subsequent post-acute care episodes. Thus, for every $1 of gross savings, net savings of $0.25 are achieved. In other words, for every dollar saved in hospital admissions and post-acute care spending, it takes $0.75 in home health care and other types of services to provide the requisite care to the patient and still achieve net savings. This assumption is consistent with studies conducted at the VA, which reduced 78 percent of inpatient days and 18.2 percent in 30-day readmission rates, thus reducing overall costs by 24 percent.[30]

HOSPITAL READMISSION REDUCTION MODELS WITHIN HHA FIRST SETTING EPISODES (Models 3 & 4): These models were designed to simulate the potential Medicare savings that could be realized by reducing acute care readmissions through the extended use of home health. Model 3 is conducted at the hospital referral region (HRR) level and is based upon a change in a given HRR's hospital readmission rate per 1,000 fee-for-service beneficiaries within an MS-DRG. HRRs in which the readmission rates exceed the national median are reduced to the median rate. The national models (Model 4) reduce hospital readmissions by 25 percent, 50 percent, and 75 percent and offset these reductions with an increase in expenditures for HHA care and other ambulatory care.

For both the regional and national models, an increase in expenditures for HHA care is assumed to be 75 percent of gross readmission savings for the avoided readmissions, consistent with results from the VA.[31]

The above simulations are based on assumptions derived from the literature of results that might be achievable. However, there are various factors that the models do not (and cannot) account for that will influence the likelihood that these simulated results could actually be achieved. Accordingly, our results must be considered indicative of the range of savings that could be achieved, rather than definitive predictions of what would happen if specific policies were adopted.

Projected One and 10-Year Savings

The study's analytic models were designed to analyze the potential for Medicare savings by restructuring care processes and placing patients into the cost-effective and clinically appropriate care setting. We present savings for each model over a one-year (2008) and 10-year time frame (2013-2022). (Five-year savings estimates are presented as well.)

Our 10-year savings model is based on the "current law" expenditures as calculated by the Congressional Budget Office (CBO) and reflects changes from the 2012 CMS Final Rules

[30] Edes T. (2011). Impact of VA home based primary care: Access, quality, and cost. National Health Policy Forum (presentation).

[31] Edes T. (2011). Impact of VA home based primary care: Access, quality, and cost. National Health Policy Forum (presentation).

for payment in each care setting.[32] We then estimate the 10 year fiscal impact on Medicare for each of our models. We assume a four-year phase-in before the full savings are realized (25 percent per year). Consistent with CBO convention, we then calculate the total and annual savings for each model after accounting for a Medicare beneficiary premium offset. We assume that a bundled payment or ACO system would be legislated in the near future, but provide two years for CMS to prepare relevant regulations.

Summary of Findings

Exhibit ES-1 presents one-year and 10-year savings based on overall episode expenditures for 2008. We also present the percent of post-discharge spending represented by our one-year savings estimates (excluding spending for the index acute care hospital).

Exhibit ES-1: Summary of Simulation Results (in billions)

	One-Year Medicare Savings (2008)	Percent of Post-Discharge Spending* (2008)	10-Year Medicare Savings (2014-2023)
1) Restructuring through Clinically Appropriate and Cost-Effective Placement (CACEP) Models			
Model 1A: Cascade of Care to Most Clinically Appropriate and Cost-Effective Setting Model	$2.5	2.6%	$34.7
Model 1B: Moderate Restructuring of Care Beyond CACEP	$5.1	5.3%	$70.0
Model 1C: Aggressive Restructuring of Care Beyond CACEP	$7.3	7.5%	$100.0
2) Hospital Reduction Model for Ambulatory Care Sensitive Conditions			
Model 2: Hospital Reduction Model for Ambulatory Care Sensitive Conditions	$3.0	1.7%**	$37.7
3) Hospital Readmission Reduction Models Within HHA First Setting Episodes			
Model 3: Regional Readmission Reduction Model	$0.5	0.5%	$10.3
Model 4A: National Readmission Reduction Model (25%)	$0.2	0.2%	$4.2
Model 4B: National Readmission Reduction Model (50%)	$0.4	0.4%	$8.3
Model 4C: National Readmission Reduction Model (75%)	$0.6	0.7%	$12.5

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region and standardized to 2009 dollars. Medicare Savings include care from all facility-based and ambulatory care settings, and excludes beneficiary co-payments and Part D.

* Post-discharge spending refers to all spending during the post-acute care episode, excluding the index acute care hospital.

** Represents the percent of post-acute care spending, including the index acute care hospitalization.

Model 1A (cascade to clinically appropriate and cost-effective setting) under our hybrid approach produces Medicare savings for one year of $2.5 billion (1.4 percent of total Medicare episode payments, and 2.6 percent of total Medicare episode payments after discharge from the index hospitalization in 2008). The 10-year savings estimate is $34.7 billion between 2014 and 2023.

[32] Current law estimates are obtained by CBO's March 2011 Baseline for 2011-2021.

Exhibit ES-2 shows the proportion of episodes that are shifted based on the current first setting (before the shift) and the clinically appropriate first setting (after the shift). These results indicate that from a clinical standpoint, the majority of episodes currently in HHA, SNF, and IRF are appropriately placed. About 86 percent of HHA first setting episodes remain in HHA, while 80 percent and 69 percent of SNF and IRF first setting episodes remain in their respective settings.

Exhibit ES-2: Distribution of Patient Episodes by Current First Setting and Simulated Clinically Appropriate First Setting: Hybrid Approach among Select MS-DRGs

		Clinically Appropriate (Simulated) First Setting				
		OP Therapy	HHA	SNF	IRF	LTCH
Current First Setting	OP Therapy	29%	71%			
	HHA	14%	86%			
	SNF	5%	15%	80%		
	IRF	3%	9%	18%	69%	
	LTCH			31%	11%	58%

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

Models 1B and 1C offer the greatest potential savings to Medicare by reducing total episode expenditures in 2008 by $5.1 billion and $7.3 billion, which amounts to a payment reduction of approximately 5.3 percent and 7.5 percent, respectively, of all post-discharge spending (excluding the index acute care hospitalization). This model resembles the structure of a bundled payment initiative that also requires a minimum percent reduction in post-acute care episode expenditures. This means the Congress would set a given savings level and CMS would draft regulation to obtain the result. How these spending cuts are achieved, however, would be at the discretion of the care bundler. The literature suggests that tools are available for care restructuring. The experience with DRGs in the early 1980s suggests that national program implementation can produce broad systemic reform on a real-time basis.

The hospital reduction model for ambulatory care sensitive conditions (Model 2) shows savings of $3.0 billion in 2008 (1.7 percent of episode payments, including the index acute care hospitalization), or $37.7 billion in savings over 10 years.

Our hospital readmission reduction models (Models 3 and 4) appear to show lower savings than typically noted in the literature. The Medicare Payment Advisory Commission (MedPAC) notes, for instance, that $17.4 billion are associated with unplanned readmissions.[33] Our readmission savings estimates of $0.2 billion (0.2 percent

[33] Medicare Payment Advisory Commission (MedPAC). (2007). Chapter 5: Payment policy for inpatient readmissions. In *Report to Congress, Promoting Greater Efficiency in Medicare*. Washington, DC: MedPAC.

of post-discharge Medicare spending) to $0.6 billion (0.7 percent of post-discharge Medicare spending) appear to be less than those suggested by other researchers because we offset each $1 of savings with $0.75 of additional home health costs to maintain continued patient clinical stability, and limit our model to those episodes with HHA first setting.

IMPLICATIONS

Our models highlight the potential cost savings of various ways of transitioning patients to the most cost-effective settings. This transition is currently taking place in the Medicaid Home and Community-Based Services Waiver (Waiver) program,[34] which emphasizes home and community-based care over facility-based care. Experiences over the past twenty-five years have shown that there is a role for both facility-based care and home and community-based care. However, on the margin, home care represents a safe and cost-effective alternative for some patients when compared to facility-based care, notwithstanding the fact that patients typically prefer to receive care in the home setting.[35]

In our literature review chapter, we note that improved continuity of care and care transition planning activities indicate that the clinical tools are available to reform large parts of the health care delivery system. Although savings can be substantial, they are perhaps more limited than one might expect a priori, and will require substantial amounts of collective effort to set in place. One way of viewing the cost problem is that policymakers should focus on reducing the rate of increase in health care expenditures. In Vermont, for instance, policy analysts have projected that Vermont's Blueprint for Health could reduce the rate of increase in health care expenditures by 28.7 percent by its fifth year.[36]

Analysis of Part D Utilization and Claims for Enrollees

About 60 percent of beneficiaries in our 5 percent sample are enrolled in Medicare Part D. To ensure that our analysis of clinically appropriate and cost-effective placement is informed by all health care utilization and spending, we replicated Model 1A on Part D enrollees, including their Part D payments. Our analysis suggests that including Part D payments in the model yields consistent results to those presented in Model 1A. That is, Part D payments do not appear to skew the relative payments across first setting episodes, nor do they greatly impact the distribution of episodes by care setting once patients are clinically appropriately and cost-effectively placed.

Additional analyses of the Part D enrollees were conducted and the following was observed. First, we observed that patients enrolled in Part D have similar patient profiles

[34] Thomas Reuters. (2010). Preparing for readmission payment reductions: Know your risk and opportunities. Thomson Reuters: 1-3.

[35] The Joint Commission. (2011). Home – The best place for health care. The Joint Commission: 2-16.

[36] Vermont Department of Health. (2010). Vermont blueprint for health: 2009 annual report.

(in terms of clinical and demographic characteristics) and Medicare episode payments (only including Medicare Parts A and B) than those without Part D coverage. Part D enrollees have an average Medicare episode payment of $19,797, compared to $19,451 for those not enrolled in Part D. Part D payments average $796 for a 60-day post-acute care episode.

Second, medication compliance, defined as receiving timely medication refills, decreases as the number of non-institutionalized days increases within a post-acute care episode, as the patient and/or caregiver is left to manage the medications.

Discussion

Based on published literature and the use of linked Medicare identifiable patient-level claims data files, this report provides information on how health care delivery can be reformed to place patients in the most cost-effective and clinically appropriate care setting. CMS is promoting the use of similar data to evaluate various payment reforms on a "real time" basis, such as the Medicare Shared Savings Demonstration (e.g. ACOs) and the BPCI initiative. We used these data to develop descriptive statistics showing the clinical components and episode payments of Medicare post-acute care, pre-acute care, and non-post-acute community-based care, as well as to conduct simulations at the patient and episode levels. These data and analyses could be useful to private and public sector stakeholders who are considering various ways to make the health care system more effective by restructuring the way care is delivered.

Our models assume aggressive systemic implementation of existing innovative payment and care delivery models that have been developed over the last several decades. CMS is currently piloting, demonstrating, and evaluating new payment and delivery models using the types of data files utilized in this study. These developments render the findings of this study ever more important.

As former president Franklin D. Roosevelt once said, "The country demands bold, persistent experimentation."[37] The existing health care system is unsustainable. If reforms such as those noted in this paper are not broadly implemented over the next few years, the opportunity costs of increasing health care expenditures will become ever more burdensome. If that happens, the types of reform initiatives and provider payment reductions that might result from a deficit-driven political process may not produce better care for Medicare beneficiaries or any other patients.

Although the simulation models presented are based primarily on post-acute care episodes, the implications of our savings models can be applied to both the pre-acute care and non-post-acute care community-based episodes to explore the potential for clinical interventions

[37] Dionne EJ. (1997). Roosevelt, America's original man from hope. The Washington Post Company.

and Medicare savings outside of a hospitalization or post-acute care services. This is especially true for our ambulatory care sensitive admission reduction model.

Considering our results to date, we have identified areas for future research that could better address the ongoing needs of policymakers, the home health community, and public and private sector decision makers. CMS is promoting "mixed methods" study protocols that integrate qualitative and quantitative study approaches. As we consider research that can build on and extend our initial results, researchers should make use of both qualitative and quantitative methods.

Literature has asserted that appropriate patient placement after discharge from an acute care hospital is critical to the provision of quality patient care. However, additional research is needed to understand the discharge decision-making process concerning how patients are transitioned from one setting to the next.

It is equally important to have a better understanding of the clinical profile and precipitating circumstances of patients who are admitted from the community and/or readmitted to the acute care hospital, including a better understanding of the care that immediately preceded the readmission. The functional status of patients over time (as identified in the assessment data) can help track patient improvements or declines prior to a readmission. Another area worth exploring is the complexity of how management (or lack of management) of prescription drugs impacts patient care and readmission rates. Additional research is also needed to better understand which subsets of patients would benefit most from a transition to lower intensity care settings in other episode types.

Our descriptive statistics and modeling indicate the need for payment systems that would incentivize health care delivery reform. We contemplate a hybrid payment system that pays on MS-DRGs consistent with the Inpatient Prospective Payment System (IPPS), but that also pays on patient demographic, clinical and, perhaps, functional status, similar to the Medicare Advantage program. This hybrid system might be appropriate, as payment bundles reflect fixed payments that need to be allocated across multiple providers.

Introduction

Context of the CACEP Study

In late 2009, staff of the Centers for Medicare & Medicaid Services (CMS) recommended that the Alliance for Home Health Quality and Innovation (Alliance) obtain and analyze patient-level Medicare claims to develop episodes of care across all care settings. Such information can inform research as to how home care can be used to improve the quality and cost-effectiveness of care delivered to Medicare beneficiaries. The Alliance commissioned Dobson DaVanzo & Associates, LLC (Dobson | DaVanzo) to explore the potential of home health care to improve care coordination and serve as a platform for improved planning of care transitions across health care settings.

The purpose of the Clinically Appropriate and Cost-Effective Placement (CACEP) study is to model a series of care episodes in order to understand their composition, distribution, and associated Medicare payments. With respect to examining better use of the Medicare home health benefit, we simulated several scenarios that could potentially drive efficiencies in the health care system.

The Efficiency Imperative

There is widespread agreement that the U.S. health care system is highly fragmented, over specialized, and inefficient.[38] Current health care delivery for Medicare patients comprises multiple siloed prospective payment systems for each individual care setting, such as the Inpatient Prospective Payment System (IPPS). Furthermore, a fee-for-service payment structure encourages the provision of care volume. Additionally, the incentives of a pluralistic mix of public and private finance and payment systems work against effective care coordination and careful management of patients as they move from one care setting to the next. This mix of payers results in lack of any over-arching incentives to place patients in care settings that provide the best overall value.

[38] American College of Physicians. (2006). Reform of the dysfunctional healthcare payment and delivery system. ACP Online: 1-28.

Introduction

While the Patient Protection and Affordable Care Act (ACA) has expanded health insurance coverage, the existing payment system incentives remain in place. This means that controlling health care expenditure growth is even more essential as uninsured Americans become newly covered by health insurance. The structured integration of home health care into health care reform initiatives has the potential to "bend the cost curve" and provide quality care to patients in their homes. Rather than admitting patients to institutional settings, home health has been shown to improve patient satisfaction, and reduce Medicare payments.[39] Due to its patient-centric focus, home health care providers have the ability to tailor treatment plans and develop specialized preventive health regimens to manage patients with multiple chronic conditions. Numerous studies have shown that patients who can safely remain in their homes and receive needed treatments are better able to maintain their independence in the community.[40]

Cost drivers for health care programs are complex and interrelated. They include the use of ever more expensive technologies, the aging of the population, and the increased prevalence of chronic conditions. They also include the lack of a coherent strategy to encourage the use of efficient and coordinated health care delivery, such that each and every patient is provided care in the most clinically appropriate and cost-effective setting. An important system-wide goal is to coordinate care and care transitions to minimize the need for more aggressive care intervention over time.

Based on an extensive review of the literature, it is clear that there is an impressive array of care delivery models that could potentially be applied toward the needs of chronically ill patients. Many of these models have the potential to reduce health care expenditures, as they provide for coordination of care across providers and improved transitional care. Models that employ comprehensive hospital and post-acute care discharge planning activities would encourage the provision of care in the most cost-effective care settings. Bold action is required, as well as willingness to test innovative care delivery approaches under different circumstances. For many patients, reform to the delivery system could result in the increased provision of care in their homes. The ability to receive needed care at home could reduce the number of hospital admissions and readmissions.

The ACA contains several demonstration provisions that may change the way facility and home-based care are delivered, and would test new and innovative models of delivering care (Appendix A). The ACA does, in this way, explicitly recognize that sustained cost control will only occur with more coordinated care that prevents avoidable complications for patients with chronic conditions. By providing primary care and care coordination, home health can serve as a platform for several delivery system initiatives, such as

[39] Shepperd, et al. (2009). Avoiding admission through provision of hospital care at home: a systematic review and meta-analysis of individual patient data. *Canadian Medical Association Journal* 180(2): 175-182.

[40] New York Academy of Medicine. (2009). Independence at home act: a chronic care coordination program for Medicare that has proven effective in reducing costs and improving quality for highest cost patients. Powers, Pyles, Sutter & Verville, P.C.

accountable care organizations (ACO), patient-centered medical homes (PCMH), community health teams, independence at home programs, and bundled payments.

The opportunities for reform of the health care delivery system are sizeable. Recent literature indicates that only about 10 percent of rehospitalizations were likely to have been planned.[41] Slightly fewer than 20 percent of hospital admissions are for ambulatory care-sensitive conditions that might be avoided, and many patients who now receive care in institutional settings can be safely cared for in home and community settings.[42] Often the right care for the right patient may be considerably less expensive than the care that is currently being provided.

Accounting for Medicare Expenditures

The potential ability of home care to reduce health care expenditures is related to both direct and indirect influences. Direct influence includes, for example, clinically appropriate placement of patients into home health as opposed to institutional care settings, such as what is currently taking place in state Medicaid waiver programs that seek to provide home and community-based alternatives to nursing homes. Indirect influences include using home health services to improve the quality of care coordination. This report utilizes Medicare claims data to construct a series of post-acute care episodes that link all care received by a Medicare beneficiary during a specified time period (e.g., 60 days after discharge from an index acute care hospital). The following exhibits demonstrate how the concepts developed in this report relate to overall Medicare expenditures for 2008.

Exhibit 1.1 provides a distribution of total Medicare expenditures by fee-for-service provider type, including inpatient and outpatient hospital, physicians, home health agencies (HHA), skilled nursing facilities (SNF), inpatient rehabilitation facilities (IRF), long-term care hospitals (LTCH), and "other FFS."[43] Fee-for-service Medicare expenditures totaled $313.0 billion in 2008. As shown in Exhibit 1.2, post-acute care providers represent $52.0 billion, or about 17 percent, of total fee-for-service spending. Expenditures for HHA services include both community-referred HHA services and those that follow discharge from a facility-based care setting.

[41] Jencks SF, Williams MV, Coleman EA. (2009). Rehospitalizations among patients in the Medicare fee-for-service program. *New England Journal of Medicine* 360(14): 1418-1428.

[42] O'Brien E. (2005). Long-term care: understanding Medicaid's role for the elderly and disabled. The Kaiser Commission on Medicaid and the Uninsured: 3.

[43] Other FFS includes durable medical equipment, dialysis, outpatient rehabilitation facilities, outpatient laboratory, physician-administered drugs, ambulance services, ambulatory surgical centers, rural health clinics, and qualified health centers.

Exhibit 1.1: Total Medicare Expenditures (2008)

Care Setting	Medicare Expenditures (billions)	Percent of Total
Medicare Fee-for-Service		
HHA	$18.0	5.8%
SNF	$23.0	7.3%
IRF	$6.0	1.9%
LTCH	$5.0	1.6%
Hospital Inpatient	$123.0	39.3%
Hospital Outpatient	$23.0	7.3%
Physician Services	$60.0	19.2%
Hospice	$11.0	3.5%
Other FFS	$44.0	14.1%
Subtotal	**$313.0**	**100%**
Other Medicare Services		
Part D	$50.7	34.4%
Managed Care	$96.8	65.6%
Subtotal	**$147.5**	**100.0%**
Total Medicare Spending	**$460.5**	

Source: Medicare Payment Advisory Commission. (2009). A Databook: Healthcare Spending and the Medicare Program.

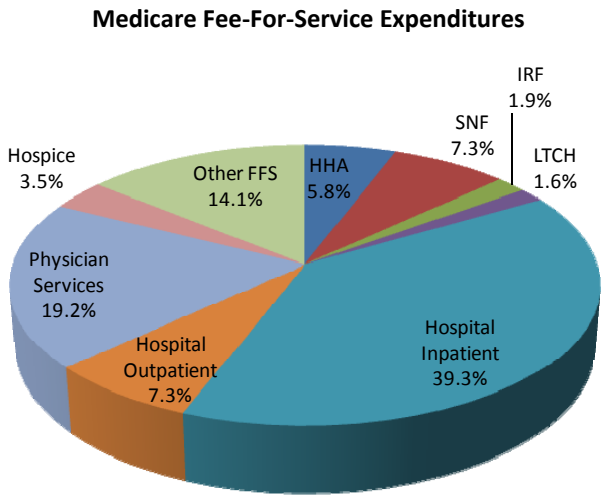


Exhibit 1.2: Medicare Post-Acute Care Expenditures (2008)

Care Setting	Medicare Expenditures (billions)	Percent of Total
HHA	$18.0	34.6%
SNF	$23.0	44.2%
IRF	$6.0	11.5%
LTCH	$5.0	9.6%
Total	**$52.0**	**100.0%**

Source: Medicare Payment Advisory Commission. (2009). A Databook: Healthcare Spending and the Medicare Program.

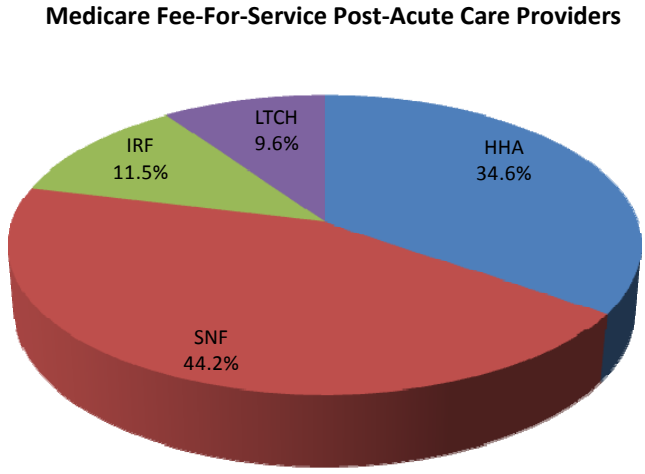


Exhibit 1.3 presents the Medicare payments by care setting contained in the CACEP study's 60-day fixed-length post-acute care episodes for 2008. These post-acute care episodes contain $180.1 billion in Medicare payment, or about 58 percent of the total Medicare fee-for-service payments in 2008. These payments exclude beneficiary copayments and deductibles, and include payments for end-stage renal disease (ESRD) patients.

Exhibit 1.4 shows that $33.7 billion (19 percent) of the $180.1 billion included in the 60-day post-acute care episodes are for post-acute care providers. Since our post-acute care episode definition only includes care for 60-days following an index acute care hospitalization, we do not capture all of the care in these settings in our episodes ($33.7 billion in our episodes

compared to $52.0 billion overall). The most notable difference is that home health care in our post-acute care episodes ($5.6 billion of $18.0 billion in total HHA spending) does not capture community-referred home health admissions, which represent approximately 61 percent of all home health admissions.[44]

Exhibit 1.3: Distribution of Medicare Payments by Care Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2008)

Care Setting	Medicare Episode Payment (billions)	Percent of Total
HHA	$5.6	3.1%
SNF	$19.4	10.8%
IRF	$5.6	3.1%
LTCH	$3.0	1.7%
Readmission	$29.5	16.4%
Index Hospitalization	$83.1	46.1%
Outpatient	$4.8	2.7%
Physician	$23.6	13.1%
ER	$1.2	0.7%
Outpatient Therapy	$0.5	0.3%
Hospice	$1.6	0.9%
DME	$1.4	0.8%
Other Inpatient	$0.8	0.4%
Total	**$180.1**	**100.0%**

Source: Dobson | DaVanzo analysis of research-identifiable 5% sample of Medicare claims data for all sites of services for 2008, standardized to 2009 dollars and extrapolated to reflect the universe of Medicare beneficiaries.

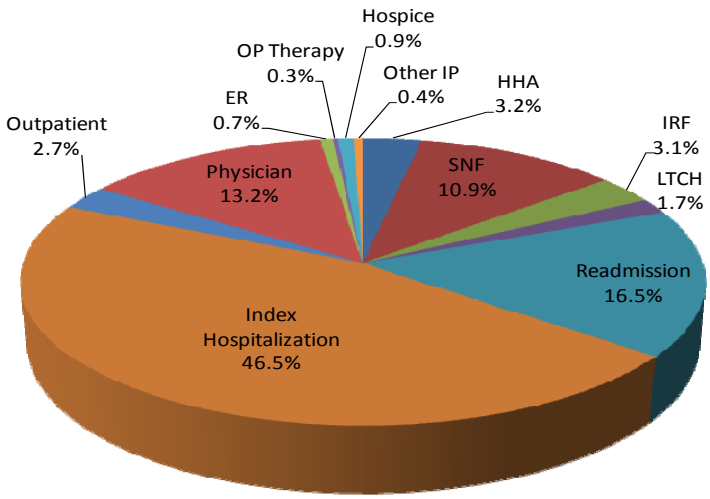
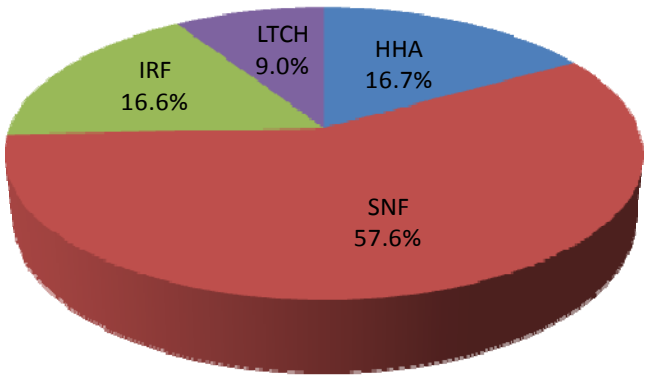


Exhibit 1.4: Distribution of Medicare Payments by Post-Acute Care Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2008)

Care Setting	Medicare Episode Payment (billions)	Percent of Total
HHA	$5.6	16.7%
SNF	$19.4	57.6%
IRF	$5.6	16.6%
LTCH	$3.0	9.0%
Total	**$33.7**	**100.0%**

Source: Dobson | DaVanzo analysis of research-identifiable 5% sample of Medicare claims data for all sites of services for 2008, standardized to 2009 dollars and extrapolated to reflect the universe of Medicare beneficiaries.



[44]Medicare Payment Advisory Commission (2010, March). *Report to Congress: Medicare Payment Policy.* (Washington, DC: MedPAC).

Introduction

By transforming the health care delivery system and identifying the most clinically appropriate and cost-effective setting for beneficiaries, there is an opportunity to reduce Medicare payments within the framework of our episodes as defined above. Medicare savings could be achieved from the following potentially avoidable services:

- SNFs
- IRFs
- LTCHs
- Readmissions
- Hospitalizations for ambulatory care sensitive conditions

Home-based care used in conjunction with primary care physician services has the potential to markedly reduce overall Medicare expenditures and growth rates. This suggests that CMS demonstration projects and other initiatives – such as ACOs or payment bundling – could prove important over time.

Report Overview

We first provide a detailed analytic methodology for obtaining and processing the Medicare claims data, developing patient episodes, and calculating descriptive statistics. We also introduce the methodology for our simulations, but present a more detailed description of the methodology for each model in the "Simulation Results" chapter.

After presenting the methodology, we review key descriptive statistics for our post-acute care episode definitions in terms of episode frequency and payments, patient pathways, and readmissions. This chapter is followed by a summary of our review of the literature and discussion of the over-arching assumptions that drive our simulation models.

The next two chapters present our analytic results based on 2008 post-acute care episodes, including their underlying assumptions and connections to the literature. Medicare savings estimates are presented for one-year (2008), five-years (2014-2018), and 10-years (2014-2023). We then present our analysis of Part D enrollees, and conclude the report with a discussion section. In summary, the report is organized in the following sections:

- Analytic Methodology
- Descriptive Statistics
- Evidence of Home Based Care in the Care Continuum
- Simulation Results
- Projected Impact of Modeled Savings
- Simulation Results among Medicare Part D Enrollees
- Discussion

Analytic Methodology

The analytic methodology for the CACEP study consists of several key components, including: 1) obtaining and linking patient-level Medicare claims data in order to develop patient episodes; 2) calculating descriptive statistics; 3) conducting a literature review; 4) developing simulation models for various scenarios that identify more efficient use of the Medicare home health benefit.

The first component is developing the patient episodes. Patient episodes are designed to capture different components of patient care: 1) care following an acute care hospitalization (post-acute care episodes); 2) care prior to an acute care hospitalization (pre-acute care episodes); and 3) care for patients who are referred to home health from the community (non-post-acute care community-based episodes). Based on these patient episodes, we developed a series of descriptive statistics that focus on episode frequency and payments by various clinical and demographic characteristics, patient pathways, and readmissions.

Once patient episodes and descriptive statistics were developed, we incorporated the patient assessment data from HHAs, SNFs, and IRFs into the patient episodes. This step allows us to analyze how the functional status of patients was related to the care they received during the episodes. We also linked Medicare Part D claims for those beneficiaries with a prescription drug plan to analyze how drug payments and compliance with prescription drug regimens are related to overall Medicare episode payments.

The first two components of our methodology were informed by the third, the literature review. This review included published and unpublished literature focusing on acute care hospital readmissions, clinically appropriate placement, new care delivery and payment models (such as home-based primary care and bundled payments), and various CMS demonstrations that identify the potential opportunity to achieve efficiencies through better coordinated and transitional care.

The last step of the methodology was to model variations in the care provided to patients based on clinical and functional need, and the Medicare payments for providing that care. We then replicate our clinically appropriate and cost-effective placement model among Part D enrollees to understand how prescription drug use among Medicare beneficiaries affects clinically appropriate placement, and ultimately Medicare savings. In this section of the report, we provide a detailed methodology for each of these components.

Datasets

The primary database includes all Medicare Part A and B claims from a five percent sample of Medicare beneficiaries for all sites of service from 2007-2009, including: inpatient and outpatient hospitals, HHAs, SNFs, IRFs, LTCHs, hospice, physician visits, and durable medical equipment (DME). For those patients enrolled in Medicare Part D, we also have a linked database that includes their Medicare Part D claims. All claims data were requested from the CMS Chronic Condition Warehouse (CCW),[45] which assigns each patient claim the clinical conditions for which the patient has been treated historically. The CCW data contain flags for 21 common conditions, including, but not limited to, diabetes, congestive heart failure, osteoporosis, various cancers, depression, and stroke. As CMS develops future payment systems, it will use comparable systems of data to track system performance, perhaps on a near "real time" basis.

In addition to using the Medicare claims data, our analysis incorporates select variables from the Medicare assessment data for patients who received care from a HHA (Outcome and Assessment Information Set – OASIS), SNF (Minimum Data Set – MDS), or IRF (Patient Assessment Instrument – IRF-PAI). We discuss how the assessment data was imported into our dataset later in this section.

We appended several external datasets to the Medicare administrative and assessment claims to better understand patient characteristics and health care supply variables. Exhibit 2.1 shows the external data sources used to enhance the utility of the Medicare claims data for multivariate modeling.

Exhibit 2.1: Supplemental Data Sources

Data Source	Explanation of Use
Dartmouth Health Atlas	Provides data that will allow the consolidation of providers in different zip codes into Dartmouth Hospital Referral Regions (HRR)
Provider of Services (POS) file	Provides data to link providers to geographic areas
Area Resource File (ARF)	Provides information on health facilities and professions, measures of resource scarcity, health status, and economic activity
MS-DRG Grouper	Allows assignment of Medicare Severity Diagnosis Related Groups to each index acute care hospitalization
Impact File	Contains intern and resident-to-bed ratio and the wage index

[45] Data were provided by CMS under Data Use Agreement #21007.

The above data (claims, assessment, and external data) were linked together at the patient level into a master relational database. This master database supported the calculation of descriptive statistics and the simulations of the various care delivery models.

In order to remove the effect of geographic location on Medicare payment amounts presented in the claims data, we standardized the database by adjusting all Medicare expenditures by the appropriate wage index (or other geographic price adjusters) for the labor-related portion for each type of provider. We also standardized the database to 2009 dollars by inflating all Medicare payments in 2007 and 2008 to 2009 dollars. This was accomplished by using the escalation factor for each care setting for each year from the Impact Files. Descriptive statistics presented in this report do not include beneficiary copayments or deductibles, or Medicare DME or Part D services. However, utilization and payments for DME patients are included in our simulation analyses. Furthermore, utilization and payments for beneficiaries with Medicare coverage on the basis of ESRD and disabilities are included. Cell sizes representing less than 11 beneficiaries are suppressed, per our data use agreement with CMS.

Patient Episode Definitions

Patient "episodes" were created to capture all health care utilization following (or preceding) key points in the patient's care. An "episode" consists of all care provided during a fixed period of time, and is not limited to the care provided in a single setting (i.e., a "stay" in a SNF, a HHA "episode," and/or an outpatient therapy "visit").

We created three episode types, each of which are used to assess how care is currently being provided to patients.

OVERVIEW OF EPISODE DEFINITIONS:

Three episode definitions were developed to capture a different aspect of patient care:

1. Post-acute care episodes
2. Pre-acute care episodes
3. Non-post-acute care community-based home health episodes

All episode types have the same internal structure. Each episode type is initiated by an index event. This index event is either an acute care hospital admission or admission into home health care that is preceded by at least 15 days of no facility-based or home health care. Episode Types 1 and 3 capture all health care utilization, across all settings, for a fixed number of days following discharge from the index (hospital or home health) stay. Episode Type 2 tracks all care preceding the index acute care hospital stay, as well as the index stay. The length of the episode varies by episode type, but all episodes are fixed-length. Care initiated within the episode timeframe that extends beyond the end of the episode is partitioned to include only the care and payments that occurred within the episode timeframe. For example, if a patient initiates a home health stay 55 days

following the index acute care hospital discharge (of a 60-day fixed-length episode), we calculated the per-day payments for the home health admission and only included the payments for the first five days in the total 60-day episode payment.

1. **EPISODE TYPE 1 - POST-ACUTE CARE:** Initiated by an index acute care hospital stay, post-acute care episodes capture all post-acute care (facility- and non-facility-based care) that patients receive following a hospital discharge. This episode type was constructed to include all care within 60 days following acute care hospital discharge, and is clinically defined by the MS-DRG for the index acute care hospitalization. That is, in order to compare episodes with similar levels of clinical complexity, we calculated descriptive statistics at the acute care hospital MS-DRG level.

   Episodes are administratively defined by the first setting following the index hospitalization. For example, if a patient is discharged from the acute care hospital and directly admitted to home health, that episode is referred to as a "home health" (HHA) first setting episode. This nomenclature does not mean, however, that the episode only includes care from the first setting; episodes often include care from several different care settings. This nomenclature allowed us to track different patient pathways[46] across episodes within MS-DRGs. Exhibit 2.2 contains the first care settings used to administratively define episodes in our analyses.

Exhibit 2.2: Description of First Settings that Characterize Post-Acute Care Episodes

First Setting	Definition
HHA	Home health agency
IRF	Inpatient rehabilitation facility
SNF	Skilled nursing facility
LTCH	Long-term care hospital
STACH	Short term acute care hospital; patient was discharged home and readmitted to the hospital before receiving care from any other setting (readmission)
Community	Physician or Outpatient visit; patient was discharged home and received a physician, outpatient, or ambulatory surgical center visit prior to any other care setting
OP Therapy	Outpatient therapy
ER	Emergency room
Other IP	Other inpatient hospital, such as psychiatric hospital admission
No Care	Patient returned home and received no inpatient or ambulatory care during the episode

   The Medicare payment data presented for the post-acute care episodes include both the Medicare payment for care during the index acute care hospitalization (including physician visits and other care during the hospitalization), as well as payment for all subsequent post-discharge care during the fixed-length episode.

[46] Patient pathways refer to the sequence of care settings a patient enters within an episode.

2. **EPISODE TYPE 2 - PRE-ACUTE CARE:** Pre-acute care episodes encompass the care that was provided prior to the index acute care hospitalization in Episode Type 1 (including Medicare payments for the index acute care hospitalization itself). While this episode type is anchored by the same index acute care hospitalization as the post-acute care episode (Episode Type 1), the episode looks back to care provided prior to the hospitalization. Pre-acute care episodes were constructed to include all care within 60 days preceding the acute care hospital admission. Rather than using the index acute care hospitalization MS-DRG, these episodes are clinically defined by the patient's "primary" chronic condition. To assign each patient a unique primary chronic condition designation, we used community-risk scores based on the Medicare Advantage hierarchical condition categories (HCC). We discuss more about clinically defining these patient episodes in the next section of this report.

3. **EPISODE TYPE 3 - NON-POST-ACUTE COMMUNITY-BASED CARE:** Non-post-acute care community-based episodes differ from the others, as they are the only episode type that is triggered by an admission to home health from the community. This episode type aims to capture the care and Medicare payments that patients incur following discharge from home health. Non-post-acute care community-based episodes were constructed to include all care provided within nine months following discharge from the patient's first home health episode (60-day home health episode). According to the Medicare Payment Advisory Commission (MedPAC), the average home health patient had two home health episodes in 2009.[47] Therefore, we extended the length of this episode type relative to the others in order to capture any remaining home health episodes, as well as the care they receive once they are no longer receiving home health. Similar to Episode Type 2, these patient episodes are clinically defined by the patient's primary chronic condition.

   The Medicare episode payment data presented for the non-post-acute care community-based episodes include the Medicare payment for the first home health episode and all care following the patient's first home health discharge.

DETERMINING "PRIMARY CHRONIC CONDITION" AND PATIENT SEVERITY

For the purpose of attributing health care utilization and payments to unique patient episodes, it is important to categorize each patient with a single mutually exclusive "primary chronic condition." Primary chronic conditions were determined by mapping each chronic condition identified in the CCW[48] data onto a single HCC.[49] We present a crosswalk of CCW chronic conditions to HCCs in Appendix B. HCCs were ranked from

[47] Medicare Payment Advisory Commission. (2011). Chapter 8: Home health services. *Report to Congress, Medicare Payment Policy.* (Washington, DC: MedPAC).

[48] CCW flags are determined by CMS through a series of algorithms that investigate patient diagnoses on historical claims. Each chronic condition has its own algorithm.

[49] HCCs are used in the Medicare Advantage program to determine per-member-per month payments based on historical utilization.

highest to lowest risk based on the HCC community-risk score. Patients with three select disease interactions were ranked as the highest risk. For example, patients with both congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD) (CHF*COPD) were ranked with a higher severity than patients with either individual condition. The other two interacted conditions include diabetes and CHF (DIABETES*CHF), and CHF and renal failure (CHF*RENAL).

For those patients who do not have these three disease interactions, the primary chronic condition is determined by their highest ranked chronic condition. That is, if a patient has more than one chronic condition, their primary chronic condition is the one with the highest community-risk score according to the most closely related HCC. Therefore, in order to have a single mutually exclusive primary chronic condition for each patient, patients are only represented in one primary chronic condition category.

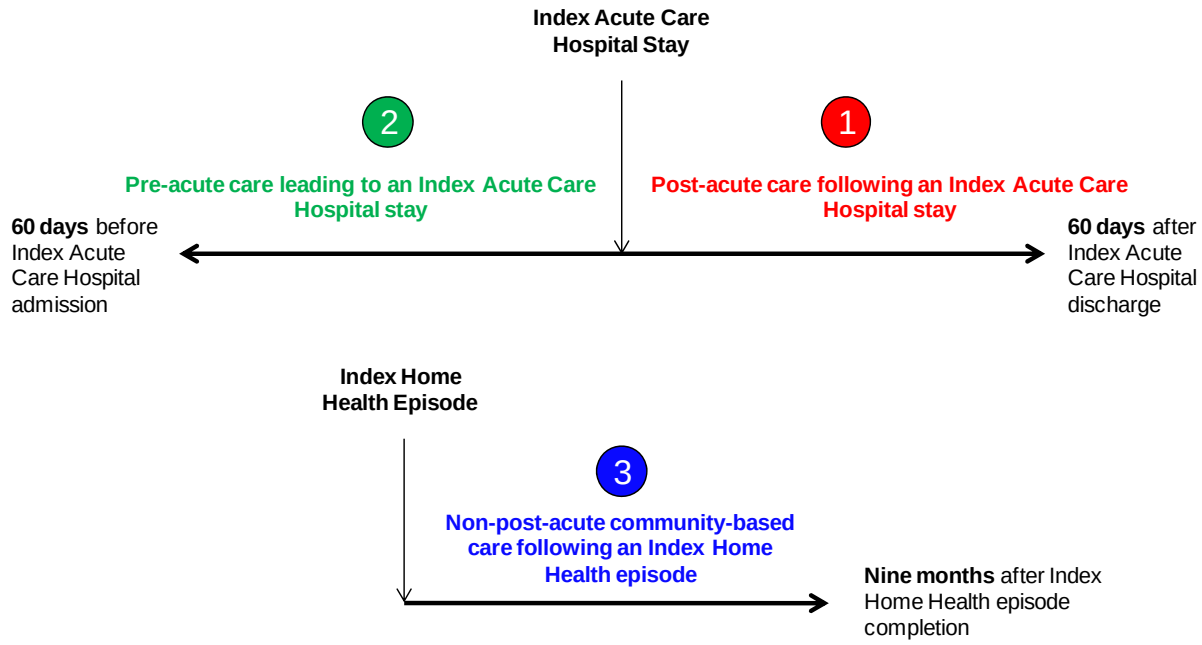
The HCC community-risk score is based on the relative cost of a diagnosed condition, all other things being equal. For example, COPD has a risk score of 0.388, diabetes has a risk score of 0.124, and depression has a risk score of 0.318. A patient with all of these conditions is assigned a primary chronic condition of COPD, as COPD has the highest community-risk score. This patient episode will not be included in the categories of diabetes or depression. This approach avoids double counting of patients with multiple comorbidities, which is important, as most Medicare patients have more than one diagnosed condition.

RELATIONSHIP BETWEEN EPISODE TYPES

Exhibit 2.3 shows how the three episode types in this study relate to each other. Each index acute care hospital stay that initiates a post-acute care episode (Episode Type 1) has a pre-acute care episode that captures the care that led to the index hospitalization (Episode Type 2). We emphasize post-acute care episodes in this report, as these are currently under discussion by policymakers generally and more specifically by CMS as part of the Center for Medicare & Medicaid Innovation (CMMI) Bundled Payments for Care Improvement (BPCI) initiative.[50] Furthermore, these episodes represent a substantial proportion of Medicare fee-for-service expenditures.

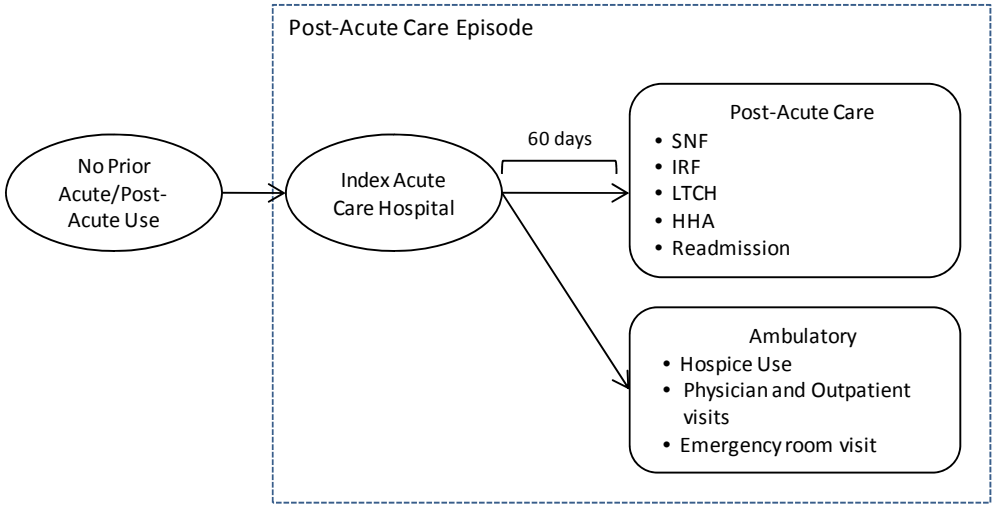
[50] Centers for Medicare and Medicaid Innovations. Bundled Payments for Care Improvement. http://innovations.cms.gov/initiatives/bundled-payments/

Exhibit 2.3: Relationship between Episode Types



The structure and care settings included in the post-acute care episodes are shown in Exhibit 2.4.

Exhibit 2.4: Structure and Care Settings Included in Post-acute Care Episode



Note: DME is excluded from the descriptive statistics presented in this report, but is included in simulation model results as an ambulatory service.

Assessment Data

In addition to using the Medicare claims data, our analysis incorporates select variables from the Medicare assessment data for patients who received care from an HHA (OASIS), SNF (MDS), or IRF (IRF-PAI). The assessment data provide functional information on each patient that is not available in administrative claims data. The assessment data were used to better characterize patient's functional ability to receive care in home-based as opposed to other care settings (because of safety and the availability of caregiver support).

One limitation to using the assessment data, however, is the lack of consistent metrics across sites of service. In order to compare the functional status of patients across sites of service, we developed a standardized scale that was applied to each of the selected variables across datasets. The variables selected pertained to patients' living situation and available caregiver support, as well as their functional ability to perform dressing, bathing, toileting, transferring, locomotion, and feeding (also known as activities of daily living [ADLs]). We developed an eight-point scale that categorizes each patient on a continuum of fully dependent (fully or mostly relies on caregiver support) to fully independent (able to perform the measure without assistance). Within the simulation models, scores for individual variables were then summed ranging from zero (low functional status [or highly dependent]) to 56 (high functional status [or highly independent]). Appendix B contains the crosswalk of assessment data scales to our standardized metric.

Since we used the assessment data to track the availability of caregiver support and patient functional status as close to patient discharge from the index hospitalization as possible, we limited our analysis to the data in the first clinical assessment in each care setting. We did not calculate change in functional status over time within each care setting.

Literature Review

Our four overarching assumptions are based on a structured review of the literature. Both the Medline and PubMed databases were searched for studies conducted between 1998 and 2012. The search was divided into three categories: acute care hospital readmission, clinically appropriate and cost-effective placement, and new care delivery and payment models. If the study concerned any of these topics, the article was included in our evidence chart.

Sample search keywords included: integrated care, coordinated care, readmissions, home health, care management, patient-centered, self-management, disease management, hospital at home, home-based primary care, transitional care, discharge planning, and bundled payment. The evidence chart includes 96 of the studies most appropriate to our research on the current state of home health integration into the care continuum through

various care delivery and payment reform initiatives. In addition to the small number of randomized controlled trials of innovative programs that reduced costs and/or readmissions, we examined a fair number of observational studies in order to understand the range of care models that are currently underway and/or being tested. Most studies describe situations in which providers are safely treating patients in the home, coordinating care, and/or providing self-management education. Some literature concerns regional variation in care delivery and cost. Appendix D contains an evidence table summarizing the literature.

Analytic Models

Based on patient episodes that also contain the assessment data, we developed three types of simulation models reflecting structural changes in the delivery system that could produce savings to the Medicare program. These simulation models were designed based on findings from the descriptive analyses of patient episode expenditures, pathways, and readmissions, as well as findings from the literature review. These models are independently modeled, but could be potentially integrated into a single scenario in future work. That is, while the models focus on separate aspects of patient care (i.e., simulating changes to the first setting following hospital discharge and readmissions within the episode), the results are calculated individually and do not assume that more than one model is implemented at a given time. Also, while these models are based on post-acute care episodes, similar methods could be applied to non-post-acute care community-based episodes to estimate the impact of care delivery reform on community-based home health patients through a modification to the current Medicare benefit.

Since several of the models compare savings as a percent of total episode and Medicare fee-for-service spending, our analyses were limited to post-acute care episodes in which care was received during 2008. As discussed in the methods section above, each post-acute care episode is triggered by an index acute care hospitalization that is preceded by a 15 day “clean period” with no facility-based or home health care. Additionally, each episode must have a 60-day “look back” period to help with risk adjustment. One of our models aims to reduce index hospitalizations for ambulatory care sensitive conditions, and therefore, also includes the pre-acute care episodes in our analyses.

SELECTING MS-DRGS TO INCLUDE IN SELECT SIMULATION ANALYSES

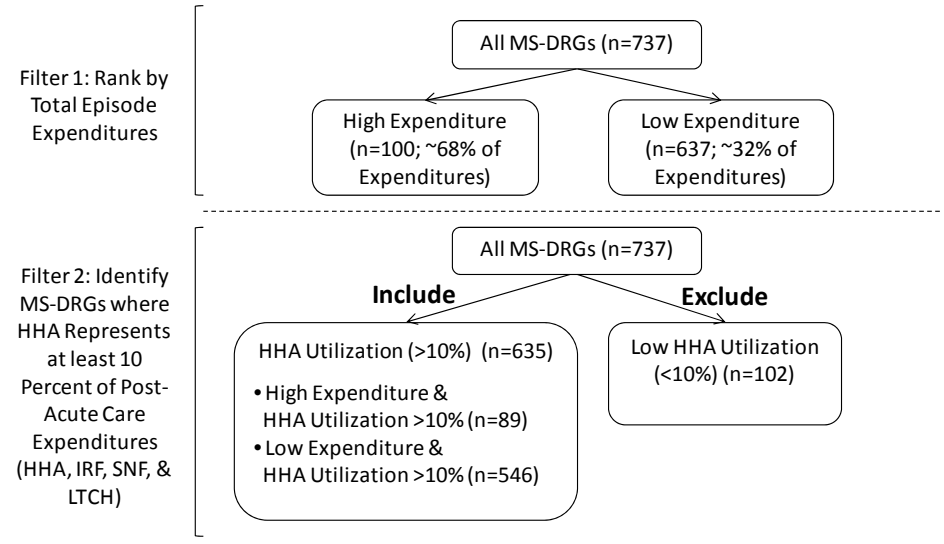
Given that Medicare home health care is designed to allow patients to remain at home safely with intermittent skilled care, patients with more complex conditions cannot be treated in the home in our simulations. Additionally, there are several low frequency or low expenditure conditions that are treated within the Medicare program that likely would not result in large Medicare savings, even if the care delivery system were to change for those conditions. As a result, we developed a two-phase filter to identify the

MS-DRGs to be included in the select models that center on the use of home health care.[51]

As shown in Exhibit 2.5, the first phase of the filter is to identify high utilization and low expenditure MS-DRGs within the Medicare program. Our filter first selects the top 100 MS-DRGs ranked by total episode expenditures. These MS-DRGs represent about 68 percent of total episode expenditures. The second filter identifies MS-DRGs where home health expenditures represent at least 10 percent of post-acute care episode expenditures for HHA, IRF, SNF, and LTCH services. We determined that 635 of the total 737 MS-DRGs "passed" this second filter. This second filter also removed 11 MS-DRGs from the MS-DRGs previously identified as being in the top 100 by Medicare expenditures (e.g., MS-DRG 003 – ECMO or tracheostomy with mechanical ventilation 96+ hrs), in which less than 10 percent of the post-acute care expenditures are attributed to home health care. Our simulation models analyze each of the remaining 89 MS-DRGs individually.

Analyses are conducted using the 635 MS-DRGs that were included in the second filter, but are divided into two groups: 1) "Select 89 MS-DRGs," which include those that pass both filters (high expenditure and high utilization MS-DRGs; n=89), and 2) "Other MS-DRGs," which includes all those that passed the first filter but not the second (low expenditure and high utilization; n=546). These "Other MS-DRGs" are aggregated together and are analyzed as a single "other" MS-DRG in our modeling. There were 102 MS-DRGs that were excluded from our analysis altogether since they did not pass the second filter. Appendix B lists the MS-DRGs included in the analyses.

Exhibit 2.5: MS-DRG Filter for Analytic Models



[51] This specific MS-DRG filter only related to simulation model for hospital readmission reductions among HHA first setting episodes (Models 3 and 4), which are described later in this chapter. The remaining models use alternative filters to ensure clinical appropriateness and volume of the MS-DRGs included.

THREE TYPES OF SIMULATION MODELS

A brief high-level description of the methodology for each of the three types of simulation models is presented below. A full list of simulation models is presented in Exhibit 2.6. A detailed methodology is presented in the Simulation Results chapter of this report prior to discussing the findings for each model.

Exhibit 2.6: Three Types of Simulation Models

1) Restructuring through Clinically Appropriate and Cost-Effective Placement (CACEP) Models
Model 1A: Cascade of Care to Most Clinically Appropriate and Cost-Effective Setting Model
Model 1B: Moderate Restructuring of Care Beyond CACEP
Model 1C: Aggressive Restructuring of Care Beyond CACEP
2) Hospital Reduction Model for Ambulatory Care Sensitive Conditions
Model 2: Hospital Reduction Model for Ambulatory Care Sensitive Conditions
3) Hospital Readmission Reduction Models Within HHA First Setting Episodes
Model 3: Regional Readmission Reduction Model
Model 4A: National Readmission Reduction Model (25%)
Model 4B: National Readmission Reduction Model (50%)
Model 4C: National Readmission Reduction Model (75%)

1. **RESTRUCTURING THROUGH CLINICALLY APPROPRIATE AND COST-EFFECTIVE PLACEMENT MODELS (MODELS 1A-1C):** Literature suggests that the transition to the first setting after hospital discharge can impact the long term health care expenditures and patient outcomes.[52] This first simulation model type (of which there are three model variants) investigates the extent to which patients can be clinically appropriately placed into lower intensity care settings following discharge from the index acute care hospitalization. Models 1A-1C are all based on the premise that financial incentives and payment policies (such as those introduced by bundled payments or ACOs) could encourage the placement of patients into the most clinically appropriate and cost-effective setting. Model 1A serves as the base model that operates within the current structure and processes of care delivery from which Models 1B and 1C are extended.

   Driven by clinical factors, such as MS-DRGs and patient chronic conditions, Model 1A uses the functional status of the patient (based on the assessment data for each patient who received care in a HHA, SNF, or IRF[53]) to determine if he/she would be able to receive care safely in a lower intensity setting. Multinomial logistic regressions were used to determine the propensity for a

[52] Peikes D, Chen A, Schore J, Brown R. (2009). Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries. *Journal of the American Medical Association* 301(6): 603-618.

[53] LTCHs and OP Therapy do not have an assessment tool to determine functional status.

patient to receive care from any given setting. A simulation then randomly chooses a beneficiary's first setting based on the probabilities obtained from the regressions. Medicare savings are then estimated by replacing the patients' actual Medicare post-acute care episode payments (excluding the index acute care hospitalization payments and any payments during the hospitalization) with that of a similar patient in the "new" (simulated) care setting.

Models 1B and 1C extend changes to the care delivery and payment system simulated in Model 1A to achieve additional Medicare savings following discharge from the index acute care hospital. Based on the distribution of payments by care setting resulting from Model 1A, these models calculate the additional percent change reduction to aggregate post-discharge spending in 2008 needed to achieve desired savings targets (i.e., $70 billion and $100 billion) over 10 years. These models assume that an explicit policy to reduce post-acute care payments will encourage providers to adjust the structure and processes through which care is provided.

2. **HOSPITAL REDUCTION MODELS FOR AMBULATORY CARE SENSITIVE CONDITIONS (MODEL 2):** This model simulates how care could be provided under a reformed delivery system. Our model goes beyond simulating care within the post-acute care episode and focuses on providing home health and other ambulatory care services prior to the index acute care hospitalization with the aim of avoiding hospitalizations for ambulatory care sensitive conditions and, ultimately, eliminating the post-acute care episode. The Agency on Healthcare Research and Quality (AHRQ) has developed prevention quality indicators for ambulatory care sensitive conditions.[54,55] This suggests that with the proper care, fewer patients with these conditions should be admitted to the acute care hospital (an example of an ambulatory care sensitive condition is uncomplicated diabetes). As a result, this is the only model that includes the 60-day pre-acute care episodes, and focuses on patient episodes within a focused subset of index acute care hospital MS-DRG (a subset beyond those excluded by our MS-DRG filters – See Exhibit 2.5). This model assumes that the current Medicare homebound eligibility requirement for receiving home health care has been removed and that the numerous chronic care models explored in the literature review flourish, and are eventually scalable.

3. **HOSPITAL READMISSION REDUCTION MODELS WITHIN HHA FIRST SETTING EPISODES (MODELS 3 AND 4A-4C):** We model the impact of reducing a portion of all rehospitalizations within HHA first setting 60-day post acute care episodes.

[54] Agency for Healthcare Research and Quality. Prevention Quality Indicators Overview. http://www.qualityindicators.ahrq.gov/Modules/pqi_overview.aspx.

[55] List of ambulatory care sensitive conditions available at: http://archive.ahrq.gov/data/safetynet/billappb.htm

This last type of model estimates Medicare savings if acute care readmissions are reduced through an increase in the use of home health care and other care settings as a means of better managing patient care. This model type includes two variants, both of which are only applied to HHA first setting episodes. Model 3 attempts to account for regional variation and is conducted at the HRR level. For HRRs with high readmission rates (by MS-DRG) relative to the national median, readmission rates are reduced to a specific level. Savings are offset by additional use of home health care and other ambulatory care service to maintain patient stability. Model 4 reduces readmissions among HHA first setting episodes at the national MS-DRG level. We conduct a sensitivity analysis that assumes that 25 percent (Model 4A), 50 percent (Model 4B), or 75 percent (Model 4C) of acute care rehospitalizations are eliminated from HHA first setting episodes through an increase in the provision of home health care and other ambulatory care services.

Projected Impact of Savings

Based on the one year (2008) potential savings for each of the simulation models, Medicare fee-for-service savings were projected over a five- (2014-2018) and 10-year period (2014-2023). Savings were projected according to a current law baseline, based on several assumptions.

CURRENT LAW BASELINE: The projection model starts with a current (2012) total Medicare fee-for-service spending baseline, as developed by CBO[56] for each care setting. These annual projections were published after passage of the ACA, and therefore included forecasted changes in Medicare spending and utilization, and calendar year 2012 Final Rules.

PROJECTION OF MEDICARE EPISODE PAYMENTS: Historical growth rates in Medicare spending, as reported by MedPAC in its bi-annual *Report to Congress*, are applied to the 2008 episode payments in order to estimate episode spending between 2008 and 2011. Starting in 2012, the projected annual growth in Medicare spending for each care setting is then applied to the inflated 60-day Medicare episode spending. Our projection model is based on Medicare episode spending, and not total Medicare fee-for-service spending.

MODELED SAVINGS: We assume that Medicare will not realize full savings immediately upon implementation, as these models require a change in financial incentives and care delivery structure for providers. Therefore, we model a four year phase-in of savings at 25 percent each year. The impact on Medicare spending is calculated for each care setting separately, and aggregated for the overall Medicare impact. That is, if an analytic model produces savings attributed to hospital admissions, but is offset by an additional cost of

[56] Congressional Budget Office. March 2011 Medicare Baseline. Retrieved from: http://www.cbo.gov/budget/factsheets/2011b/medicare.pdf

home health services, we project the savings for each setting separately over the study period and aggregate the results for the whole year. Savings are calculated both annually and over five- and 10-year periods.

Consistent with CBO convention, we offset our aggregate savings with a 25 percent Part B premium offset. This offset is included in order to share Medicare savings with beneficiaries in the form of reduced premiums. This offset, however, is only applied to Part B services, which is about 63 percent of home health payments[57], all physician, outpatient, hospice and DME payments, but is not SNF, IRF, LTCH, or hospital savings.

EXTENSION OF MEDICARE TRUST FUND SOLVENCY: Based on the estimated 10-year savings (2014-2023) for the clinically appropriate and cost-effective placement models (Models 1A-1C), we estimate how long the Medicare trust fund could remain solvent under intermediate cost assumptions. According to the Board of Trustees, the Medicare Hospital Insurance (HI) (Part A) trust fund will become insolvent in 2024.[58] Modeled Medicare Part A savings for each year are identified and returned to the projected Medicare trust fund balance. We include an additional interest payment of four percent for these modeled savings. These results are presented to offer the reader a point of reference for how Medicare savings could result in increased years of solvency of the trust fund.

Data Limitations

The key limitation of using administrative data to model changes in the care delivery system is the lack of consistent clinical information from the medical records across all provider settings. While we have relied on recoding of assessment data to consistently define patient functional status across post-acute care settings, additional clinical data would help explain why some patients with seemingly similar clinical profiles are admitted to different care settings. While the CARE Tool (Continuity Assessment Record & Evaluation)[59] is in development, it will likely not be implemented or able to provide usable information until 2015 or later. Thus, we have attempted to crosswalk comparable items from the assessment datasets to each other to better understand the functional status of patients even given different methods of measurement. Although the combination of administrative claims and assessment data may be incomplete, these datasets do provide useful information.

[57] The Board of Trustees. (2010). 2010 Annual Report of the Board of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds (Table IV.B6). Retrieved from: https://www.cms.gov/ReportsTrustFunds/downloads/tr2010.pdf

[58] The Board of Trustees. (2012). 2012 Annual Report of the Board of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds. Retrieved from: https://www.cms.gov/ReportsTrustFunds/downloads/tr2012.pdf

[59] The Continuity Assessment Record and Evaluation (CARE) tool was developed by RTI International, and is a standardized patient assessment tool developed for use at acute hospital discharge and at post-acute care admission and discharge. The Tool was developed as part of the Post Acute Care Payment Reform Demonstration (PAC-PRD).

Another limitation of the claims data is that they do not contain either Medicare Advantage utilization and payments or Medicaid long-term care related payments for dually eligible beneficiaries. In our 10-year savings model, we estimate the impact on Medicare expenditures if our simulations included Medicare Advantage patients. However, the relationship of Medicare to Medicaid payment systems is problematic for analyses that involve episodes of care as Medicare payments currently tend to cross-subsidize Medicaid underpayment in post-acute care settings. Additionally, with 50 different Medicaid program policies reflected in the data for dual eligibles, there is some variability for which we cannot explicitly account.

The last limitation involves diagnosis coding in relation to patient categorization for the purpose of adjusting for differences in patient severity. MS-DRGs are used as a severity adjustment tool for IPPS payments, which is why the CACEP study uses MS-DRGs as the basis for clinically categorizing the post-acute care episodes. However, MS-DRGs are not able to adjust for patient severity across the various settings after discharge from the index acute care hospitalization, and are thus, when taken alone, not an adequate basis for determining episode payment.

Descriptive Statistics

As part of this project, Dobson | DaVanzo has produced a series of working papers to present descriptive statistics on each of the episode types described above. The descriptive statistics contained in each working paper shed light on patterns in the care Medicare beneficiaries currently receive, the Medicare payments associated with different types of care, and the characteristics of both patients and providers that influence the type and cost of care provided.

Working Paper #1 focused on the frequency and distribution of episodes, Working Paper #2 examined Medicare payment for the episodes, Working Paper #3 investigated the range of different patient pathways, and Working Paper #4 explored the prevalence and impact of hospital admissions and readmissions on Medicare payments and patient pathways by episode type. Each working paper contains the distribution of episodes and Medicare episode payments by first setting, by MS-DRG, by chronic condition, and by other beneficiary demographic and clinical characteristics, both at the national level and across the 10 CMS administrative regions.[60] These descriptive analyses provide insight into the composition of post-acute care, pre-acute care, and non-post-acute community-based care episodes at many different levels of aggregation. The insights we gained from these descriptive statistics are the basis of this chapter and informed our simulation models.

The key findings we present below focus on 60-day fixed-length post-acute care episodes (Episode Type 1). We also include findings from analyses of 60-day fixed-length pre-acute care episodes (Episode Type 2) and nine-month fixed-length non-post-acute care community-based episodes (Episode Type 3) in Appendix C. We highlight episode variance in Medicare payments and other aspects within MS-DRGs by using MS-DRG 470 (major joint replacement or reattachment of lower extremity w/o MCC, e.g. hip replacement) as an example. MS-DRG 470 is the most common episode type in the post-acute episodes, and

[60] For a map of the 10 CMS regions and a list of states within each region, please see Appendix C.

represents the highest total Medicare payments. (See Appendix C for an additional example based on MS-DRG 291 [heart failure and shock w/ MCC]).

Overview of Descriptive Statistics

Below we present the wide variation in episode frequencies, Medicare payments, patient pathways, and readmission rates through the lens of MS-DRGs, chronic conditions, first setting, beneficiary demographic and clinical characteristics, and regional variation. Through these descriptive analyses, we attempt to understand the factors that influence Medicare episode payments and to determine where clinical similarities among beneficiaries within and across MS-DRGs may exist.

In this section, we present descriptive statistics for post-acute care episodes in the following order:

- Benchmarking
- Payments by first setting and MS-DRG
    - Concentration of MS-DRG episode payments
    - Case study: Average payment across settings for MS-DRG 470
    - Overlap in episode frequency across MS-DRGs and primary chronic conditions
- Beneficiary demographic and clinical characteristics
- Patient pathways
- Readmissions within episodes
- Regional variation

We begin this chapter with the "Benchmarking" discussion by comparing the frequency of post-acute care episodes by first setting produced using our episode definition to analyses conducted by researchers at RTI International. These comparisons to known benchmarks validate the overall distribution of episodes that we observe in the data.

After benchmarking our episodes, we present a series of descriptive statistics on post-acute care episodes. In the "Payments by first setting and MS-DRG" sub-section, we show the frequency of episodes and Medicare payments at the first setting level in more detail, as well as how average Medicare episode payments differ across first settings.

After focusing on the first setting, we look at episode frequencies and Medicare payments at the MS-DRG level. We show that Medicare payments are highly concentrated within a relatively small number of MS-DRGs, and that the highest ranked MS-DRGs (by total Medicare expenditures) have similar rankings across HHA and SNF. Independent of MS-DRGs, we also see that primary chronic conditions alone do not explain differences in

Medicare payments across first settings, but that the *number* of chronic conditions explains some portion of episode expenditures.

In the "Beneficiary demographic and clinical characteristics" sub-section, we see that beneficiary demographic and clinical characteristics also have a significant impact on both Medicare payments and the first setting in which an episode begins. These impacts vary by first setting and by MS-DRG.

In the "Patient pathways" sub-section, following beneficiary characteristics, we show how the average number of "sequence stops" in a patient pathway, as well as the mix of facility- and ambulatory-based sequences stops within an episode, vary by first setting. We also show how patient pathways vary by number of chronic conditions and by MS-DRG.

From patient pathways, we look closer at the influence of readmissions on Medicare payments and sequence stops in the "Readmissions within episodes" sub-section. The presence of a readmission within the episode has significant implications for both payments and sequence stops, and this impact is relatively consistent across first settings and across MS-DRGs.

Finally, in the "Regional variation" sub-section, we show how days of care per 1,000 fee-for-service beneficiaries during the index hospitalization and readmissions vary widely by CMS region.

We conclude this chapter with a summary of the key findings from our descriptive analyses, and how the implications of these findings ultimately influenced the simulation models we constructed.

Benchmarking

Dobson | DaVanzo's analysis of acute and post-acute care episodes has been calibrated to known, published research and statistical benchmarks. The episode database created by Dobson | DaVanzo using claims data from 2007 to 2009 approximates the patient episodes created by RTI International using data from 2006.[61] As shown in Exhibit 3.1, the two analyses have a similar distribution of episodes by the first post-acute care setting following the discharge from the index acute care hospitalization. (Note: this is the only exhibit that presents findings from a 30-day episode, for the purpose of comparison).

Exhibit 3.1: Comparison of Distribution of 30-Day Fixed-Length Post-Acute Care Episodes Defined by First Setting between RTI (2006) and Dobson | DaVanzo (2007-2009)

	RTI Episode Post-Acute Care Distribution[a]		Dobson | DaVanzo Episode Post-Acute Care Distribution	
First Setting	Number of Episodes	Percent of Episodes	Number of Episodes	Percent of Episodes
HHA	40,865	41.2%	3,227,220	38.4%
SNF	44,929	45.3%	4,269,420	50.9%
IRF	11,240	11.3%	731,840	8.7%
LTCH	2,235	2.3%	165,320	2.0%
Total	**99,269**	**100%**	**8,393,800**	**100%**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009.
[a] Gage B, et al (2009). Examining post acute care relationships in an integrated hospital system: Final report. Prepared for the Assistant Secretary of Planning and Evaluation, U.S. Department of Health and Human Services. (Waltham, MA: RTI International).
Note: Dobson | DaVanzo episodes have been extrapolated to the universe of Medicare beneficiaries.

The discrepancies between the RTI International and Dobson | DaVanzo analyses presented above are due to the difference in episode definition, length of the "clean period" needed before the index acute care hospitalization, the year of data, and size of the sample.[62] It is important to note that many of the tables presented in this chapter reflect multiple years of data, so the frequency and payment totals do not strictly match estimates based on a single year of data.

According to the Dobson | DaVanzo episode definition, SNF first setting episodes represent over 50 percent of all episodes beginning in a post-acute setting, and HHA first setting episodes represent nearly 40 percent of all such episodes. Much of the analyses that follow focus on these two settings, which represent the vast majority of first setting episodes and Medicare episode payments. These two settings also have considerable overlap in the patient populations they treat.

[61] Gage B, Morley M, Spain P, Ingber M. (2009). Examining post acute care relationships in an integrated hospital system: Final report. Prepared for the Assistant Secretary of Planning and Evaluation, U.S. Department of Health and Human Services. (Waltham, MA: RTI International).

[62] The RTI International analysis requires a 60-day "clean period" with no facility-based care or home health prior to the index hospitalization, while our analysis only requires a 15-day "clean period" of no facility-based care or home health. We chose to use a 15-day "clean period" rather than a 60-day period to maximize the number of episodes in our analyses, while limiting the amount of hospital readmissions that could be identified as "index" stays.

All remaining analyses of post-acute care episodes are based on a 60-day fixed-length post-acute care episode definition.

Payments by First Setting and MS-DRG

After benchmarking our episode database to RTI International (and later to aggregate results from BPCI episode analyses), we investigated the relationship between the frequency of episodes by first setting and the associated Medicare payments.

While nearly 40 percent (38.7 percent) of discharges from the index hospital to a post-acute care setting are admitted first to home health, these episodes represent less than 30 percent (27.8 percent) of Medicare episode payment (Exhibit 3.2). SNF first setting episodes represent a proportional amount of Medicare episodes and Medicare episode payment (50.7 percent and 52.3 percent, respectively), while IRF and LTCH first setting episodes represent a disproportionately high amount of Medicare payment relative to the proportion of post-acute episodes they represent. Across episodes that begin in a post-acute care setting, average Medicare episode payments range from $20,345 for HHA first setting episodes to $89,869 for LTCH first setting episodes.

Exhibit 3.2: Distribution of Episodes and Medicare Episode Payment by Select First Settings for 60-day Fixed-length Post-Acute Care Episodes (2007-2009)

First Setting	Percent of Episodes	Percent of Total Medicare Episode Payment	Average Medicare Episode Payment
HHA	38.7%	27.8%	$20,345
SNF	50.7%	52.3%	$29,218
IRF	8.7%	13.6%	$44,193
LTCH	2.0%	6.3%	$89,869
Average	**100.0%**	**100.0%**	**$28,294**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region and standardized to 2009 dollars. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings, and excludes beneficiary co-payments, DME, and Part D.

Episode frequency and payment are highly concentrated within relatively few MS-DRGs. Twenty percent of episode index hospitalization MS-DRGs (n = 148) represent approximately 80 percent of Medicare episodes and payment overall. This finding is relatively consistent across episodes by first setting.

The percent of Medicare episode payment represented by the top 20 percent of index hospitalization MS-DRGs ranges from 75.0 percent in ER first setting episodes to 82.7 percent in LTCH episodes (Exhibit 3.3).

Exhibit 3.3: Percent of Episodes and Medicare Episode Payment by First Setting Represented by Top 20 Percent of MS-DRGs (Ranked by Total Medicare Episode Payment) (N=148) for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

First Setting	Episodes in Top 20 Percent of MS-DRGs	Percent of Episodes	Medicare Episode Payment (in millions)	Percent Medicare Episode Payment
HHA	2,354,860	78.3%	$46,850	76.6%
SNF	3,192,020	81.1%	$91,890	79.9%
IRF	551,600	81.6%	$23,524	78.8%
LTCH	120,020	77.7%	$11,483	82.7%
STACH	509,440	77.7%	$14,946	76.7%
Community	9,767,080	76.5%	$139,468	75.5%
ER	542,580	74.3%	$8,959	75.0%
OP Therapy	273,720	79.9%	$4,138	79.3%
Hospice	365,660	76.0%	$6,379	75.1%
Other IP	82,880	83.7%	$1,901	81.4%
No Care[a]	1,024,980	73.5%	$15,850	77.0%
Total	**18,784,840**	**77.5%**	**$365,388**	**77.3%**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

[a] Episodes include deaths during index admission.

After comparing the distribution of Medicare payments by first setting across MS-DRGs and the concentration of Medicare episode payments by MS-DRG within first setting, we investigated how Medicare payments were distributed across select first settings *within* MS-DRGs. For episodes defined by MS-DRG 470 (hip replacement), we found substantial differences in average Medicare episode payment by first setting compared to the overall average. For example, HHA first setting episodes are $5,411 less than the overall average episode payment for these first settings, while LTCH first setting episodes are $34,417 more than the overall average (Exhibit 3.4). We observe similar trends across MS-DRGs (see Appendix C for a comparable table based on MS-DRG 291).

The wide variation in Medicare payment across first setting episodes shows not only the complexity of post-acute care episodes, but also highlights the current payment system's inability to appropriately risk-adjust payments across an entire episode using the clinical information available from administrative claims. Were a payment system based on post-acute care episodes implemented that was "site neutral" or otherwise did not include a facility-specific adjustor, providers could be placed at considerable financial risk if they did not have a typical mix of first setting episodes.

Exhibit 3.4: Medicare Episode Payment for MS-DRG 470 by Select First Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

First Setting	Number of Episodes	Medicare Episode Payment (in millions)	Average Medicare Episode Payment	Difference Between First Setting Average and Overall Average Medicare Payment
HHA	366,140	$6,616	$18,068	$5,411
SNF	430,240	$11,557	$26,861	($3,382)
IRF	128,680	$4,316	$33,538	($10,059)
LTCH	1,080	$63	$57,896	($34,417)
STACH	2,580	$78	$30,302	($6,823)
Community	134,240	$2,328	$17,340	$6,140
Overall Average	**1,062,960**	**$24,958**	**$23,479**	**$0**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D. Medicare expenditures for ER, OP Therapy, Hospice, Other IP, and No Care episodes were excluded from the calculation of Overall Average Medicare Episode Payment.

Overall, the index hospitalization and related services provided during the index hospital stay (including physician services and outpatient and ER services) represent one-half of average Medicare episode payment. Exhibit 3.5 shows the proportion of average Medicare episode payment allocated to the index hospitalization and post-acute care services for MS-DRGs 470 and 291. Across first settings, the index hospitalization for MS-DRG 470 episodes represents $13,373 out of an average Medicare episode payment of $22,986 (58.2 percent). For MS-DRG 291, the index hospitalization represents $9,291 out of an average Medicare episode payment of $21,572 (43.0 percent). The index hospitalization represents a greater percent of episode payment for HHA and ambulatory-based first setting episodes, and represents a smaller percent for LTCH and Other IP first setting episodes.

Exhibit 3.5: Average Medicare Episode Payment for Index Hospitalization and Post-Acute Care Services by First Setting for MS-DRG 470 and MS-DRG 291 for 60-Day Fixed-Length Post-Acute Episodes (2007-2009)

	MS-DRG 470			MS-DRG 291		
First Setting	Average Medicare Episode Payment	Average Paid for Index Services[a]	Average Paid for Post Acute Care	Average Medicare Episode Payment	Average Paid for Index Services[a]	Average Paid for Post-Acute Care
HHA	$18,068	$13,101	$4,967	$20,211	$9,108	$11,104
SNF	$26,861	$13,618	$13,243	$28,551	$9,767	$18,784
IRF	$33,538	$13,863	$19,675	$45,426	$11,006	$34,420
LTCH	$57,896	$16,392	$41,504	$62,123	$12,144	$49,979
STACH	$30,302	$13,228	$17,074	$35,030	$9,185	$25,844
Community	$17,340	$13,177	$4,163	$19,127	$8,922	$10,205
ER	$17,766	$13,171	$4,595	$22,124	$9,387	$12,736
OP Therapy	$15,103	$12,825	$2,277	$20,004	$8,858	$11,147
Hospice	$25,569	$13,727	$11,842	$15,412	$9,646	$5,766
Other IP	$30,574	$11,975	$18,599	$41,459	$8,718	$32,741
No Care[b]	$11,290	$11,290	$0	$12,024	$12,024	$0
Overall Average	**$22,986**	**$13,373**	**$9,613**	**$21,572**	**$9,291**	**$12,280**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. Average Medicare Episode Paid includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

[a] Average Paid for Index Services include the index acute care hospitalization payment and payments for outpatient, physician, and ER services during the index.

[b] Episodes include deaths during index admission.

We next present the top 20 MS-DRGs ranked by total Medicare episode payment, and their ranking within each first setting. We found significant overlap for several MS-DRGs, but also observed wide variation across the top 20 MS-DRGs more generally (Exhibit 3.6). For example, MS-DRG 470 (hip replacement) is the top ranked MS-DRG for HHA, SNF, and IRF, while MS-DRG 003 (tracheostomy) is top-ranked for LTCHs but ranked lower for HHA, SNF, and IRF. This finding suggests that there is some clinical comparability in Medicare beneficiaries across first settings, but this comparability is limited to certain types of clinical conditions and other factors. Furthermore, this indicates that most first setting providers have capabilities to treat patients within these MS-DRGs

Exhibit 3.6: Top 20 MS-DRGs (Ranked by Total Medicare Episode Payment) by First Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

MS-DRG	Med/Surg	Percent		Overall	HHA	SNF	IRF	LTCH
		Episodes	Episode Paid					
470: Major joint replacement or reattachment of lower extremity w/o MCC	**Surgical**	**4.7%**	**5.5%**	**1**	**1**	**1**	**1**	**34**
871: Septicemia or severe sepsis w/o MV 96+ hours w MCC	Medical	1.8%	2.1%	2	6	3	20	3
291: Heart failure & shock w MCC	Medical	1.5%	1.6%	3	2	7	29	9
003: ECMO or trach w MV 96+ hrs or PDX exc face, mouth & neck w maj O.R.	Surgical	0.2%	1.5%	4	91	31	10	1
194: Simple pneumonia & pleurisy w CC	Medical	2.1%	1.5%	5	9	5	65	22
481: Hip & femur procedures except major joint w CC	Surgical	0.8%	1.4%	6	73	2	3	53
292: Heart failure & shock w CC	Medical	1.6%	1.3%	7	3	14	63	37
065: Intracranial hemorrhage or cerebral infarction w CC	Medical	1.0%	1.3%	8	29	6	2	30
392: Esophagitis, gastroent & misc digest disorders w/o MCC	Medical	2.5%	1.3%	9	20	35	125	80
690: Kidney & urinary tract infections w/o MCC	Medical	1.9%	1.3%	10	11	4	64	43
247: Perc cardiovasc proc w drug-eluting stent w/o MCC	Surgical	1.4%	1.3%	11	66	195	239	268
641: Nutritional & misc metabolic disorders w/o MCC	Medical	1.7%	1.1%	12	16	9	58	84
329: Major small & large bowel procedures w MCC	Surgical	0.4%	1.1%	13	5	11	17	4
460: Spinal fusion except cervical w/o MCC	Surgical	0.6%	1.0%	14	7	29	7	194
287: Circulatory disorders except AMI, w card cath w/o MCC	Medical	1.3%	1.0%	15	31	98	103	42
293: Heart failure & shock w/o CC/MCC	Medical	1.3%	0.9%	16	10	40	123	233
683: Renal failure w CC	Medical	1.0%	0.9%	17	23	16	74	44
193: Simple pneumonia & pleurisy w MCC	Medical	0.9%	0.9%	18	22	18	60	17
312: Syncope & collapse	Medical	1.6%	0.9%	19	24	24	55	138
280: Acute myocardial infarction, discharged alive w MCC	Medical	0.6%	0.9%	20	13	15	26	18

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Total Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

Although Medicare payment rankings vary across first settings by MS-DRG, payment rankings by primary chronic condition within MS-DRGs are highly consistent across first settings – including LTCHs. Exhibit 3.7 shows episodes for MS-DRG 470 (hip replacement) by primary chronic condition, ranked by total Medicare episode payment for HHA first setting episodes. The episode is assigned the most severe chronic condition, (e.g., an "osteoporosis episode" will often contain numerous less-severe conditions). Our mutually exclusive assignment of conditions allowed us to conduct analyses by chronic condition without duplicating the number of episodes or any Medicare payments.

For MS-DRG 470, rheumatoid arthritis/osteoarthritis episodes are ranked first across nearly all first settings, and the other primary chronic conditions are roughly the same rank order thereafter. The similarity in Medicare episode payment rankings by primary chronic condition further indicates some degree of clinical comparability in patients across first settings.

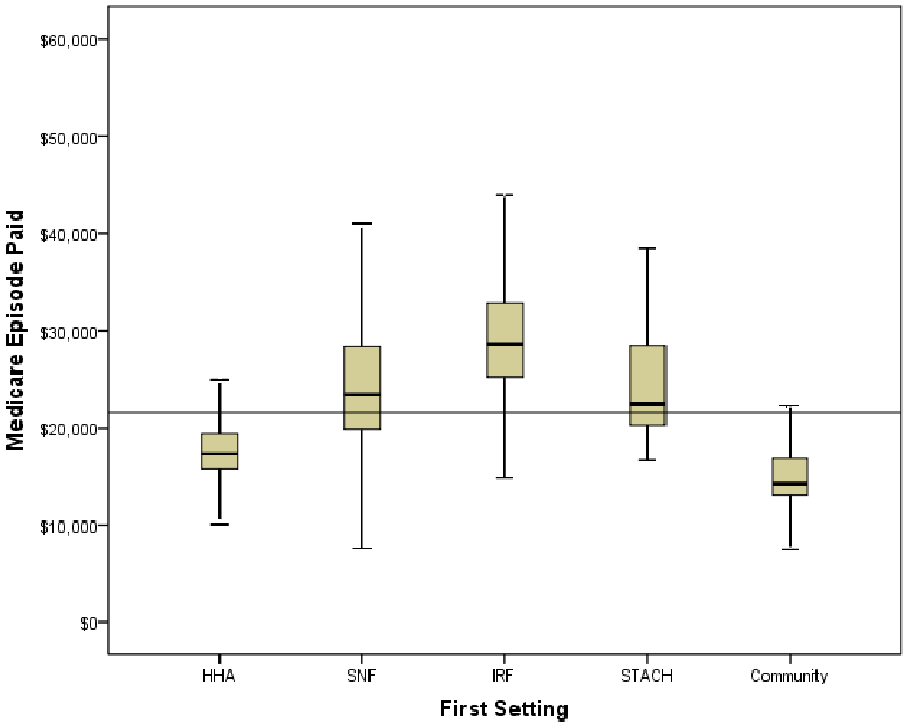
Exhibit 3.7: Top Primary Chronic Conditions[a] (Ranked by Total Medicare Episode Payment) for MS-DRG 470 for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

Primary Chronic Condition	HHA	Overall	SNF	IRF	LTCH	STACH	Community
Rheumatoid Arthritis/Osteoarthritis	1	1	1	2	3	1	1
Osteoporosis	2	2	2	1	1	3	2
Chronic Obstructive Pulmonary Disease	3	5	5	5	7	4	4
CHF*COPD	4	3	3	3	2	2	3
DIABETES*CHF	5	4	4	4	4	5	5
CHF*RENAL	6	6	7	6	5	6	6
None	7	8	9	9	*	10	7
Lung Cancer	8	9	8	8	*	8	9
Hip/Pelvic Fracture	9	7	6	7	6	7	8
Ischemic Heart Disease	10	10	10	10	*	9	10
Depression	11	11	11	12	*	*	12
Cataract	12	12	17	*	*	11	11
Diabetes	13	13	13	13	*	*	15
Chronic Kidney Disease	14	15	16	14	*	*	14
Heart Failure	15	14	12	11	*	*	13

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Total Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.
* Primary chronic condition not present in this setting.
[a] For methodology used to determine primary chronic condition, see Analytic Methods.

As suggested above, primary chronic conditions alone do little to adjust for the differences in average Medicare episode payment across first settings within MS-DRG. To explore the impact of primary chronic conditions on Medicare episode payment within MS-DRGs, we also examined the distribution of Medicare payments using a box plot.[63] Beneficiaries with the primary chronic condition of rheumatoid arthritis/osteoarthritis within MS-DRG 470 show a wide distribution of Medicare episode payments within first setting and across first setting (Exhibit 3.8). We observe similar trends across MS-DRGs (see Appendix C for a comparable table based on MS-DRG 291).

Exhibit 3.8: Medicare Episode Payment with Primary Chronic Condition[a] of Rheumatoid Arthritis/Osteoarthritis by Select First Setting for MS-DRG 470 for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)



Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Total Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

[a] For methodology used to determine primary chronic condition, see Analytic Methods.

Note: A box plot is a measure of dispersion reflecting the assumptions of a normal distribution. The box in the middle represents 50 percent of the observations (the interquartile range), and the dark line in the middle of the box represents the median value. The "whiskers" represent nearly 2 standard deviations of the observations.

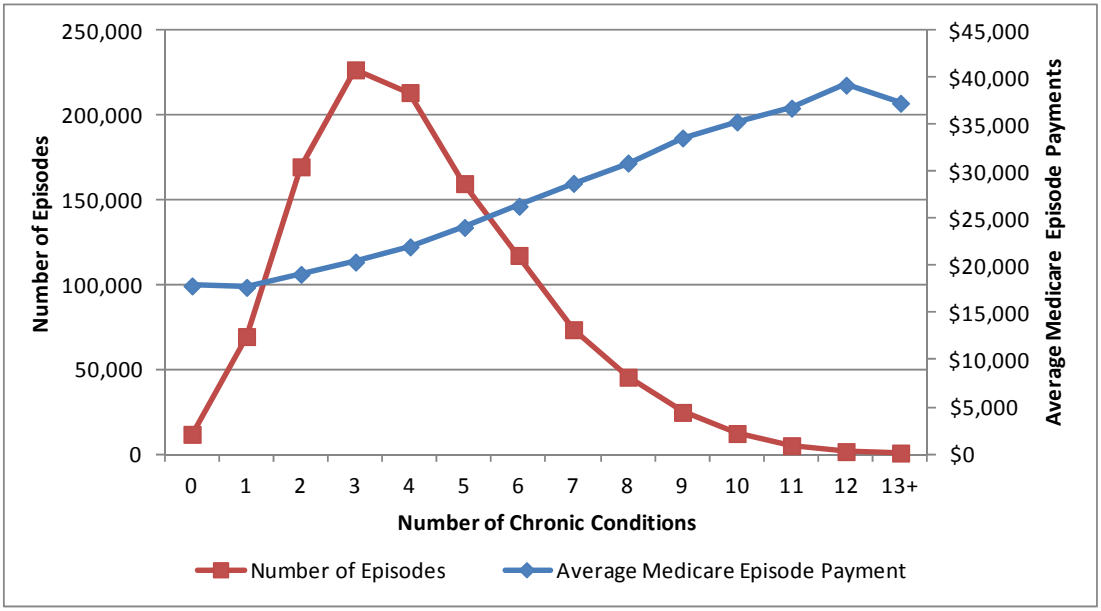
[63] A box plot is a measure of dispersion reflecting the assumptions of a normal distribution. The box in the middle represents 50 percent of the observations (the interquartile range), and the dark line in the middle of the box represents the median value. The "whiskers" represent nearly 2 standard deviations of the observations. Outliers are presented as dots and represent approximately 10 percent of all observations.

Beneficiary Demographic and Clinical Characteristics

Given the similarities in Medicare payment rankings by primary chronic condition across first settings and the wide variation in payments by first setting within MS-DRG, it appears that chronic conditions alone cannot be used to adjust for patient severity across first settings within MS-DRG. However, we found that the total number of chronic conditions a beneficiary has, as opposed to his or her primary chronic condition category, has a significant impact on episode payment. This finding is true across, as well as within, all MS-DRGs and first settings.

For example, MS-DRG 470 (hip replacement) episodes show a linear increase in average Medicare payment for episodes with no (0) chronic conditions to episodes with 12 chronic conditions (Exhibit 3.9). The majority of MS-DRG 470 episodes have between two and six chronic conditions. (See Appendix C for a comparable chart based on MS-DRG 291).

Exhibit 3.9: Number of Episodes and Average Medicare Episode Payment by Number of Chronic Conditions for MS-DRG 470 for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)



Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Total Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D payments.

Patient Pathways

Patient pathways – the sequence of care settings through which a beneficiary transitions over the length of an episode – vary substantially in complexity by first setting. Across all MS-DRGs, the average number of "sequence stops" varies by over 50 percent (excluding No Care episodes), with Community episodes the lowest at 3.04 sequence stops per episode and IRF episodes the highest at 4.88 stops per episode (Exhibit 3.10).

Exhibit 3.10: Average Medicare Episode Payment and Average Number of Sequence Stops by First Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

First Setting	Average Medicare Episode Payment	Average Sequence Stops	Average Facility-based (Including HHA) Sequence Stops	Average Ambulatory-based Sequence Stops
HHA	$20,345	4.37	2.77	1.60
SNF	$29,218	4.12	2.99	1.13
IRF	$44,193	4.88	3.33	1.55
LTCH	$89,869	4.03	3.20	0.83
STACH	$29,713	4.43	2.96	1.47
Community	$14,478	3.03	1.41	1.62
ER	$16,364	4.78	1.65	3.13
OP Therapy	$15,233	4.77	1.36	3.41
Hospice	$17,651	3.04	1.10	1.94
Other IP	$23,572	4.34	1.66	2.68
No Care[a]	$14,761	1.00	1.00	0.00
Overall Average	**$19,505**	**3.44**	**1.92**	**1.52**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

[a] Episodes include deaths during index admission.

The relative mix of ambulatory-based and facility-based sequence stops also varies by first setting – IRF and LTCH episodes have the highest average facility-based stops (3.33 and 3.20 respectively), while OP Therapy and ER episodes have the highest average ambulatory-based stops (3.41 and 3.13 respectively). While HHA first setting episodes have more sequence stops than the overall average, they have more ambulatory sequence stops than the overall average.

Exhibit 3.11 presents the top five most frequent patient pathways overall and the average Medicare episode payments for these pathways. Across first settings, the most frequent pathway, represented by more than one-third of all post-acute care episodes, is "A-C." This pathway indicates that the patient was discharged from the index acute care hospital and returned to the community to receive only physician and outpatient care. This pathway does not involve any formal or facility-based care beyond the index acute care hospitalization. Due to the ambulatory nature of the pathway, the average Medicare episode payment for this pathway is significantly lower than the overall average payment

across all post-acute care episodes ($10,003 compared to $19,505). The second most frequent pathway ("A-H-C") involves home health care following discharge from the index acute care hospital, followed by physician or outpatient visits ("Community").

Overall, the top five most frequent pathways have an average Medicare episode payment of $12,799 compared to the overall average of $19,505. This indicates that, on average, streamlined pathways such as these top five are not the drivers of high average Medicare episode payments. It is likely that the complicated pathways, which include several facility-based settings, drive overall Medicare payment and the variance in Medicare episode payment within a given type of episodes. The pathways represented by the "other" category represent 47.1 percent of episodes and have an average Medicare episode payment of $27,039 (which is more than double the average of the top five patient pathways). It is important to note that readmissions are not very prevalent in the top five patient pathways, and are only represented following a Community first setting episode ("A-C-A-C").

Exhibit 3.11: Distribution of Episodes and Medicare Episode Payment for Top Five Most Frequent Patient Pathways for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

Pathway Pattern	Percent of Episodes	Average Medicare Episode Payment
A-C	34.5%	$10,003
A-H-C	7.1%	$16,048
A	5.8%	$14,761
A-C-A-C	2.8%	$22,395
A-S	2.8%	$25,568
Subtotal	**52.9%**	**$12,799**
Other	47.1%	$27,039
Total	**100.0%**	**$19,505**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

Facility-based Sequence Stops:	
A	STACH (Index or Readmission)
H	HHA
I	IRF
L	LTCH
S	SNF
Ambulatory-based Sequence Stops	
C	Community (Physician and Outpatient Visits)
E	ER
P	OP Therapy
T	Hospice
Z	Other IP

Exhibit 3.12 presents the most frequent patient pathway and average Medicare episode payment by first setting. Among HHA first setting episodes, the most frequent patient pathway, represented by more than one-half of all HHA first setting episodes (56.9 percent), is "A-H-C." This patient pathway, which has an average Medicare episode payment of $16,048, comprises a patient who enters HHA immediately after discharge from the index hospitalization and then receives physician and outpatient services.[64] (As discussed above, this patient pathway is also the second most frequent pathway overall.)

[64] As noted in the Analytic Methodology section, physician visits occurring during a HHA segment are recorded as a sequence stop. Home health segments interrupted by a community visit (e.g., an "H-C-H" pathway) are considered multiple HHA "stops," and one community "stop." This structure gives us a clearer picture of how home health care interacts with community care.

SNF first setting patient pathways are not as concentrated as HHA first setting patient pathways, with the most frequent pathway only comprising 17.1 percent of all SNF first setting episodes. This patient pathway ("A-S") is a patient that is admitted to a SNF following discharge from the index acute care hospitalization, and only receives SNF care for the remainder of the episode.[65] The most common patient pathways for IRF and LTCH first setting episodes are below the average Medicare episode payment for those first settings as well. The other first settings show comparable trends.

Exhibit 3.12: Distribution of Episodes and Medicare Episode Payments for Most Frequent Patient Pathways by First Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

First Setting	Pathway Patterns	Percent of Episodes	Average Medicare Episode Payment (for Pathway)	Overall Average Episode Payment (for First Setting)
HHA	A-H-C	56.9%	$16,048	$20,345
SNF	A-S	17.1%	$25,568	$29,218
IRF	A-I-H-C	28.1%	$37,931	$44,193
LTCH	A-L	18.1%	$96,557	$89,869
STACH	A-A-C	26.9%	$20,921	$29,713
Community	A-C	65.6%	$10,003	$14,478
ER	A-E-C	35.6%	$10,960	$16,364
OP Therapy	A-P-C	13.9%	$9,732	$15,233
Hospice	A-T	48.1%	$15,981	$17,651
Other IP	A-Z-C	29.4%	$16,234	$23,572

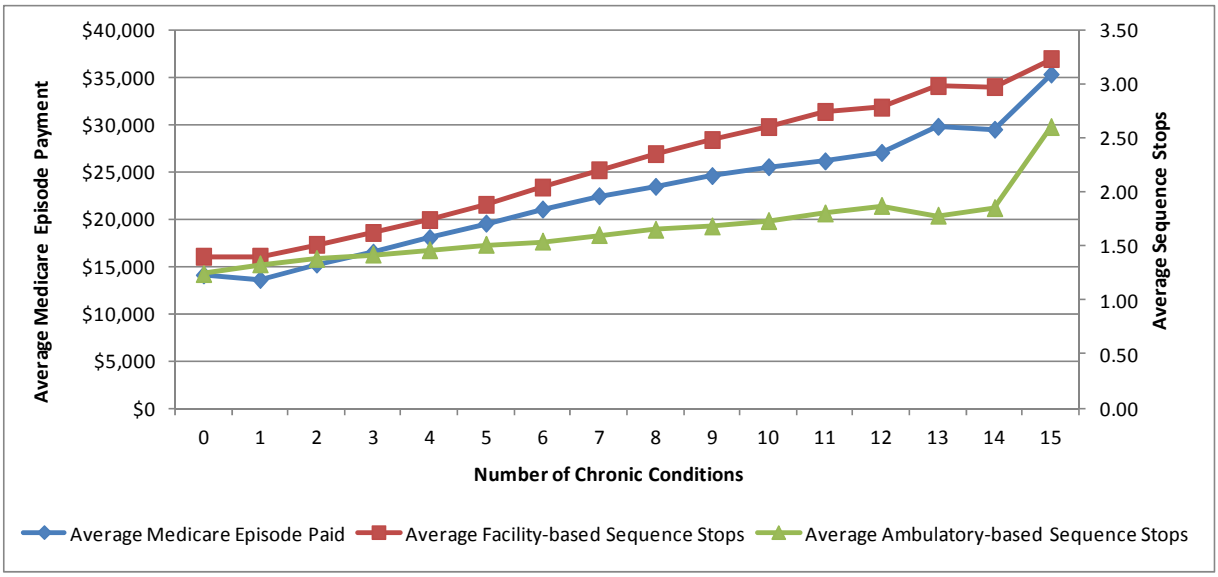
Facility-based Sequence Stops:	
A	STACH (Index or Readmission)
H	HHA
I	IRF
L	LTCH
S	SNF
Ambulatory-based Sequence Stops	
C	Community (Physician and Outpatient Visits)
E	ER
P	OP Therapy
T	Hospice
Z	Other IP

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D payments.

Patient pathways are also influenced by the number of chronic conditions a beneficiary has. Like Medicare episode payments, the average number of overall sequence stops, both ambulatory-based sequence stops, and facility-based sequence stops, increase almost linearly as the number of beneficiary chronic conditions increases from 0 to 15 (Exhibit 3.13). This finding further suggests that the number of chronic conditions a beneficiary has, more than the primary chronic condition of that beneficiary, is an important determinant of episode pathway complexity as well as Medicare episode payments. That is, the data show that the presence of comorbidities matters.

[65] This pathway may represent a patient who died in the SNF, or possibly a long-term care or dual eligible patient receiving services covered under Medicaid.

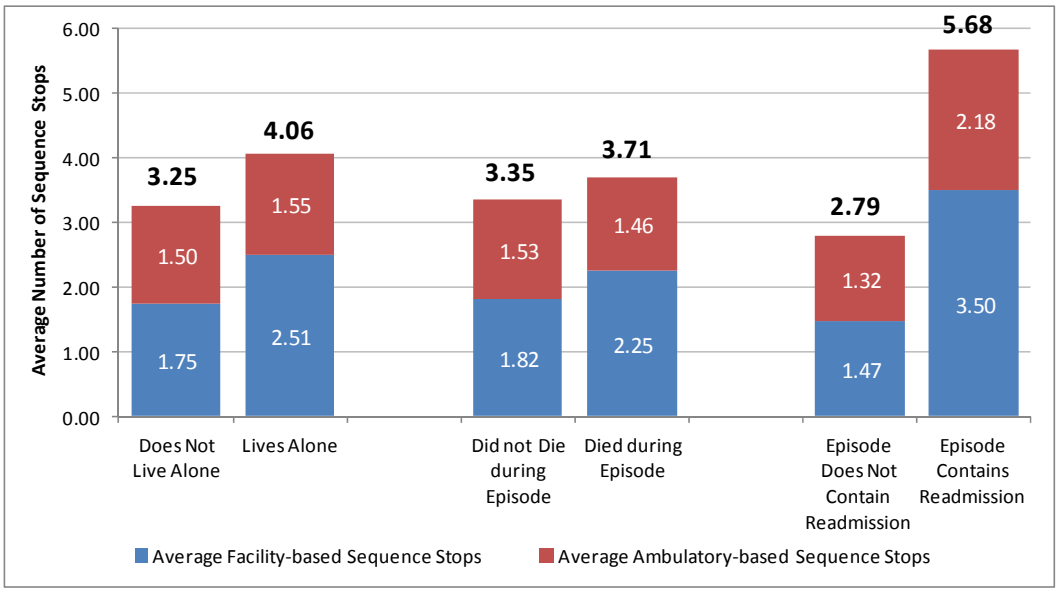
Exhibit 3.13: Average Medicare Episode Payment and Average Facility-based (Including HHA) and Ambulatory-based Sequence Stops by Number of Chronic Conditions for 60-day Fixed-Length Post-Acute Care Episodes (2007-2009)



Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

In addition to the number of chronic conditions, other beneficiary demographic and clinical characteristics have a substantial impact on the average number of sequence stops. Exhibit 3.14 shows the effect of three such characteristics: 1) whether the beneficiary lives alone, 2) whether the beneficiary died during the episode, and 3) whether the beneficiary was rehospitalized during the episode. If a beneficiary lives alone, on average the episode will contain 0.81 more sequence stops (4.06 vs. 3.25), while a beneficiary who dies during an episode will have an average of 0.36 more sequence stops (3.71 vs. 3.35). The presence of a readmission has the greatest impact, nearly doubling the average number of sequence stops during the episode (5.68 with a readmission vs. 2.79).

Exhibit 3.14: Average Facility-based (including HHA) and Ambulatory-based Sequence Stops by Select Beneficiary Demographic and Clinical Characteristics for 60-day Fixed-Length Post-Acute Care Episodes (2007-2009)



Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

Exhibit 3.15 shows the most frequent patient pathways and average Medicare episode payments at the MS-DRG level. For episodes with an index hospitalization MS-DRG 470 (hip replacement), the most frequent patient pathway is "A-H-C", indicating that the beneficiary was discharged from the hospital to a HHA, and subsequently went to the community. This pathway represents 19.6 percent of MS-DRG 470 episodes and has an average Medicare episode payment of $17,172, which is well below the overall MS-DRG 470 average of $22,986.

The second most frequent patient pathway for MS-DRG 470, "A-S-H-C", represents 12.4 percent of these episodes and has an average Medicare payment of $25,073. The addition of a SNF stay to this pathway increases the average Medicare episode paid by nearly $8,000. The top five most frequent patient pathways represent roughly one-half (48.4 percent) of all MS-DRG 470 episodes.

Exhibit 3.15: Distribution of Episodes and Medicare Episode Payments for Top Five Most Frequent Patient Pathways for MS-DRG 470 for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

Pathway Patterns	Percent of Episodes	Average Medicare Payment
A-H-C	19.6%	$17,172
A-S-H-C	12.4%	$25,073
A-C	7.4%	$14,003
A-S-C	5.0%	$22,517
A-I-H-C	4.0%	$31,839
Subtotal	**48.4%**	**$20,483**
Other	51.6%	$25,333
Total	**100.0%**	**$22,986**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

Facility-based Sequence Stops:	
A	STACH (Index or Readmission)
H	HHA
I	IRF
L	LTCH
S	SNF
Ambulatory-based Sequence Stops	
C	Community (Physician and Outpatient Visits)
E	ER
P	OP Therapy
T	Hospice
Z	Other IP

Readmissions within Episodes

Across all MS-DRGs and chronic conditions, the percent of episodes with a readmission is relatively consistent by first setting for the four major post-acute care settings (Exhibit 3.16). This readmission rate ranges from 22.7 percent of episodes in IRF episodes to 29.2 percent of LTCH episodes. Approximately 23 percent of HHA episodes have a readmission. This does not mean, necessarily, that the readmissions directly follow the first setting. A readmission can occur anywhere along the patient pathway.

Episodes that do not contain a hospital readmission have an average Medicare episode payment of $15,335, while episodes that do contain a hospital readmission have average Medicare episode payment of $33,926 (ratio of average Medicare payment for episodes with a readmission to episodes without a readmission of 2.21). Community first setting episodes not containing a readmission have an average Medicare episode payment of $10,768, while the average Medicare episode payment for Community first setting episodes that include a readmission is almost three times higher ($29,377, ratio of 2.73). This suggests that Community first setting episodes that do not contain a readmission are generally able to remain safely in the community without facility-based care; however, it is possible that some patients may be discharged from the hospital too early, should have but did not receive some level of post-acute care, or had a planned readmission. This early discharge (or planned event) may then result in a readmission.

Conversely, LTCH first setting episodes without readmissions have an average Medicare payment of $83,121, while episodes with a readmission have an average payment of $106,247 (or ratio of 1.28). The ratio is primarily influenced by the size of the base Medicare episode payment relative to the increase in payments related to a readmission.

For instance, LTCH first setting episodes are the most expensive on average, and the addition of Medicare payments related to a hospital readmission is not as large relative to the base Medicare episode payment without a readmission (a low ratio), while Community first setting episodes have a low average Medicare episode payment and therefore the addition of a hospital readmission into the episode is large relative to the base (a high ratio).

Exhibit 3.16: Distribution of Episodes and Average Medicare Episode Payment by Readmission Status by First Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

Exhibit 3.16: Distribution of Episodes and Average Medicare Episode Payment by Readmission Status by First Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)			Average Medicare Episode Payment			
First Setting	Percent of Episodes	Percent of Episodes with Readmission	All Episodes	Without Readmission	With Readmission	Ratio[a]
HHA	12.4%	23.3%	$20,345	$16,291	$33,694	2.07
SNF	16.2%	25.8%	$29,218	$24,628	$42,390	1.72
IRF	2.8%	22.7%	$44,193	$39,191	$61,273	1.56
LTCH	0.6%	29.2%	$89,869	$83,121	$106,247	1.28
STACH	2.7%	100.0%	$29,713	N/A	$29,713	N/A
Community	52.7%	19.9%	$14,478	$10,768	$29,377	2.73
ER	3.0%	28.9%	$16,364	$11,558	$28,203	2.44
OP Therapy	1.4%	19.3%	$15,233	$11,890	$29,210	2.46
Hospice	2.0%	4.6%	$17,651	$16,983	$31,380	1.85
Other IP	0.4%	21.7%	$23,572	$20,587	$34,325	1.67
No Care[b]	5.8%	N/A	$14,761	$14,761	N/A	N/A
Overall Average	**100.0%**	**22.4%**	**$19,505**	**$15,335**	**$33,926**	**2.21**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

[a] Average Medicare episode payments for episodes with a readmission divided by Average Medicare episode payments for episodes without a readmission.

[b] No Care episodes include patient deaths.

Descriptive Statistics

On average, 22.4 percent of post-acute care episodes contain a readmission. Of these episodes with a readmission, 77.5 percent contain only one readmission, with the remainder containing two or more readmissions (Exhibit 3.17). As the number of readmissions per episode increases, the average Medicare episode payment increases proportionately as well, from $15,336 for episodes without any readmissions, to $52,868 for episodes containing three or more readmissions. The number of readmissions within an episode, and whether these readmissions were preventable, has significant implications for how care delivery is organized and how episode payments are designed.

Exhibit 3.17: Frequency of Readmissions for 60-day Fixed-Length Post-Acute Care Episodes (2007-2009)

Number of Readmissions	Number of Episodes	Percent of Episodes	Cumulative Percent of Total Readmissions	Percent of Episodes with Readmission	Average Medicare Episode Payment	Percent of Total Medicare Episode Payment
0	18,802,460	77.6%	0.0%	0.0%	$15,336	61.0%
1	4,211,700	17.4%	17.4%	77.5%	$30,762	27.4%
2	976,620	4.0%	21.4%	18.0%	$42,752	8.8%
3+	248,300	1.0%	22.4%	4.6%	$52,868	2.8%
Total	**24,239,080**	**100.0%**	**22.4%**	**100.0%**	**$19,505**	**100.0%**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

Exhibit 3.18 shows the percent of episodes and average Medicare episode payment by primary chronic condition for episodes that contain a readmission compared to episodes that do not. The top seven primary chronic conditions represent 79.7 percent of total post-acute care episodes.

Exhibit 3.18: Percent of Episodes and Medicare Episode Payment by Primary Chronic Condition[a] by Readmission Status for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

			Average Medicare Episode Payment			
Primary Chronic Condition	Percent of Episodes	Percent of Episodes with Readmission	All Episodes	Without Readmission	With Readmission	Ratio[b]
CHF*COPD	25.0%	33.3%	$22,754	$16,534	$35,206	2.13
DIABETES*CHF	13.4%	27.0%	$22,842	$17,357	$37,684	2.17
CHF*RENAL	5.6%	27.9%	$22,863	$17,720	$36,156	2.04
Lung Cancer	2.0%	27.7%	$21,903	$17,407	$33,650	1.93
Osteoporosis	15.0%	15.4%	$17,226	$14,808	$30,463	2.06
COPD	7.7%	19.4%	$16,879	$13,770	$29,796	2.16
Rheumatoid Arthritis/Osteoarthritis	11.0%	13.5%	$17,118	$15,023	$30,568	2.03
Hip/Pelvic Fracture	0.6%	16.9%	$25,379	$22,726	$38,397	1.69
Heart Failure	2.6%	17.2%	$17,923	$15,127	$31,401	2.08
Alzheimer's Disease	1.3%	15.3%	$16,182	$13,743	$29,648	2.16
Alzheimer's Disease and Related	1.4%	18.3%	$17,948	$14,618	$32,825	2.25
Stroke/Transient Ischemic Attack	1.7%	16.1%	$17,862	$14,603	$34,860	2.39
Colorectal Cancer	0.5%	22.8%	$22,057	$18,173	$35,228	1.94
Depression	3.1%	17.8%	$14,422	$11,582	$27,500	2.37
Acute Myocardial Infarction	0.4%	13.0%	$19,331	$17,277	$33,080	1.91
Ischemic Heart Disease	3.4%	12.1%	$14,827	$12,697	$30,299	2.39
Other	3.2%	12.0%	$13,986	$11,688	$30,880	2.64
None	2.0%	12.9%	$14,037	$11,514	$31,102	2.7
Overall Average	**100.0%**	**22.4%**	**$19,505**	**$15,335**	**$33,926**	**2.21**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

[a] For methodology used to determine primary chronic condition, see Analytic Methods.

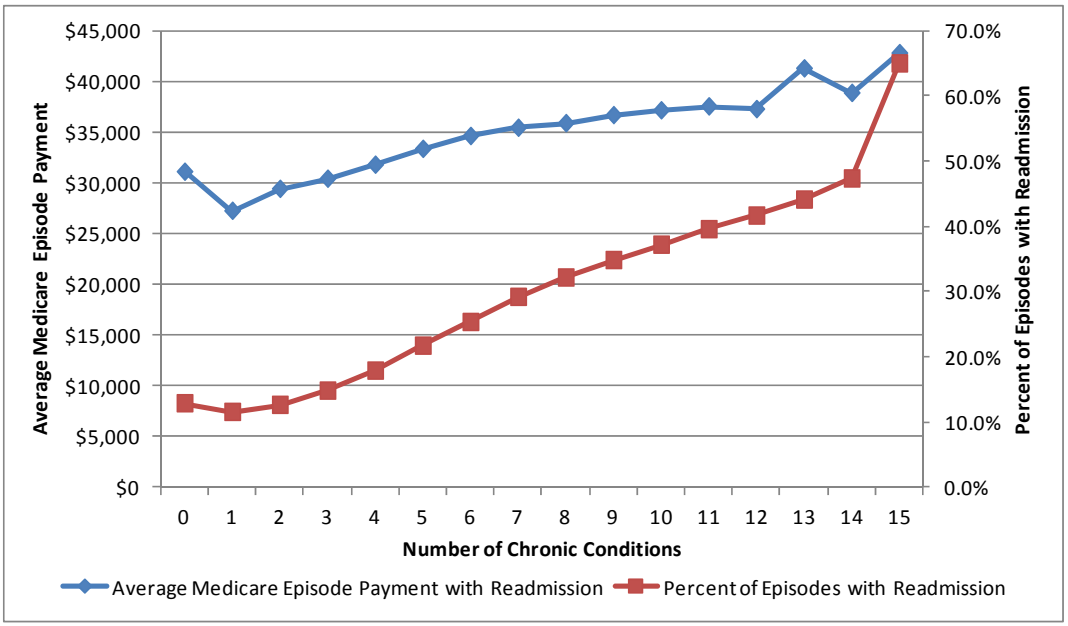
[b] Average Medicare episode payments for episodes with a readmission divided by Average Medicare episode payments for episodes without a readmission.

As the severity of primary chronic conditions decreases hierarchically, the percent of episodes within the primary chronic condition category decreases as well. One-third of CHF*COPD episodes, and approximately 28 percent of episodes each with DIABETES*CHF, CHF*RENAL, and lung cancer contain a readmission, all of which are above the overall average readmission rate. While episodes with CHF*RENAL or lung cancer represent a smaller portion of episodes, hospital readmission reduction programs focusing on CHF*COPD and DIABETES*CHF could prevent a large proportion of preventable rehospitalizations. However, 12.1 percent of episodes with a primary chronic condition of ischemic heart disease contain a readmission. We note that the readmission may not be related to the patient's primary chronic condition and in some cases may comprise a planned surgery.

The average Medicare episode payment for high-severity primary chronic condition episodes often doubles when the episode contains a readmission, while the increase in payment is nearly three times higher for lower-severity primary chronic condition episodes. This finding indicates that lower-severity episodes generally rely more on community-based care services than episodes that include a readmission, while higher-severity episodes often contain more facility-based care. Therefore, avoiding readmissions, particularly for beneficiaries with high-severity primary chronic conditions through use of additional ambulatory-based care and care coordination, could result in significant Medicare savings.

Exhibit 3.19 shows the percent of episodes that contain a readmission and the average Medicare episode payment for episodes containing a readmission by the number of chronic conditions per episode. The percent of episodes containing a readmission increases with the number of chronic conditions per episode, which suggests that readmissions are partially attributable to the complexity of patients with multiple chronic conditions. Approximately 12.9 percent of episodes with no chronic conditions contain a readmission while 65.0 percent of episodes with 15 chronic conditions contain a hospitalization (data not shown). It is interesting to note that the growth in the proportion of episodes with a readmission increases faster than the growth in the average Medicare episode payment for these episodes.

Exhibit 3.19: Percent of Episodes and Average Medicare Episode Payment for Episodes with Readmissions by Number of Chronic Conditions for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)



Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

Exhibit 3.20 presents the distribution of episodes with a readmission by antecedent setting (source), as well as the percent of all episodes with care in a given setting that have a hospital readmission directly from that setting. For example, 62.0 percent of episodes with a readmission had an antecedent setting of Community, while 13.7 percent of episodes with a readmission had an antecedent setting of home health.

However, of all episodes that received home health care anytime during the episode, 12.5 percent of these episodes had an HHA antecedent setting. Community episodes have the highest rate of antecedent readmissions (16.9 percent of all episodes that receive care from the Community), followed by SNF (14.2 percent). About 9.0 percent and 8.3 percent of episodes receiving care from an LTCH and IRF, respectively, are readmitted from these settings.

Exhibit 3.20: Distribution of Readmissions (excluding No Care Setting) by Antecedent Setting (Source) and Percent of Readmissions from Antecedent Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

Antecedent Setting	Percent of Total Readmissions by Setting	Percent of Episodes Directly Readmitted by Setting
HHA	13.7%	12.5%
SNF	12.8%	14.2%
IRF	1.4%	8.3%
LTCH	0.4%	9.0%
Community	62.0%	16.9%
ER	7.5%	10.8%
OP Therapy	1.4%	4.8%
Hospice	0.5%	2.5%
Other IP	0.3%	6.9%
Overall Average	**100.0%**	**N/A**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

Exhibit 3.21 shows the proportion of episodes that contain a readmission and the average Medicare episode payment by readmission status for select patient demographic characteristics. More than one-third (33.9 percent) of episodes for patients who die contain a readmission, which indicates that several of these patients may have died during the readmission or shortly thereafter. Approximately 21.6 percent and 21.7 percent of episodes for females and those residing in rural areas contain a readmission, respectively. The highest ratio of Medicare payment for episodes with a readmission to episodes without a readmission is for non-white beneficiaries (2.31), while the lowest is for beneficiaries that live alone (1.94).

Exhibit 3.21: Percent of Episodes with a Readmission and Average Medicare Episode Payment by Beneficiary Demographic and Clinical Characteristics for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

Demographic Characteristic	Percent of Episodes with Readmission	Average Medicare Episode Payment		Ratio[a]
		Without Readmission	With Readmission	
Live Alone	27.5%	$18,159	$35,263	1.94
Died during Episode	33.9%	$18,647	$37,670	2.02
Dual Eligible	26.5%	$15,173	$33,441	2.20
Female	21.6%	$15,032	$32,830	2.18
Rural	21.7%	$14,562	$31,897	2.19
85 and Older	22.5%	$15,352	$31,544	2.05
Non-white	26.3%	$15,835	$36,537	2.31
Overall Average	**22.4%**	**$15,335**	**$33,926**	**2.21**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D.

[a] Average Medicare Episode Payment for episodes that contain a readmission divided by Average Medicare episodes payments for episodes that do not contain a readmission.

Regional Variation

Exhibit 3.22 presents the total number of days of care per 1,000 fee-for-service beneficiaries for the index acute care hospitalization and readmissions by region. These data indicate that regions with relatively high index acute care hospital days of care per 1,000 fee-for-service beneficiaries have a disproportionately high number of readmission days of care per 1,000 fee-for-service beneficiaries.

Exhibit 3.22: Days of Care per 1,000 Fee-for-Service Beneficiaries for the Index Acute Care Hospital Stay and Readmissions by CMS Region for 60-Day Fixed-Length Post-Acute Care Episodes (2008)

CMS Region	Index Hospital Stay Days of Care per 1,000 Fee-for-Service Beneficiaries	Episode Readmission Days of Care per 1,000 Fee-for-Service Beneficiaries
Region I-Boston	150.5	53.4
Region II-New York	214.3	84.2
Region III-Philadelphia	181.9	68.9
Region IV-Atlanta	166.8	59.1
Region V-Chicago	166.7	62.2
Region VI-Dallas	146.8	50.7
Region VII-Kansas City	163.3	59.4
Region VIII-Denver	130.0	41.2
Region IX-San Francisco	148.2	51.1
Region X-Seattle	119.6	35.8
Overall Average	**164.2**	**59.3**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region, and standardized to 2008 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Average Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments, DME, and Part D. Center for Medicare and Medicaid Services, Health Care Financing Review, Statistical Supplement, 2008.

That is, Region II (New York) has the highest number of index acute care hospital days of care per 1,000 beneficiaries (214.3) and Region X (Seattle) has the lowest (119.6). Therefore, Region II's index acute care hospital days of care per 1,000 fee-for-service beneficiaries are 179 percent that of Region X. In addition, in terms of readmission days of care per 1,000 fee-for-service beneficiaries, Region II has 235 percent as many days of care as Region X (84.2 compared to 35.8). This suggests that regions with high index acute care hospital days of care are more likely to experience acute care hospital readmissions. A crosswalk of states to CMS regions can be found in Appendix C.

Implications of Descriptive Statistics

The composition of 60-day post-acute care patient episodes – in terms of which beneficiaries have episodes, what conditions they have treated during the index hospitalization, where they go during the episode, and how much Medicare spends to treat them – is extremely complex.

The relationship between the index hospitalization and the post-acute care that follows is not well understood. The mix of care provided during the "pre-acute" period before the index hospitalization, or the relationship between a community-based home health admission and the

acute and post-acute care that occurs afterwards, is even less well understood. Given the relative proportion of Medicare spending represented by 60-day post-acute care episodes, the relationship between pre-acute and post-acute care surrounding a hospitalization has profound implications for how health care delivery and payment reform should be considered.

We have used several different perspectives to deconstruct the components of the patient episode and understand what factors influence Medicare payment, including MS-DRGs, chronic conditions, first setting, beneficiary demographic and clinical characteristics, patient pathways, readmissions, and regional variation.

In summary, the descriptive statistics presented above point to the following key findings:

- Medicare payments per episode vary considerably across first settings ***within*** and ***across*** MS-DRGs
- Episode payments and complexity are correlated with specific beneficiary demographic and clinical characteristics and patient pathways, which have differential impacts across first settings and MS-DRGs
- There is clinical overlap in patients across MS-DRGs and first settings
- Index hospitalization and readmission days of care per 1,000 fee-for-service beneficiaries vary considerably across CMS regions

The variation in Medicare payments within episodes for a given MS-DRG, in particular, is correlated with: a) the number of sequence stops and variety of settings used during the episode, b) the beneficiary's number of chronic conditions, and c) the fact that clinical characteristics used to categorize beneficiaries in the inpatient hospital are not the same as the clinical (and functional) characteristics used to categorize beneficiaries across the various post-acute care settings.

These key findings have two major implications for our simulations, as well as for future CMS demonstrations on broader payment reform (and payment bundling, specifically):

1) Risk-adjustment based on claims data alone for episode payments across first settings may not substantially explain observed differences in Medicare payments across first settings within MS-DRGs
2) Based on observable characteristics, some patients in the facility-based settings have characteristics that support a clinically appropriate placement in home health, but cost differences across settings cannot be ignored for those appropriately treated in each type of facility (e.g., SNF, IRF, LTCH)

In the next section, we will provide an overview of the published literature, which we combine with the implications of the descriptive statistics presented above to form the basis of our simulation models.

Evidence of Home Based Services in the Care Continuum

Our review of the research literature has been critically important to the CACEP study, as it provides a basis in evidence for analytic activities and also indicates the various ways that home care could be used in a scalable fashion to improve the quality and efficiency of care delivery. While the interventions described in this chapter are often smaller scale, geographically-focused and condition-specific, they serve as models for integrating home health more effectively into the care continuum in a way that is safe and cost-effective.

One example of a promising model being tested in order to determine the scalability and the success of providing care in Medicare beneficiaries' homes is the Independence at Home (IAH) Demonstration, authorized under Section 3024 of the ACA, for which CMS recently released guidelines.[66] The IAH Demonstration will test a service delivery model that utilizes physician and nurse practitioner-directed primary care teams to provide services to high cost, chronically ill Medicare beneficiaries in their homes.

Consistent with the spirit of the IAH Demonstration, one research finding of particular note is that home care can play an enhanced and integrative role in patient care, as evidenced in the many initiatives currently being conducted across the U.S. According to the National Home and Hospice Care Survey, each day in 2007, there were an estimated 1,459,900 home health care patients. There were about 7.6 million people receiving community-based care to help with post-acute and chronic conditions, disabilities, or terminal illnesses. The number is expected to increase as the population ages and continues to wish to "age in place."[67]

Home health is well positioned to provide integrated care management if incorporated into future health care delivery models. Although home health has been identified as a

[66] Medicare Program; Independence at Home Demonstration Program, 76 Fed. Reg. 79193-79194 (2011).
[67] Caffrey C, Sengupta M, Moss A, et al. (2011). Home health care and discharged hospice care patients: United States, 2000 and 2007. National health statistics reports 38: National Center for Health Statistics.

cost-effective care setting with positive clinical outcomes for patients,[68] healthcare reform discussions to date have not fully capitalized on home health's possible role as a care integrator or its potential to both contain costs and increase quality.

Home health can manage patient transitions from facility-based care to their homes, teach patients to self-manage multiple chronic conditions in order for them to remain at home, and coordinate care across settings to ensure overall patient safety. As evidenced in published literature and findings from integrated care programs referenced in this chapter, careful attention to these aspects of patient care can help reduce overall health care expenditures and the reliance on facility-based care. Due to the management and cost structure of home-based care delivery, home health agencies can readily adapt care delivery to better focus on these issues. The basic concept for integrated care management at home is to provide the right care to the right patient at the right time, within a system of payment incentives that encourages providers to be more cost-conscious.

Numerous integrated care programs and delivery models that could be incorporated into the home health infrastructure are currently in use. Several current and emerging care delivery models offer integrated care coordination for patients across settings. We refer to "integrated care programs" as programs that are generally comprehensive and include several sites of service. We use the term "care delivery models" to refer to interventions that typically focus on a single point in patient care. Examples of integrated care programs include Veterans Affairs Home Based Primary Care (HBPC), Medicare Program of All-Inclusive Care for the Elderly (PACE), and Vermont's Blueprint for Health. Typically, the provider of services within these programs is also the payer. These programs are described in greater detail later in this section.

Care delivery models can also be implemented within "siloed" individual care settings, but can face challenges managing patient care across settings. The transitional care model developed by Mary Naylor[69] and the Care Transition Intervention™ developed by Eric Coleman[70] focus on managing patient transitions from the hospital or facility to the community in order to ensure that patients are safe and medically stable at home.

[68] Buntin MB, Deb P, Escarce JJ, et al. (2005). Comparison of Medicare spending and outcomes for beneficiaries with lower extremity joint replacements. Working Paper. RAND Corporation (WR-271-MedPAC). Retrieved from: http://www.rand.org/pubs/working_papers/2005/RAND_WR271.pdf

[69] Naylor MD, Brooten B, Campbell R, et al. (1999). Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized trial. *JAMA* 281(7): 613-620.

[70] Coleman EA, Boult C. (2003). Improving the quality of transitional care for persons with complex care needs. *Journal American Geriatrics Society* 51: 556-557.

Literature assessing these programs suggests that implementation of programs like these could improve patient outcomes and reduce health care expenditures.[71,72]

The ACA recognizes the importance of integrated care and home and community-based care, especially given the increasing shortage of primary care physicians. The U.S. health care delivery system is suffering from a well-documented and growing shortage of primary care physicians, relative to an aging population. The U.S. could have nearly 63,000 fewer physicians than needed by 2015, according to a projection from the Association of American Medical Colleges.[73] The elderly, who need more frequent and intensive health care, are the most likely to experience this shortage of primary care capacity. The ACA contains several demonstration provisions that may change the way facility and home-based care is delivered, and would test innovative new methods of delivering care. The ACA does, in this way, explicitly recognize that sustained cost control will only occur with more coordinated care that consistently prevents avoidable complications for patients with chronic conditions. By providing primary care and care coordination, home health can be a leader in the creation of several of the new delivery system initiatives, such as ACOs, patient-centered medical homes (PCMHs), community health teams, and bundled payments.

Because the literature describing integrated care initiatives that incentivize improved measurement and health outcomes in post-acute care settings is extensive (although not that well developed), we organized this literature review around the four overarching assumptions that have guided our analytic work from project inception. In addition to the dozen or so randomized controlled trials of innovative home-based programs that reduced costs and/or readmissions, we examined a fair number of observational studies in order to understand the range of care models that are currently being conducted and/or being tested. Most studies describe situations in which providers are safely treating patients in the home, coordinating care, and/or providing self-management education.[74] Some literature concerns regional variation in care delivery and cost.[75,76] (The full evidence table for the literature review can be found in Appendix D).

[71] Coleman EA, Smith JD, Frank JC, et al. (2004). Preparing patients and caregivers to participate in care delivered across settings: The Care Transition Intervention. *Journal American Geriatrics Society* 52: 1817-1825.

[72] Phillips CO, Wright SM, Kern DE, et al. (2004) Comprehensive discharge planning with postdischarge support for older patients with congestive heart failure – A meta-analysis. *JAMA* 291(11):1358-1367.

[73] American Academy of Medical Colleges (AAMC). (2010). The impact of health care reform on the future supply and demand for physicians updated projections through 2025. AAMC: p. 1.

[74] Boult C, Green AF, Boult LB, et al. (2009). Successful models of comprehensive care for older adults with chronic conditions: evidence for the Institute of Medicine's "Retooling for an Aging America" report. *Journal American Geriatrics Society* 57(12):2328-2337.

[75] Bernstein J, Reschovsky JD, White C. (2011) Geographic variation in health care: Changing policy directions. National Institute for Health Care Reform. Policy Analysis No. 4.

[76] Medicare Payment Advisory Commission (2011). *Report to the Congress: Regional Variation in Medicare Service Use*. Washington D.C: MedPAC.

The following four key study assumptions guided us in modeling how home health could be used as a cost-effective way to care for particular types of patients.

Over-Arching Assumptions

Assumption 1: Although there are limited randomized controlled trials comparing home care to other types of care, there are numerous observational studies that identify "enormous inefficiencies" in the health care system and demonstrate ways health care can be improved and costs reduced through the use of home care.

Assumption 2: A sizeable proportion of patients currently being treated in facility-based post-acute care settings could be safely and effectively treated in the home or community.

Assumption 3: Provider payment incentives will need to be developed to support a more cost-effective use of care settings through the expansion of continuity of care and care transitions following acute care hospitalization.

Assumption 4: Regional variation in the cost and amount of care provided to beneficiaries is due to differences in patient populations and practice patterns across providers.

ASSUMPTION 1: OBSERVATIONAL STUDIES CAN IDENTIFY "ENORMOUS INEFFICIENCIES"

In a recent article, Cutler and colleagues projected the impact of health care spending in a post-reform landscape. Prior to reform, Medicare payments were projected to grow by 6.8 percent annually from 2010 to 2019. Payment and system reform savings estimated by CBO total $397 billion (excluding Community Living Assistance Services and Supports [CLASS] and non-Medicare provisions), and applying these cost savings reduces the annual growth rate to 5.5 percent. When additional health system modernizations are accounted for, the annual growth rate is reduced to 4.9 percent and total 10-year savings reach $524 billion.

Exhibit 4.1 contains a sample of observational studies we examined. A limited number of randomized controlled trials, in combination with these and other observational studies, form an adequate base of evidence for identifying inefficiencies in the system and demonstrating how reengineered care can lead to improved health outcomes and cost savings.

"The experiences of [select] health care delivery organizations demonstrate that health can be improved and costs lowered…While these studies are often published in the professional literature, their authors do not employ the careful comparison groups that would make the results compelling to the most skeptical reviewers. Thus, case study findings are not given as much emphasis as they otherwise might…While views differ as to appropriate evidence standards, the situation we analyze is one where there are essentially no clinical trials and where effects of multiple large policy changes may differ substantially from the effects of small trials of single interventions. In such a situation, it is imperative to cast a wider net than traditional evidence standards do."[77]

[77] Cutler DM, Davis K, Stremikis K. (2010). The impact of health reform on health system spending. Center for American Progress and The Commonwealth Fund. Issue Brief. Commonwealth Fund pub. 1405, Vol. 88.

Exhibit 4.1: Sample of Observational Studies Reviewed

Study	Intervention	Effect
Buntin, 2010[78]	Patients after stroke and hip fracture in different post-acute settings	Hip fracture patients who returned home from acute care cost Medicare $17,332 less, and $24,219 less for stroke patients than those who used an IRF
Phillips et al, 2004[79] (Meta-analysis)	Comprehensive discharge planning and post-discharge home visits for CHF patients	Fewer readmissions, lower mortality, and improved survival and quality of life without increasing costs
Anderson et al, 2000[80]	Home-based nursing and rehabilitation to facilitate early hospital discharge for stroke patients	Patients discharged early who received intervention cost $8,040 vs. $10,054 for those who received conventional care
Cyer et al, 2012[81]	Acute hospital-level care within patients' homes	Comparable or better clinical outcomes, saved 19 percent compared to similar inpatients
Frick et al, 2009[82]	Hospital-at-home for pneumonia, CHF, COPD, and cellulitis	Costs in the home significantly lower than usual acute hospital care ($5,081 vs. $7,480, p<0.001)

A study by Buntin et al.[83] suggests that home health is an efficient health care setting. Total Medicare post-acute care payments for IRFs and SNFs were $8,023 and $3,578, respectively (for 120 day episodes following acute discharge), which is higher than Medicare payments for those discharged home (reference group).

Phillips et al. reviewed 18 studies containing data from eight countries of 3,304 older patients with CHF, comparing comprehensive discharge planning plus post-discharge support to usual care.[84] Patients with comprehensive discharge planning and post-discharge support had fewer readmissions, lower all-cause mortality, and higher quality-of-life scores

[78] Buntin MB, Colla CH, Deb P, et al. (2010). Medicare spending and outcomes after postacute care for stroke and hip fracture. *Medical Care* 48(9): 776-784.

[79] Phillips CO, Wright SM, Kern DE. (2004). Comprehensive discharge planning with post discharge support for older patients with congestive heart failure. *JAMA* 91(11): 1358-1367.

[80] Anderson C, Mhurchu CN, Rubenach S, et al. (2000). Home or hospital for stroke rehabilitation? Results of a randomized controlled trial: II: cost minimization analysis at 6 months. *Stroke* 31(5): 1032-1037.

[81] Cyer L, Shannon SB, Van Amsterdam M, et al. (2012). Costs for 'Hospital at Home' patients were 19 percent lower, with equal or better outcomes compared to similar inpatients. Health Affairs 31(6): 1237-1243.

[82] Frick KD, Burton LC, Clark R, et al. (2009). Substitutive hospital at home for older persons: effects on costs. *American Journal of Managed Care* 15(1): 49-56.

[83] Buntin MB, Colla CH, Escarce JJ. (2009). Effects of payment changes on trends in post-acute care. *Health Services Research* 44(4): 1188-1210.

[84] Phillips CO, Wright SM, Kern DE. (2004). Comprehensive discharge planning with post discharge support for older patients with congestive heart failure. *JAMA* 91(11): 1358-1367.

than control group patients. Post-discharge support with a home visit could prevent 84,000 readmissions with an estimated reduction in Medicare payments of $424 million per year, after adjusting for the cost of discharge planning with a home visit. The average cost for administering the intervention in the U.S. was a nominal $80.76 per patient per month.

In Anderson et al., economic results indicated that an established clinical protocol could play an important role in the release of hospital beds and be a cost-effective approach to the rehabilitation of patients with stroke.[85] The average cost per patient was lower for patients with early hospital discharge and home-based rehabilitation: Australian $8,040 compared to Australian $10,054 for those who received conventional care.

Cyer et al. examined Presbyterian Healthcare Services' (Albuquerque, New Mexico) adaptation of the "hospital-at-home" model to provide acute hospital-level care within patients' homes.[86] Patients showed comparable or better clinical outcomes compared with similar inpatients, and better satisfaction levels. This program saved 19 percent over costs for similar inpatients, and was available to Medicare Advantage and Medicaid patients with common acute care diagnoses. These savings resulted from lower average length-of-stay and fewer lab and diagnostic tests. In another study of the hospital-at-home intervention, Frick et al. found that costs were significantly lower than those of usual acute hospital care ($5,081 versus $7,480).[87] The results, however, were condition-specific. Total costs were lower when substitutive hospital-at-home care was available for COPD and CHF patients but not for patients with community-acquired pneumonia or cellulitis.

The success of these individual programs suggests that home-based interventions, when designed with the right incentives and targeted to the right populations, can maintain or improve health outcomes and decrease costs.

ASSUMPTION 2: SOME PATIENTS CAN BE SAFELY & EFFECTIVELY TREATED IN THE HOME OR COMMUNITY

Reducing the growth in health care expenditures will require a collective emphasis on community-based care, and associated payment systems that reduce the dependence of the chronically ill on higher-cost care settings. Medicare is largely based on a non-integrated fee-for-service model, which produces incentives for service volume and excess

> "Reform based initiatives could produce major gains in a relatively short time." This…"demands bold initiatives that are based on the best evidence available and swiftly implemented."[88]

[85] Anderson C, Mhurchu CN, Rubenach S, et al. (2000). Home or hospital for stroke rehabilitation? Results of a randomized controlled trial: II: cost minimization analysis at 6 months. *Stroke* 31(5): 1032-1037.

[86] Cyer L, Shannon SB, Van Amsterdam M, et al. (2012). Costs for 'Hospital at Home' patients were 19 percent lower, with equal or better outcomes compared to similar inpatients. Health Affairs 31(6): 1237-1243.

[87] Frick KD, Burton LC, Clark R, et al. (2009). Substitutive hospital at home for older persons: effects on costs. *American Journal of Managed Care* 15(1): 49-56.

[88] Thorpe KE. (2010). The foundation that health reform lays for improved payment, care coordination, and prevention. *Health Affairs* 29(6):1183-87.

spending. More than seventy-five percent of health care spending is attributed to patients with chronic illness.[89] The five percent of Medicare beneficiaries who account for nearly one-half of Medicare expenditures have multiple chronic conditions, functional limitations, and average per capita health care costs of over $50,000 per year.[90]

Providing more cost-effective care for these patients will require changes in Medicare policy that emphasize effective care integration supported by changes in Medicare payment and delivery systems. This could entail lifting legislative and regulatory restraints on the providers of care, such as the home health homebound requirement and the three-day hospital stay requirement for Medicare SNFs. Removing the homebound restriction would allow for home health care providers to provide integrated care for those with chronic conditions, ensuring that patients can remain at home, maintain their health, and, as a result, avoid more expensive facility-based care settings. This change in policy would allow home health to provide continuity of care and transitional care coaching to non-homebound Medicare patients.

Several care coordination programs have successfully improved beneficiaries' care and reduced their need for hospitalization as seen in Exhibit 4.2.

Exhibit 4.2: Sample of Care Coordination and Home-Based Interventions Reviewed

Study	Intervention	Health Outcome/Lesson Learned
Brown, 2012[91]	Four out of 11 Medicare Coordinated Care Demonstration programs reduced hospitalizations by 8 to 33% for high-risk patients	Successful coordination care programs have six important components: in-person patient contact, physician engagement, care coordinator, patient education, transition and medication management
Peikes, 2012[92]	When switching from phone-based care management to in-person care managers, hospitalizations were reduced by 12% (and 17% for higher risk patients) in Washington University's care coordination program	Care coordination programs' emphasis on building in-person relationships between patients and physicians is a value consideration for current and future programs

[89] Centers for Disease Control and Prevention (CDC). (2009). Chronic diseases: the power to prevent, the call to control (at a glance 2009). Accessed online at: http://www.cdc.gov/chronicdisease/resources/publications/aag/chronic.htm

[90] DeJonge KE, Taler G, Boling PA. (2009). Independence at home: Community-based care for older adults with severe chronic illness. *Clinics in Geriatric Medicine* 25(1): 155-169.

[91] Brown RS, Peikes D, Peterson G, et al. (2012). Six features of Medicare Coordinated Care Demonstration Programs that cut hospital admissions of high-risk patients. *Health Affairs* 31(6): 1156-1166.

[92] Peikes D, Peterson G, Brown RS. (2012). How changes in Washington University's Medicare Coordinated Care Demonstration Pilot ultimately achieved savings. *Health Affairs* 31(6): 1216-1226.

Study	Intervention	Health Outcome/Lesson Learned
Centers for Medicare and Medicaid Services (CMS), 2012[93]	During the Post Acute Care Payment Reform Demonstration, a study found self care functional ability improved significantly from admission to discharge in home health stays when accounting for patient acuity	PAC payment systems can be improved by including patient acuity measures and show the potential for home health in improving patients' ability to participate in self care
Boling, 2009 & 2010[94,95]	Home-based primary care team consisting of MDs, NPs, and PAs; house calls from SWs, pharmacists and HHA clinicians*	Reduced hospital length of stay (LOS) by 2.5 days, 30-day readmission rate reduced by 50%, rare use of SNF care
Harrison, et al, 2002[96]	Extended home care services	For patients with heart failure, a nurse-led transitional care intervention improved HR-QOL and reduced ED use
Buntin et al, 2005[97]	Lower extremity joint replacement recovery	IRF and SNF patients had higher probability than HHA and "no care" patients of being dead or institutionalized at 120 days post-discharge
Fazzi Associates, 2012[98]	18-month Ohio home-care project tracked patients' reasons for readmission and home care workers adjusted their care accordingly	Reduced rehospitalizations by 6%, reducing the average hospitalization rate to 25% (vs. national average of 27%)
Leff et al, 2005[99]	Hospital-at-home for CHF, COPD, cellulitis patients	At 8 weeks, patients treated at home had fewer clinical complications than those in hospital

*Note: NP is a nurse practitioner; PA is a physician assistant; SW is a social worker; and HHA is a home health agency.

When implemented properly, coordinated care interventions can reduce hospitalizations. A study by Brown et al. found that four of 11 programs that were part of the Medicare Coordinated Care Demonstration reduced hospitalizations by eight to 33 percent among enrollees who had a high risk of near-term hospitalization.[100] Each of these programs had six important components: 1) face-to-face patient contact; 2) physician engagement and

[93] Centers for Medicare and Medicaid Services (CMS). Report to Congress: Post Acute Care Payment Reform Demonstration. Accessed online at http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/Flood_PACPRD_RTC_CMS_Report_Jan_2012.pdf; pp.1, 9

[94] Boling PA. (2009). Care transitions and home health care. *Clinics in Geriatric Medicine* 25: 135-148.

[95] Boling PA. (2010). 25 years' experience at VCU with house calls and transitional care programs. Virginia Commonwealth University (PowerPoint slides).

[96] Harrison MB, Brown GB, Roberts J, et al. (2002). Quality of life of individuals with heart failure: a randomized trial of the effectiveness of two models of hospital-to-home transition. *Medical Care* 40: 271-282.

[97] Buntin MB, Colla CH, Escarce JJ. (2009). Effects of payment changes on trends in post-acute care. *Health Services Research* 44(4): 1188-1210.

[98] Fazzi Associates. (2012). Ohio Council for Home Care and Hospice: Move to Improve Campaign for Excellence Final Report. pp. 1-62.

[99] Leff B, Burton JR. (2001). The future history of home care and physician house calls in the United States. *Journal of Gerontology* 56A(10): M603-M608.

[100] Brown RS, Peikes D, Peterson G, et al. (2012). Six features of Medicare Coordinated Care Demonstration Programs that cut hospital admissions of high-risk patients. *Health Affairs* 31(6): 1156-1166.

cooperation; 3) care coordinator had "communications hub" role with physicians; 4) patient education; 5) transition management; and 6) medication management. These approaches, if incorporated into medical homes, ACOs, and other policy initiatives, could significantly reduce hospitalizations. However, such programs will only save money if care coordination fees are modest and organizations find cost-effective ways to deliver the interventions.

A recent case study of the Washington University School of Medicine, which participated in the Medicare Coordinated Care Demonstration, showed the value of building in-person relationships between physicians and patients.[101] The original Washington University care coordination program was not able to demonstrate any reduction in hospitalizations, but after a redesign – which involved switching from phone-based care management to in-person local care managers – hospitalizations were reduced by 12 percent (and 17 percent for higher-risk enrollees). After the redesign, Washington University reduced monthly Medicare spending by $217 per enrollee ($435 for higher-risk enrollees), offsetting the program's monthly $151 care management fee.

Demonstrations emphasizing post-acute care have also shown the value of home health. An important demonstration, the Post Acute Care Payment Reform Demonstration (PAC PRD) was required in Section 5008 of the Deficit Reduction Act of 2005.[102] When examining HHA stays, this study found a statistically significant positive impact on improving self-care functional ability from admission to discharge after controlling for patient acuity. HHA patients had a mean self-care change that was 4.02 units higher than that of SNFs. Family involvement and other factors that may be associated with admission to home health were not included in the model, however.[103] Post acute care payment systems could be improved by the inclusion of patient acuity measures that are not included in current payment systems (such as patient characteristics measured using the CARE tool). Both the Medicare Coordinated Care Demonstration and PAC PRD show the potential or proven role of home health for providing a smoother transition between care settings and improving patients' ability to participate in self care.

The ACA also provides numerous provisions that could enhance the delivery of care, such as community health teams, community-based transition programs, ACOs, and bundled payment mechanisms for acute and post-acute care. The eventual goal is to expand these types of programs nationally. The Vermont Blueprint for Health's utilization of medical homes and community health teams is expected to save 28.7 percent in incremental health

[101] Peikes D, Peterson G, Brown RS. (2012). How changes in Washington University's Medicare Coordinated Care Demonstration Pilot ultimately achieved savings. *Health Affairs* 31(6): 1216-1226.

[102] Centers for Medicare and Medicaid Services. Report to Congress: Post Acute Care Payment Reform Demonstration. Accessed online at http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/Flood_PACPRD_RTC_CMS_Report_Jan_2012.pdf; pp.1, 9

[103] Centers for Medicare and Medicaid Services. Report to Congress: Post Acute Care Payment Reform Demonstration. Accessed online at http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/Flood_PACPRD_RTC_CMS_Report_Jan_2012.pdf; pp.1, 9

spending by its fifth year. This means less emergency room care, fewer hospital admissions and readmissions, and more community-based care. Implicit in the Vermont model is the assumption that savings will be achieved through reducing the growth in hospital care by replacing it with community-based care. The VA system has already moved in this direction in its HBPC initiative. Exhibit 4.2 summarizes select home-based care interventions from the literature.

The move toward home and-community based care is evident in the literature as a way to fulfill both clinical and psychosocial needs in addition to reducing the costs of care. Most home-based interventions target specific conditions, such as stroke, hip fracture, joint replacement, CHF, COPD, or other chronic conditions, and aim to reduce hospital admissions and readmissions, as well as a facility-based care. Boling et al. suggest that expansion of the PACE and IAH models will enable the community-based care of persons with chronic illness to effectively manage their clinical and social needs.[104] In Harrison et al., disease specific (heart failure) health-related quality of life significantly improved more for patients in the transitional care group than for those in the usual care group at six and twelve weeks, and transitional care patients showed reduced use of the emergency department.[105] The documented savings from using comprehensive care in a patient's home range from 30 percent to 50 percent of total costs.[106]

In Stuck et al., preventative home visitation programs were effective if based on multidimensional geriatric assessments, include multiple follow-up home visits, and target persons at lower risk for death and those who are relatively young. The assessment delayed or prevented functional status decline, and the follow-up visits reduced nursing home admissions. While preventive home visits required an initial assessment of $433 per person the first year, this investment resulted in net savings of $1,403 per person annually in the third year.[107] These findings illustrate the potential for home-based care to both improve patient quality of life and decrease health care costs.

In addition to reducing the total cost of care and improving quality of life, home health interventions also play a role in reducing hospitalizations by measuring patient outcomes. The national Outcome-based Quality Improvement (OBQI) trial was designed to establish a methodology and template to collect uniform (OASIS) data on all adult home health patients in order to measure and report patient outcomes. OBQI patients had a reduction in hospitalization in both the National Demonstration of 27 states (by 22 percent) and New

[104] Boling PA. (2009). Care transitions and home health care. *Clinics in Geriatric Medicine* 25: 135-148.

[105] Harrison MB, Brown GB, Roberts J, et al. (2002). Quality of life of individuals with heart failure: a randomized trial of the effectiveness of two models of hospital-to-home transition. *Medical Care* 40: 271-282.

[106] Boling PA. (2009). Care transitions and home health care. *Clinics in Geriatric Medicine* 25: 135-148.

[107] Stuck AE, Egger M, Hammer A, et al. (2002). Home visits to prevent nursing home admission and functional decline in elderly people. JAMA 287(8): 1022-1028.

York State Demonstration (by 26 percent) over the three and four-year demonstration periods.[108]

In terms of patient safety, institutional care overall can lead to a higher probability of mortality and morbidity in comparison to home health. Buntin et al.[109] established that patients who use IRF care are at higher risk of death or long-term institutionalization than those who use no institutional post-acute care, and those who use SNF care are at even higher risk over a seven-year period (1996-2003).

Medicare PACE Program

The Balanced Budget Act of 1997 established the Program of All-Inclusive Care for the Elderly (PACE). PACE is a comprehensive, capitated benefit package that integrates Medicare and Medicaid financing to provide acute and long-term care for the elderly. Eligible participants must be aged 55 or over, need nursing facility-level care, and live in a PACE organization care area. As a result of the eligibility requirements, most, but not all, PACE participants are dually eligible for Medicare and Medicaid. For most participants, the comprehensive benefit allows them to avoid institutionalization and, instead, receive services in their homes or at an adult day health center. Currently there are 166 PACE centers, operated by 81 sponsoring organizations in 29 states that serve over 23,000 PACE participants.[110]

PACE enrollment is associated with:[112-115]

- improved care quality
- less mortality
- preservation of function
- fewer unmet assistance needs
- greater patient/caregiver satisfaction
- less hospital/nursing home utilization
- lower Medicare costs

PACE organizations, which are public or private non-profit organizations that must meet certain eligibility requirements, administer the program. Services include primary care services, social services, restorative therapies, personal care and supportive services (including mental health services), nutritional counseling, recreational therapy, and meals. They combine post-acute and long-term care. The interdisciplinary team must, at a minimum, include a primary care physician, nurse, social worker, physical therapist, occupational therapist, recreational therapist or activity coordinator, dietitian, PACE center supervisor, home health liaison, health workers/aids (or their representatives), and drivers (or their representatives).

Researchers have found that PACE enrollment is associated with an improved care quality, less mortality, preservation of function, fewer unmet assistance needs, greater participant and caregiver satisfaction, less hospital and nursing home utilization, and lower Medicare

[108] Shaughnessy PW, Hittle DF, Crisler KS, et al. (2002). Improving patient outcomes of home health care: findings from two demonstration trials of outcome-based quality improvement. Journal of the American Geriatrics Society 50(8): 1354-1364.

[109] Buntin MB, Colla CH, Escarce JJ. (2009). Effects of payment changes on trends in post-acute care. *Health Services Research* 44(4): 1188-1210.

[110] Notarstefano P. (2012). Modern Healthcare Highlights PACE. Accessed online at: http://www.leadingage.org/Modern_Healthcare_PACE.aspx

costs.[111,112,113,114] For example, at a Seattle site, in the first 12 months after enrollment only 13 percent of PACE clients died, compared to 19 percent of HCBS clients. By year three, 29 percent of PACE enrollees had died, compared to 45 percent of HCBS clients. A study by Meret-Hanke found that PACE enrollees spent an estimated average of 0.2 days in the hospital per month alive compared with an estimated average of 0.8 days in the hospital per month alive by comparison subjects or an estimated PACE effect of 0.6 days in the hospital per month alive per enrollee.[115]

Some view PACE as an "example in the health care industry today where home health flourishes because economic, political, and social incentives are well aligned." Because PACE organizations take full financial risk in treating their members in the acute, post-acute, and long-term care settings, home health services can be utilized in order to preempt the need for skilled care and prevent avoidable admissions to the nursing home or hospital. This program offers supporting evidence for the concept of integrating home health into the care continuum.[116] While PACE is still being evaluated in terms of its cost effectiveness, it presents a promising solution to keeping patients out of facility-based care due to its combination of long-term care and post-acute care, use of interdisciplinary teams, and improvements in quality. However, the small scale of PACE may prove challenging in replicating on a broader scale.

Vermont's Blueprint for Health

In 2006, Vermont established several pilot programs to integrate health services for patients throughout the state based on a model of PCMHs supported by community health teams. The community health teams are multidisciplinary in composition and include nurse coordinators, social workers, behavioral health counselors, nutritionists, public health specialists and others who work together, and in close partnership, with patients and physicians at the community level. The program is designed to integrate the elements of care coordination and

Results from two Blueprint for Health pilot sites (2007-2010):[117]

- Decreased inpatient admissions by 6%
- Lower growth in spending (pilot participants vs. non-participants):
  - Inpatient expenditures (41% vs. 50%)
  - Outpatient spending (32% vs. 39%)
  - ED spending (50% vs. 56%)

[111] Boult C, Wieland D. (2010). Comprehensive primary care for older patients with multiple chronic conditions: "Nobody rushes you through." JAMA 304(17):1936–1943.

[112] White AJ, Abel Y, Kidder D. Final Report: A Comparison of the PACE Capitation Rates to Projected Costs in the First Year of Enrollment. Cambridge, MA: Abt Associates, Inc.; 2000. Contract No. 500-01-0027.

[113] Mancuso D, Yamashiro G, Felver B. (2006). PACE: An Evaluation. Olympia, WA: Research and Data Analysis Division, Department of Social and Health Services; (online) Report No. 8.26. Accessed online at: http://www1.dshs.wa.gov/pdf/ms/rda/research/8/26.pdf

[114] Beauchamp J, Cheh V, Schmitz R, Kemper P, Hall J. (2008). The Effect of the Program of All-Inclusive Care for the Elderly (PACE) on Quality: Final Report. Princeton, NJ: Mathematica Policy Research. CMS Contract No.: 500-00-0033.

[115] Meret-Hanke, LA. (2011). Effects of the Program of All-Inclusive Care for the Elderly on Hospital Use. *The Gerontologist* 51(6): 774-785.

[116] Program of All-Inclusive Care for the Elderly (PACE). Retrieved from: http://www.medicare.gov/Nursing/Alternatives/Pace.asp

[117] Agency for Healthcare Research and Quality. Innovations Exchange. Statewide Program Supports Medical Homes Through Multidisciplinary Teams, Easy Access to Information, and Incentives, Leading to Lower Costs and Better Care.

disease management with community-wide prevention efforts, patient education and self-management, and other social and economic support services.

In addition to improving access to integrated services, care coordination, and patient self-management of conditions, the major goals of the program are: 1) to reduce preventable complications and rehospitalizations due to poor management of chronic conditions; and 2) to slow the rate of growth in healthcare expenditures while improving health care quality. Vermont expects that once expanded statewide, the state's health care expenditure growth rate will be reduced by 37.4 percent.[118] The community health teams are designed to be multidisciplinary and flexible in order to provide a more effective, local solution to address the wide range of patient needs and clinical differences and the complexity of factors determining patient outcomes.

Home health agencies are already partners in several of the community health teams. While many home health agencies already provide and coordinate multidisciplinary care to patients, home health agencies are well positioned to adapt this care delivery model to "house" the "health teams." Home health agencies have a clear value as members of community health teams for their ability and experience in delivering comprehensive, low-cost service in the home, as well as in linking patients in the community to other health care providers, as needed.

Although the patchwork of programs may have challenges due to the limited capacity or type of patient, many programs are promising for the future of the home health community and the patients they serve. Existing coordinated care programs, post acute care demonstrations, hospital-at-home programs, PACE, and Vermont Blueprint for Health demonstrate that integrating home health into the care continuum is both safe for the patient and effective in improving health outcomes, such as reducing hospital admissions, readmissions or facility-based care.

ASSUMPTION 3: PROVIDER PAYMENT INCENTIVES WILL NEED TO SUPPORT COST-EFFECTIVE CARE

As noted above, the basic concept for integrated care management at home is to provide the right care to the right patient at the right time, within a system of payment incentives that encourage providers to be more cost-conscious. Numerous programs, such as the IAH model and the VA's HBPC program, focus on creating specific organizations, delivery models, and payment incentives to better coordinate care. There is an ongoing emphasis on integrating primary care with specialty care, disease state management, patient education, community services, and many other resources. These models must provide incentives for both providers and patients to participate in a meaningful way.

[118] Agency for Healthcare Research and Quality - Innovations Exchange. Statewide Program Supports Medical Homes Through Multidisciplinary Teams, Easy Access to Information, and Incentives, Leading to Lower Costs and Better Care. Accessed online at: http://www.innovations.ahrq.gov/content.aspx?id=3640

Our conclusion is that home health delivery programs and models, such as the ones described above within the context of strong payment incentives such as bundled payment, pay-for-performance, shared savings, and/or the reduction or elimination of payments for unplanned readmissions, have the potential to reduce Medicare facility-based utilization and overall healthcare spending. As shown by providers' responses to the introduction of DRGs, providers responded quickly and decisively to changes in payment by reducing inpatient length of stay and cutting costs.

Veterans Affairs Home-Based Primary Care (VA HBPC)

The U.S. Department of Veterans Affairs (VA) has been providing comprehensive primary care services to veterans in their homes since 1972, through a program now called Home-Based Primary Care (HBPC). The HBPC program is specifically designed to target patients with complex chronic diseases, and provides primary and long-term care through an interdisciplinary team of health professionals aiming to keep patients in their homes and reduce inpatient hospital days.

> "Effective home care for persons with complex chronic disease must be comprehensive, not problem-focused. It must be longitudinal, not episodic. It must be interdisciplinary, not delivered by one or two providers. Moreover, it must integrate primary care. If complex chronic disabling disease is the question, home care is the answer, and VA HBPC experience now provides the United States with substantial evidence to support this view."[119]

Unlike the Medicare home health benefit, the VA HBPC neither requires the patient to be "homebound" nor requires that the patient's condition improve over time. The overarching goals of the VA HBPC program are to provide the clinical apparatus and support system to treat complex chronic diseases in the home over time, rather than in a hospital or nursing facility. To that end, HBPC provides close monitoring and early intervention, patient and caregiver education, assistance with adapting to the home, any medical or telehealth (as appropriate) equipment, and palliative care. The HBPC interdisciplinary health team revises the patient's care plan over time to address changes in preferences and health status throughout the course of the care. In addition, the program collaborates with other VA benefits such as skilled care, adult day care, home health aide services, and home hospice. Other differences between Medicare and VA HBPC can be viewed in Exhibit 4.3.

[119] Beales JL, Edes T. (2009). Veteran's Affairs Home Based Primary Care. *Clinics in Geriatric Medicine* 25(1): 149-154.

Exhibit 4.3: Comparison of Medicare to VA HBPC[120]

Program	Patient Characteristics	Length of Stay	Care Model	Cost
Medicare	4.2 medical conditions 8.8 medications 3+ ADLs	65 days	Short-duration care to homebound patients	Increased by 29.4% (1998-2005)
VA HBPC	8 medical conditions 12 medications 5 health concerns	315 days	Comprehensive longitudinal care to chronically ill veterans	Decreased by 24% (post-HBPC)

The major limitation of the VA HBPC program is geographic – the health teams are generally based out of facilities, such as VA hospitals, and have an average coverage area of 30 to 70 miles from the facility. There are also some patients who require more frequent visits and intensive care for a prolonged period of time, which the program cannot always accommodate.

Despite these limitations, the VA has documented decreased utilization and substantial cost savings. A 2002 study of 11,334 veterans six months before and six months after enrollment in HBPC showed a reduction in inpatient hospital days by 62 percent, a reduction in nursing home bed days by 88 percent, and an increase in all home health visits by 264 percent. In addition, the mean total VA cost of care dropped from $38,000 to $29,000 per patient per year (a 24 percent reduction). Evaluation of the program in 2007 found similar reductions in utilization as well as a 21 percent reduction in 30-day hospital readmission rates, indicating that HBPC was able to reduce both the frequency and the duration of inpatient hospital admissions.[121] Furthermore, the VA HBPC has demonstrated success in maintaining patient independence and quality of life while managing chronic conditions.[122]

Wajnberg et al. examined the impact of the VA HBPC program by measuring hospitalizations and SNF admission before and after enrollment in the program between October 2004 and August 2006. [123] Sixty-one percent of patients had one or more hospitalizations before enrollment compared to only 38 percent after. The median hospitalization rate decreased from one admission to zero. This study demonstrated that house call programs (HCPs) could reduce costly hospitalizations and SNF placements.

[120] Partnership for Quality Home Healthcare. Accessed online at: http://www.homehealth4america.org/images/pdf/va-hbpc.pdf

[121] Beales JL, Edes T. (2009). Veteran's affairs home based primary care. *Clinics in Geriatric Medicine* 25(1): 149-154.

[122] Alliance for Home Health Quality and Innovation (2011). Home health care: An essential solution to America's health care challenges.

[123] Wajnberg A, Wang KH, Aniff M et al. (2010). Hospitalizations and skilled nursing facility admissions before and after the implementation of a home-based primary care program. *Journal of the American Geriatrics Society* 58(6): 1144–1147.

A report published by the CBO in 2007 compared the growth in healthcare expenditures between the VA and Medicare from 1998 to 2005, and found that annual healthcare costs per patient for the VA rose 1.7 percent over the period (0.3 percent per year), while the costs per patient for Medicare rose by 29 percent over the period (or 4.4 percent per year). This result is attributed in part to the implementation of programs designed to treat complex chronic conditions on an ongoing basis, such as the HBPC. CBO also found that one of the major factors in VA's success was the agency's focus on quality and performance measurement, as demonstrated through its improvement on two VA-specific quality indexes (the Clinical Practice Guidelines Index and the Prevention II Index).[124]

Independence at Home (IAH) Model[125]

The newly-supported model of care for seriously ill elders, based on hundreds of house call programs now operating in the U.S., is the IAH model. Exhibit 4.4 provides examples of select programs.

Exhibit 4.4: Examples of Established "Integrated Care Management at Home" Programs

Program	In Operation	Savings
Virginia Commonwealth University House Call Program[126,127]	25 years	Reduced overall costs by 63%, and hospital days by 74%. Reduced hospital costs by 60 percent for high cost beneficiaries with multiple chronic diseases.
Inspiris[128]	13 years	Partners with MCOs to reduce overall costs by 42%, hospital admissions by 63%, nursing home days by 72%

The central core of IAH is a mobile team of primary medical, nursing, and social work staff who deliver comprehensive primary care to the patient in his or her home. This patient-centered model addresses the desire of most seniors to "age in place" by changing the primary setting of care from institutions and offices to the home. It redirects payment from providers who perform high volumes of expensive procedural services to teams that both improve the overall care of a well-defined ill and disabled population and achieve cost savings. Mobile interdisciplinary IAH teams would replace office-based providers for the small subgroup of ill elders who are poorly served in the office setting. The teams offer

[124] Percy A, Gilmore JM, Goldber MS. (2007). The health care system for veterans: An interim report. (Washington, DC: Congressional Budget Office).

[125] DeJonge KE, Taler G, Boling PA. (2009). Independence at home: community-based care for older adults with severe chronic illness. *Clinics in Geriatric Medicine* 25(1):155-69.

[126] Boling PA. (2010). 25 years' experience at VCU with house calls and transitional care programs. Virginia Commonwealth University (PowerPoint slides).

[127] New York Academy of Medicine. (2009). Independence at home act: a chronic care coordination program for Medicare that has proven effective in reducing costs and improving quality for highest cost patients. Powers, Pyles, Sutter & Verville, P.C.

[128] Tudeen M. (2011). Inspiris: an IAH type program for managed care. Inspiris (PowerPoint slides).

access to care for sick homebound patients who have little or inadequate ongoing primary medical care due to their immobility.

In the IAH model, providers are rewarded for meeting three performance standards of: 1) minimum savings of five percent; 2) improved outcomes; and 3) patient/caregiver satisfaction. IAH organizations may receive payments during the year for coordinating care but must refund those payments if they fail to achieve five percent savings, and split savings beyond 5 percent with Medicare. Providers are able to keep up to 80 percent of the savings beyond 5 percent, while Medicare will receive at least 20 percent. The actual split of savings is based on quality measures and other metrics. Additionally, the IAH program provides freedom of choice – beneficiaries do not lose any existing Medicare benefits, and they may enroll in, withdraw from, or change IAH programs at their discretion.

Unlike the Medicare home health benefit, which has the primary goal of restoring physical function, the IAH model aims to manage patient care in order to prevent unnecessary acute care hospitalizations and admissions to facility-based care.

Typically, IAH teams deliver and coordinate services in the home and across settings, including hospitals and nursing homes, where care is delivered by the primary IAH staff team or by the facility-based groups that work closely with the IAH team. The mobile, primary care IAH team serves as the hub of a wheel of services, most of which are home-based. The IAH staff coordinates all ‘‘spokes’’ of care, including acute and specialty medical services, home nursing, rehabilitation, pharmacy, medical equipment, home health aides, and hospice care. This network of community providers comes from existing community resources, and is recruited to support the IAH patients and team. Below are current examples of IAH programs currently in operation and their reductions in hospitalizations and savings:[129]

- The Urban Medical House call program in Boston, MA reduced hospital admissions for these patients by 29 percent and hospital days by 34 percent.
- The Call Doctor Medical Group in San Diego, CA reduced ER visits by 59 percent and generated per capita savings of $1,075.
- The Home Physicians program in Chicago, IL reduced ER visits and hospitalizations from 35 percent by as much as 60 percent over the years.
- The House Call program at Montefiore Health System in the Bronx, NY reduced hospitalizations by 42 percent and achieved a 33 percent reduction in total costs.

[129] New York Academy of Medicine. (2009). Independence at home act: a chronic care coordination program for Medicare that has proven effective in reducing costs and improving quality for highest cost patients. Powers, Pyles, Sutter & Verville, P.C.

- The Mount Sinai Visiting Doctors program in New York City, NY reduced hospitalizations by 66 percent.
- Geriatric Care of Nevada (now Geriatric Specialty Care) reduced hospitalizations by 27 percent and per patient total costs by $750.
- The GRACE house calls program in Indianapolis, IN reduced ER visits by 50 percent and hospitalization rates by 43 percent.
- The House Call program at the Washington Hospital Center, in D.C. reduced hospital length of stay by 25 percent and end of life hospital stay by 75 percent.

Bundled Payment Model

Over the past several years, there has been a growing interest in the concept of payment bundling, whereby services for physicians, hospitals, post-acute providers and others would be "bundled" together into a single payment covering an episode of care over a specified period of time. For example, the Centers for Medicare & Medicaid Innovation (CMMI) Bundled Payments for Care Improvement (BPCI) initiative engaged providers and conveners in the data, program design, and policy activities related to payment bundling. By covering the entire episode of care, payment bundling offers providers the flexibility and financial incentives to coordinate care within an episode. Episodes align incentives to avoid preventable complications and readmissions and encourage cost effective and high quality care. Home health agencies could participate as a provider of bundled services in order to coordinate with other health care providers to reengineer and improve the quality of care for their patients.

Bundled payment could potentially reduce Medicare spending overall, as well as hospital readmissions and length of stay. One example of a successful government sponsored bundled payment programs is the Medicare Heart Bypass Demonstration. During the five-year Heart Bypass Center Demonstration, Medicare saved $42.3 million, or roughly 10 percent of expected spending, on coronary artery bypass graft (CABG) surgery at the seven participating hospitals.[130] In the private sector, Geisinger's ProvenCare program is a provider-driven pay-for-performance program and was able to reduce hospital costs by five percent and reduce the average length of stay (LOS) for CABG by 0.5 days and 30-day readmission rates by 44 percent over 18 months.[131]

[130] Centers for Medicare and Medicaid Services (CMS). Medicare Participating Heart Bypass Demonstration (Executive Summary): Final Report. Accessed online at: http://www.cms.gov/Medicare/Demonstration-Projects/DemoProjectsEvalRpts/Downloads/Medicare_Heart_Bypass_Executive_Summary.pdf

[131] Mechanic RE, Altman SH. (2009). Payment reform options: episode payment is a good place to start. *Health Affairs* 28(2): w262-w271.

ASSUMPTION 4: REGIONAL VARIATION CAN INDICATE DIFFERENT PRACTICE PATTERNS

Practice patterns have been shown to vary on a regional level due to a variety of factors, such as different physician clinical norms, patient health status, medical error, and fraud. Geographic variation in overall health care spending per capita has been growing in recent years. Since the 1970s, however, geographic variation in Medicare spending alone has decreased over time, and the decline has been linked to changes in Medicare payment policy.[132]

Research has identified a complex set of environmental, patient demographic (health status), and economic factors that could explain the wide differences in spending and use of services across geographic areas. Patient health status explains approximately 30 percent of geographic variation in Medicare spending.[133,134] Variation in Medicare spending across geographic areas does not always reflect inappropriate services or inefficient delivery. Policy reforms should attempt to standardize practice patterns, not solely decrease provider payment.

An analysis by Bernstein et al.[135] shows the need for a policy shift from narrowly targeting specific geographic areas toward a system-wide payment reform to encourage overall efficiency. Sources of variation include the use of clearly ineffective or inappropriate treatments, the rate of injuries or avoidable complications from medical error, and levels of provider fraud. Consistent with MedPAC studies, health status explained about 30 percent of the variation (after accounting for price adjustments, about 45 percent). Dartmouth Atlas research found that FFS Medicare spending for elderly beneficiaries varies as much as 2.5 times across localities. Policies to reduce Medicare payment or impose added costs on beneficiaries in high-cost areas with poor outcomes could threaten patient access, quality of care, and penalize efficient providers. Alternative payment models such as pay-for-performance or capitation to a group of providers would create incentives to coordinate and improve efficiency.

[132] Orszag PR. (2008) *Geographic Variation in Health Care Spending.* Congressional Budget Office.

[133] Zuckerman S, Waidmann T, Berenson R, et al. (2010). Clarifying sources of geographic differences in Medicare spending. *New England Journal of Medicine* 363:54-62

[134] Medicare Payment Advisory Commission (MedPAC), (2011). *Report to the Congress: Regional Variation in Medicare Service Use*. Washington D.C: MedPAC.

[135] Bernstein J, Reschovsky JD, White C. (2011). Geographic variation in health care: changing policy directions. National Institute for Health Care Reform – Policy Analysis 4: 1-14.

Simulation Results

In this chapter, we outline the analytic approach and present the results for each simulation model. As possible, in the context of the above literature review, we provide a literature-based rationale for each model. Our analyses also include three types of cost models showing Medicare savings for one year (2008), five years (2014-2018), and 10 years (2014-2023):

1) Restructuring through Clinically Appropriate and Cost-Effective Placement (CACEP) Models
Model 1A: Cascade of Care to Most Clinically Appropriate and Cost-Effective Setting Model
Model 1B: Moderate Restructuring of Care Beyond CACEP
Model 1C: Aggressive Restructuring of Care Beyond CACEP
2) Hospital Reduction Model for Ambulatory Care Sensitive Conditions
Model 2: Hospital Reduction Model for Ambulatory Care Sensitive Conditions
3) Hospital Readmission Reduction Models Within HHA First Setting Episodes
Model 3: Regional Readmission Reduction Model
Model 4A: National Readmission Reduction Model (25%)
Model 4B: National Readmission Reduction Model (50%)
Model 4C: National Readmission Reduction Model (75%)

Summary and Implications of Simulation Results

The simulations discussed in this chapter model changes in the way care is provided that promote efficiency and value to both the patient and the Medicare program. Our modeling takes into account the effect of geographic variation on Medicare spending due to a variety of factors, especially patient clinical characteristics.

Many of CMS' payment initiatives will provide incentives to transform the way patient care is provided, with an emphasis on streamlining and reducing transitions across settings, as well as ensuring care coordination to maximize patient safety. Providers will continue to be challenged to maximize their efficiency and modify their care practices to

deliver the greater value to the patient (quality care) and Medicare program (cost efficiency).

The cascade of care to most clinically appropriate and cost-effective placement model (Model 1A) simulates the most clinically appropriate setting in which patients should receive care under providers' current delivery structure and care processes. That is, we model where patients could be placed based on their functional ability and clinical and demographic characteristics based on providers' current capacity to treat these patients. This model considers all formal post-acute care settings – including LTCH, IRF, SNF, HHA – as well as outpatient therapy and explores where patients could be placed given their individual characteristics.

With an understanding of how the world could operate today, the remaining models (Models 1B-4C) in this chapter investigate how patterns of care could be made more efficient and costs better controlled. Financial incentives and relationships among providers are modified so the ultimate goal of providers becomes delivering the best care to the patient at the lowest cost to Medicare. Specifically, Models 1B and 1C extend beyond the payment changes in Model 1A to achieve additional Medicare savings through the restructuring of care delivery processes. Models 2 through 4 try to reduce unnecessary hospital admissions and readmissions by providing home and other ambulatory-based care to patient safety.

As indicated in the literature review presented above, several small programs and demonstrations have produced improvements in patient care and reduced Medicare spending. The models in this chapter look ahead to how care could be provided if these programs were to be implemented nationally with the appropriate financial incentives. Furthermore, the models suggest ways the care delivery system needs to change to produce targeted Medicare savings. Key excerpts from the literature that demonstrate providers' ability to make better use of home health care are highlighted below.

Key Concepts Supportive of Simulation Models: Expanding the Use of Home Health

- **Our comprehensive review of the literature found numerous examples of programs that have reduced hospitalizations and nursing home care, lowered patient costs, and maintained or improved the quality of care and patient outcomes through the clinically appropriate use of home health care.**
  - VA HBPC program achieved a 59 percent reduction in hospital bed days, 21 percent reduction in 30-day hospital readmission, and 89 percent reduction in nursing home bed stays. Ultimately, this program reduced health care spending across all settings by 24 percent.[136]
  - The Mt. Sinai Visiting Doctors house calls program reduced rates of hospitalization from 61 to 38 percent and reduced SNF admission rates from 38 to 18 percent after patient enrollment.[137]
  - A cost-effectiveness study of post-acute care providers found that beneficiaries admitted to the hospital for stroke, COPD, CHF, hip procedures, and hip fractures achieved the most functional improvement for the lowest cost in home health care in comparison to SNFs and IRFs.[138] A similar study on the costs and outcomes of post-acute care concluded that increased use of home health care "could result in improved outcomes at modest or no additional cost."[139] For stroke and hip fracture patients, home care was far less expensive than SNF care and stroke patients had a lower risk of institutionalization.[140] For a 120-day episode after hospital discharge, total Medicare post-acute care payments for beneficiaries with lower joint replacements were $3,578 lower for patients discharged home than for patients admitted to SNF.[141]
  - Research by SeniorMetrix comparing outcomes for patients discharged to a SNF versus home health suggests that patients sent to a SNF would have the same clinical outcomes if they received home health services, and that high functioning patients have a 300 percent higher risk of readmission when placed in a SNF.[142]
- A recent evaluation of the Medicare Coordinated Care Demonstration identified six features of a care coordination intervention that led to reduced hospital admissions for high-risk patients: 1) frequent in-person meetings with patients; 2) occasional in-person meetings with other providers; 3) acting as a communications hub for all of the patient's providers; 4) delivering evidence-based education to patients; 5) medication management; 6) and timely and comprehensive transitional care after hospitalizations. Four out of 11 programs were successful in reducing hospital admissions, and costs to Medicare were neutral across the four programs. The study concludes that, "care coordination, if directed to the appropriate populations and designed correctly, could be successfully implemented for fee-for-service Medicare patients in diverse settings throughout the country."[143]
- **The literature suggests that the components of a successful care coordination intervention – many of which home health is well positioned to deliver and manage – can keep patients safely at home. The clinical and administrative tools necessary to reduce hospital admissions and nursing home care by more effectively using home-based care are knowable, replicable, and scalable.**

[136] Beales JL, Edes T. (2009). Veteran's Affairs home based primary care. *Clinics in Geriatric Medicine* 25: 149-154.

[137] Wajnberg A, Wang KH, Aniff M et al. (2010). Hospitalizations and skilled nursing facility admissions before and after the implementation of a Home-Based Primary Care Program. *Journal of the American Geriatrics Society* 58(6): 1144-1147.

[138] Chen Q, Kane RL, Finch MD. (2000). The cost effectiveness of post-acute care for elderly Medicare beneficiaries. *Inquiry* 37(4): 359-75.

[139] Kane RL, Chen Q, Finch M, et al. (2000). The optimal outcomes of post-hospital care under Medicare. *Health Services Research* 35(3): 615-61.

[140] Buntin MB, Colla CH, Deb P, et al. (2010). Medicare spending and outcomes after postacute care for stroke and hip fracture. *Medical Care* 48(9): 776-84.

[141] Buntin MB, Deb P, Escarce JJ, et al. (2005). Comparison of Medicare spending and outcomes for beneficiaries with lower extremity joint replacements. Working Paper. RAND Corporation (WR-271-MedPAC). Retrieved from: http://www.rand.org/pubs/working_papers/2005/RAND_WR271.pdf

[142] SeniorMetrix. (2011). Acute hospital discharge: why the "right" place is the "best" place.

[143] Brown RS, Peikes D, Peterson G, et al. (2012). Six features of Medicare Coordinated Care Demonstration Programs that cut hospital admissions of high-risk patients. *Health Affairs* 31(6): 1156-66.

Most of these programs were not able to optimize the provision of care to all patients and achieve these savings with financial incentives alone. Many of these programs used home health and other ambulatory and community-based services in ways that resembled VA HBPC.

Differences Between VA HBPC & Medicare Home Care[144]

VA Home Based Primary Care	Medicare Home Health
• Targets complex chronic disease	• Remediable conditions
• Comprehensive primary care	• Specific problem-focused
• Skilled care not required	• Requires skilled care
• Strict homebound not required	• Patient must be homebound
• Accepts declining patient health status	• Requires demonstrated patient improvement
• Interdisciplinary team	• One or multidisciplinary
• Longitudinal care	• Episodic, post-acute care
• Reduces hospital days	• No definitive impact
• Limited geography & intensity	• Anywhere; anytime

The VA HBPC focuses on maintaining patient health over time, rather than the Medicare benefit that focuses on restoring it. While the Medicare home health benefit cannot operate exactly like the VA (as the VA is a closed system and serves both as the provider of and the payer for services), there are lessons to be learned from the longitudinal way care is provided to keep all patients – including non-homebound patients – in their homes.

With the availability of functional status data, we are generally able to approximate whether patients are homebound or not. However, our modeling and results from the literature suggest that a less-restrictive and longer-term benefit may provide greater savings to Medicare. By providing clinically appropriate care in the home for patients who are not homebound, but who would benefit from low-level management of their chronic conditions, many patients would be able to better maintain their health and avoid hospital stays. Therefore, in addition to implementing financial incentives to promote more clinically appropriate and cost-effective placement of patients, some models would require a waiver of the homebound requirement or a less restrictive home health benefit. Key findings from our simulation models are presented below.

[144] Edes T. (2008). VA Home Based Primary Care: Cost-Effective Home Care for Complex Chronic Disease. Department of Veterans Affairs.

Simulation Results

Key Findings across Analytic Models

- Under the existing care delivery models (changing financial incentives but not altering the care delivery structure and processes), clinically appropriate and cost-effective placement of patients across all formal care settings could reduce Medicare expenditures by $2.5 billion per year. Additional reductions to aggregate post-discharge spending of 5.3 percent and 7.5 percent could produce one-year savings of $5.1 and $7.3 billion, respectively, from 2008 baseline (Models 1A-1C).
- By avoiding hospitalizations for ambulatory care sensitive conditions and the resulting post-acute care episode, Medicare could save about $3.0 billion from 2008 baseline (Model 2).
- A reduction in readmissions during HHA first setting episodes could reduce Medicare expenditures by $200 million to $600 million per year, depending upon the level of readmissions that are avoided (Models 3 and 4A-4C).
- While there are several paths to savings, significant savings would require substantial restructuring of the health care industry.
- If Medicare Advantage subcontracted for the management of post-acute care from third party vendors, the savings above might be increased by about 21 percent, reflecting the additional Medicare savings for Medicare Advantage beneficiaries that are not reflected in our model.

The results of our simulation models are presented below in Exhibit 5.1.

Exhibit 5.1: Summary of Potential Medicare Savings for Simulation Models (in billions) (2008)

	One-Year Medicare Savings (2008)			
	One-Year Medicare Savings (2008)	Percent of Post-Discharge Spending* (2008)	Percent of Medicare FFS	10-Year Medicare Savings (2014-2023)
Restructuring through Clinically Appropriate and Cost-Effective Placement (CACEP) Models				
Model 1A: Cascade of Care to Most Clinically Appropriate and Cost-Effective Setting Model	$2.5	2.6%	0.8%	$34.7
Model 1B: Moderate Restructuring of Care Beyond CACEP	$5.1	5.3%	1.6%	$70.0
Model 1C: Aggressive Restructuring of Care Beyond CACEP	$7.3	7.5%	2.3%	$100.0
Hospital Reduction Model for Ambulatory Care Sensitive Conditions				
Model 2: Hospital Reduction Model for Ambulatory Care Sensitive Conditions	$3.0	1.7%**	1.0%	$37.7
Hospital Readmission Reduction Models Within HHA First Setting Episodes				
Model 3: Regional Readmission Reduction Model	$0.5	0.5%	0.2%	$10.3
Model 4A: National Readmission Reduction Model (25%)	$0.2	0.2%	0.1%	$4.2
Model 4B: National Readmission Reduction Model (50%)	$0.4	0.4%	0.1%	$8.3
Model 4C: National Readmission Reduction Model (75%)	$0.6	0.7%	0.2%	$12.5

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region and standardized to 2009 dollars. Medicare Savings include care from all facility-based and ambulatory care settings, and excludes beneficiary co-payments and Part D.

* Post-discharge spending includes all payments for care after discharge from the index acute care hospitalization.

** Represents the percent of post-acute care spending, including the index acute care hospitalization.

Restructuring through Clinically Appropriate and Cost-Effective Placement (CACEP) Models (Models 1A-1C)

As emphasized by CMS and other policymakers, an important goal of the Medicare program is to treat patients safely and effectively in the right setting. We developed a model (Model 1A) that attempts to determine the extent to which there could be more cost-effective placement of patients into post-acute care following an index acute care hospitalization, while ensuring patient safety. Driven in part by clinical factors (such as MS-DRGs and patient chronic conditions), this model also uses the assessment data for each patient who received care in a HHA, SNF, or IRF to determine the functional ability of the patient to determine if he/she would be able to receive clinically appropriate care in a lower intensity setting. We extend this model to determine what the additional percent reduction to aggregate post-discharge spending (post-acute care payments excluding the index acute care hospitalization and other services provided during the index) would need to be to achieve explicit savings targets through restructuring care delivery (Models 1B and 1C). These simulated effects could be achieved through ACOs, bundled payments, or alternative delivery systems that move beyond the current siloed fee-for-service payment systems.

MODEL 1A – CASCADE OF CARE TO MOST CLINICALLY APPROPRIATE AND COST-EFFECTIVE SETTING MODEL

GOAL: The goal of this model is to first investigate the extent to which current patients seem to be placed in the most clinically appropriate and cost-effective formal first setting following an index acute care hospitalization. We then model the savings in Medicare fee-for-service payments that could accrue from shifting patient pathways to comprise the most cost-effective care based on patient clinical and demographic characteristics, as well as functional status of the patient. This model allows us to understand the status quo of the current delivery system based on existing structures and processes prior to investigating how these structures could be modified with stronger provider incentives and care redesign (as shown in Models 1B and 1C below).

METHODOLOGY: This model uses patient clinical, functional, and demographic characteristics in order to identify the appropriate formal first setting following discharge from the index acute care hospitalization. Unlike the remaining models in this chapter, this model is limited to the top 100 MS-DRGs (based on total Medicare episode payment), but excludes any MS-DRG with a high concentration of post-acute care spending within any single setting. That is, if more than 70 percent of the total post-discharge episode spending is in a single setting (i.e., LTCHs), then the MS-DRG is excluded from the analysis under the assumption that the existing care setting is likely to be the most clinically appropriate for that condition. This threshold is used to ensure that patients in MS-DRGs that require specialized care typically provided by one setting or another are not shifted into an

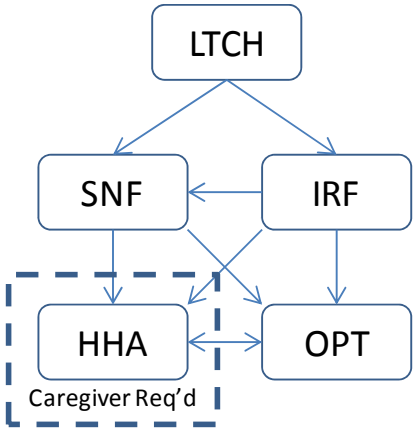
alternative setting that may not be appropriate for those needs.[145] As a result, 80 MS-DRGs are included in this simulation model. The results across these MS-DRGs are then aggregated and presented as a percent of all post-acute care episode spending.

Functional status upon discharge from the acute care hospital was determined for each patient episode that included HHA, SNF, or IRF care. Functional ability was based on eight common-concept ADL variables from OASIS, MDS, or IRF-PAI assessment tools, rescaled to a range of 0 to 7. Scores for individual variables were then summed ranging from zero (low functional ability [or highly dependent]) to 56 (high functional ability [or highly independent]) (see Appendix B for a functional status crosswalk). Whenever possible, functional status was based on the first available post-acute care assessment following discharge from the index hospitalization.[146] Functional status data were not available for patients who only received OP therapy or LTCH care, as no standardized assessment tool is currently available in these settings.

Multinomial logistic regressions were used in order to determine the propensity of a patient to receive care from any given setting. To align with current Medicare regulations and to limit inappropriate placement due to the limitations of administrative and functional status data, placement of patients into certain settings was not allowed in the simulation. The shifting rules include:

- No "up-shifting" to higher intensity settings, as the goal of the model is to place patients in the most cost-effective setting while maintaining patient safety.
- Shifting is limited to one "level," that is LTCH first setting episodes cannot be shifted into HHA or OP Therapy ("OPT").
- HHA and OP Therapy are considered to be of equal intensity and patients can shift in either direction.
- SNF first setting episodes cannot shift into IRFs because of the 60 percent rule for the IRF provider. LTCH patients can enter IRFs, but due to the relatively low volume of LTCH patient episodes, this transition is not expected to threaten the 60 percent threshold for IRF providers.
- Episodes are only able to shift into HHA if the beneficiary has caregiver support in the home.

Multinomial Shifting Limitations



A separate propensity score was calculated for each setting to estimate the probability of a beneficiary being discharged from the index hospital to that particular setting. For

[145] This is the only model that is not restricted by the MS-DRG filters presented in the Analytic Methods section.

[146] About seven percent of SNF first setting episodes did not contain an MDS assessment within 14 days of the episode. These episodes were removed from our analysis. In order to maintain a representative sample across all other settings, we also removed seven percent of each of the other first setting episodes.

example, based on the clinical, functional, and demographic characteristics of a patient with a SNF first setting episode, the regressions would determine the propensity of that patient to be treated in HHA or OP Therapy. A simulation then randomly chooses a beneficiary's first setting based on the probabilities obtained from the regressions. If the simulation results in a shifting of the patient episode into a new first setting (HHA for this example), the patient is allocated the Medicare post-discharge episode payment of a similar HHA patient. That is, care following the index hospitalization is replaced with post-discharge care of a comparable patient episode in the simulated first setting. A comparable patient episode is defined as a patient who received care from the new first setting that matches the patient's clinical, functional, and demographic characteristics (defined as a propensity score within the same decile[147]). However, if there was not at least one patient episode with a similar profile (propensity score) for the episode to match, the patient did not shift and remained in his/her current first setting. This simulation was performed multiple times and the results were averaged over the total number of runs. A list of variables used in the regressions is presented in Appendix B.

Three different approaches were used to account for differing degrees of shifting behavior. The first approach applies to the existing way care is delivered and relies on the level of functional ability of a patient whenever available to assign the patient to a given setting. This approach assumes that providers do not have any financial incentives to change the placement of patients following discharge from the acute care hospital.

The second, and least conservative, approach does not rely on functional ability at all, and assumes that providers have strong financial incentives to place patients into lower cost settings. This approach would most resemble a bundled payment or ACO scenario in which the hospital (or other convener) is responsible for the overall Medicare payment for a given patient episode.

The final approach (and the approach presented below) is a hybrid and averages the patients' propensity scores from the first two approaches. This approach likely represents the patient's functional ability as well as modest financial incentives for providers within the confines of the existing care structures and processes.

LITERATURE-BASED ASSUMPTIONS: There is one key assumption that was based on the findings from current literature. The assumption is that variables in Medicare claims and assessment data such as clinical need (MS-DRG), patient characteristics (lives alone, demographics),[148] length of hospital stay, unmet discharge need,[149] and regional supply can

[147] If a match was not found on deciles, quintiles were used.

[148] Kane RL, Chen Q, Finch M, et al. (2000). The optimal outcomes of post-hospital care under Medicare. *Health Services Research* 35(3):615-661.

[149] Bowles KH, Naylor MDE, Foust JB. (2002). Patient characteristics at hospital discharge and a comparison of home care referral decisions. *Journal American Geriatric Society* 50: 336-342.

determine patient placement into HHA (or other settings) immediately following discharge from the acute care hospital.[150]

In addition, overlapping patient profiles based on these clinical and demographic characteristics across post-acute care settings (such as the overlap identified in the descriptive statistics chapter) suggest that a proportion of beneficiaries can be safely treated in lower intensity settings. A recent study comparing the efficiency of patients with major joint replacement receiving rehabilitation in SNFs and IRFs did not find a strong relationship between site of service and outcome. The study did find that *when* a patient started rehabilitation was more important than *where*, suggesting that some patients can be more cost-effectively treated in SNFs than IRFs and still achieve the same clinical outcomes.[151] Studies conducted by the RAND Corporation on joint replacement, stroke, and hip fracture have found that many patients have worse outcomes and significantly higher costs when discharged from the hospital to facility-based post-acute care settings rather than home.[152,153]

Furthermore, the recently completed Medicare Post-Acute Care Payment Reform Demonstration compared health outcomes between HHAs and SNFs. The investigators found that beneficiaries receiving home health had a greater increase in functional ability to administer self-care from admission to discharge than beneficiaries admitted to a SNF.[154] Taken together, these findings indicate that some beneficiaries with comparable clinical and demographic characteristics can be treated safely in lower intensity settings.

[150] Marsteller JA, Burton L, Mader SL. (2009). Health care provider evaluation of a substitutive model of hospital at home. *Medical Care* 47(9): 979-985.

[151] Tian W, DeJong G, Horn SD, Putnam K, Hsieh C, DaVanzo JE (2012). Efficient rehabilitation care for joint replacement patients: Skilled nursing facility or inpatient rehabilitation facility? *Medical Decision Making* 32: 176-187.

[152] Buntin MB, Deb P, Escarce JJ, et al. (2005). Comparison of Medicare spending and outcomes for beneficiaries with lower extremity joint replacements. Working Paper. RAND Corporation (WR-271-MedPAC). Retrieved from: http://www.rand.org/pubs/working_papers/2005/RAND_WR271.pdf

[153] Buntin MB, Colla CH, Deb P, et al. (2010). Medicare spending and outcomes after postacute care for stroke and hip fracture. *Medical Care* 48(9): 776-784.

[154] Gage B, et. al. (2011). Post-Acute Care Payment Reform Demonstration Report to Congress Supplement – Interim Report. RTI.

Key Concepts and Findings for Model 1A: Cascade of Care to Most Clinically Appropriate and Cost-Effective Setting

- **Goal of Model: To transfer patients into the most clinically appropriate and cost-effective setting based on the probability that a given patient can receive care in other settings, as calculated using patient demographic, and clinical characteristics, and functional status**
- **Applicable Episode Type: All care during all LTCH, IRF, SNF, HHA, and OP Therapy first setting episodes for selected MS-DRGs**
- **Key Assumptions and Link to Literature**
  - Assumption 1: Variables such as clinical need (MS-DRG), patient characteristics (lives alone, demographics, and functional status), and regional provider supply can determine patient placement immediately following discharge from the acute care hospital.
- **Medicare Savings Estimates**
  - Using a hybrid approach that relies on functional status to determine the clinically appropriate and cost-effective placement of patients, but also recognizes the ability of providers to increase their flexibility to treat patients with lower levels of independence, Medicare could net savings of $2.5 billion in one year. The total savings reflect 2.6 percent of Medicare post-discharge episode spending, and 1.4 percent of total Medicare episode spending in 2008.

RESULTS FOR CASCADE OF CARE TO MOST CLINICALLY APPROPRIATE AND COST-EFFECTIVE SETTING MODEL (Model 1A):

We present the results for the hybrid approach that averages the propensity score for each patient based on the approach that incorporates functional status and the approach that relies on clinical and patient demographic characteristics alone. This hybrid approach assumes that discharge planners and providers will often consider the functional status and independence of a patient in determining a patient's first setting upon discharge from the hospital, and that lower intensity settings are able to treat patients with higher level of dependence (lower functional ability). Due to the matching algorithms, patients are only able to enter care settings from which providers have treated patients of similar complexity. This model is also important because it accounts for shifting across facility and community-based post-acute care settings, including from LTCHs to SNFs and IRFs, from HHA, SNF, and IRF to OP Therapy, and from OP Therapy to HHA (even without functional status variables available).

Exhibit 5.2 shows the proportion of episodes that are shifted based on the current first setting (before the shift) and the clinically appropriate first setting (after the shift). These results indicate that the majority of episodes currently in HHA, SNF, and IRF are clinically appropriate in the setting to which they were discharged from the acute care hospital. We found that 86 percent of HHA first setting episodes remained in HHA, while 80 percent and 69 percent of SNF and IRF first setting episodes, respectively, were also appropriately placed.

Due to the shifting algorithms discussed above in the methodology, episodes were only able to shift into an equal or lower-intensity setting. Therefore, we estimate that about 14 percent of HHA first setting episodes could safely receive care from OP Therapy (as the first setting). However, 71 percent of OP Therapy episodes could receive care from HHA with lower overall Medicare episode payment (which is not just limited to the payment for HHA and OP therapy). About 15 percent of SNF first setting episodes could receive care from HHAs (with caregiver support), and 18 percent of IRF first setting episodes could receive care from SNFs.

LTCH first setting episodes have the largest overall shift, as only 58 percent of episodes remain in LTCHs, while 11 percent could be treated in IRFs and 31 percent could be treated in SNFs. We do not expect that this increased volume in IRFs would impact the 60 percent IRF provider threshold.

Exhibit 5.2: Distribution of Patient Episodes by Current First Setting and Simulated Clinically Appropriate First Setting: Hybrid Approach among Select MS-DRGs

		Clinically Appropriate (Simulated) First Setting				
		OP Therapy	HHA	SNF	IRF	LTCH
Current First Setting	OP Therapy	29%	71%			
	HHA	14%	86%			
	SNF	5%	15%	80%		
	IRF	3%	9%	18%	69%	
	LTCH			31%	11%	58%

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

Exhibit 5.3 presents the overall distribution of episodes by current first setting and simulated clinically appropriate first setting for MS-DRGs included in the model. Overall, the proportion of episodes that receive care in OP Therapy or HHA first settings increases while the proportion in SNF, IRF, and LTCH first settings decreases. OP Therapy could have the largest increase in episodes – from 6.9 percent of episodes to 9.5 percent. HHA could experience an increase in the proportion of all episodes, from 35.8 percent to 43.7 percent.

Of the remaining first settings, SNF could experience the smallest decrease in the proportion of episodes for the select MS-DRGs – from 45.0 percent to 38.4 percent – but this reduction is somewhat magnified by SNF first setting episodes being a large portion of all episodes. IRF and LTCH could experience more significant reductions.

Exhibit 5.3: Overall Distribution of Patient Episodes by First Setting: Hybrid Approach Among Select MS-DRGs

First Setting	Current First Setting	Clinically Appropriate First Setting
OP Therapy	6.9%	9.5%
HHA	35.8%	43.7%
SNF	45.0%	38.4%
IRF	10.6%	7.5%
LTCH	1.6%	0.9%
Total	**100%**	**100%**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

With the shifting of episodes among select MS-DRGs presented above, we model the overall impact on the entire patient episode (including all care settings) across all post-acute care patient episodes. A shift of first setting is often associated with a different mix of services later in the episode. For example, a shift of patient episodes from SNF first setting into HHA first setting will often require additional physician visits or hospital outpatient visits, since home health PPS does not provide reimbursement for the physician services that the SNF PPS includes. When the results of the models are applied to all post-acute care episodes (not just the subset of MS-DRGs that could be shifted) Medicare could reduce its average episode payment by 2.6 percent, or from an average Medicare episode payment of $10,585 to $10,307. This would result in a decrease for the formal (and OP Therapy) care settings, but would hold the remaining care settings in aggregate relatively harmless (Exhibit 5.4).

Exhibit 5.4: Distribution of Average Medicare Post-Discharge Episode Payment (Excluding the Index Acute Care Hospitalization) by Care Setting: Hybrid Approach across All MS-DRGs

Care Setting	Current First Setting	Clinically Appropriate First Setting
OP Therapy	$51	$56
HHA	$614	$628
IRF	$2,118	$1,984
SNF	$612	$516
LTCH	$332	$288
Sub Total	**$3,727**	**$3,472**
STACH	$3,218	$3,201
Physician	$2,575	$2,562
Outpatient	$522	$528
ER	$130	$132
DME	$153	$156
Other IP	$88	$86
Hospice	$171	$169
Sub Total	**$6,858**	**$6,835**
Total	**$10,585**	**$10,307**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

While clinically appropriate and cost-effective placement could greatly impact select settings, the fact that the majority of first setting episodes are currently placed in the most clinically appropriate setting suggests that Medicare expenditures cannot be controlled strictly within the confines of the current delivery system and prospective payment structures. Rather, we interpret these results to suggest that the delivery system must incentivize providers to achieve higher efficiencies and to streamline patient care beyond the current delivery system structures and processes.

MODEL 1B & 1C – RESTRUCTURING OF CARE BEYOND CACEP

GOAL: The goal of Models 1B and 1C is to extend changes to the payment system simulated in Model 1A to achieve additional Medicare savings following discharge from the index acute care hospital beyond clinically appropriate and cost-effective placement. These models assume that an explicit policy to change aggregate post-discharge payments will encourage providers to adjust the structure and processes within which care is provided. Due to the importance of maintaining or improving outcomes and controlling expenditures throughout the overall patient episode, there will be strong financial pressures for post-acute care providers to increase efficiency and reduce Medicare expenditures by modifying their cost structures and reducing their length of

stay. This model resembles the structure of a bundled payment initiative that requires a minimum percent reduction in post-acute care episode expenditures.

METHODOLOGY: Based on the distribution of post-discharge episode payments by care setting resulting from Model 1A for select MS-DRGs included in the analysis, these models calculate the additional percentage change to aggregate post-discharge spending needed to achieve desired savings targets across all MS-DRGs. For the purpose of this analysis, we target 10-year savings between 2014 and 2023 of $70 billion (Model 1B) and $100 billion (Model 1C). This means the Congress would set a specific savings level and CMS would draft regulation to provide for this result. How these cuts are achieved, however, would be at the discretion of the care bundler. The literature suggests that tools are currently available for care restructuring, and the experience with DRGs in the early 1980s suggests that implementation of a national program can produce broad systemic reform on a real-time basis.

Using a goal-seek methodology, post-discharge episode spending in 2008 (excluding the index acute care hospitalization and excluding physician services after the impact of Model 1A) is reduced in each setting proportionate to the distribution of spending after Model 1A. However, since spending in each care setting is projected to grow at different rates during our 10-year study period, the distribution of savings will change over time.

For these models, we assume that CMS would require appropriate quality measures as a significant safeguard for patients. CMS would also need to monitor volume to ensure that volume increases do not undermine payment reduction efforts.

Key Concepts and Findings for Models 1B and 1C: Restructuring of Care beyond CACEP

- **Goal of Model: To extend Model 1A savings to achieve savings targets of $70 billion and $100 billion over 10-years through the restructuring of care delivery**
- **Applicable Episode Type: All post-acute care episodes regardless of first setting or MS-DRG**
- **Medicare Savings Estimates**
  - Achieving Medicare savings of $70 billion over 10 years would require a reduction of aggregate post-discharge episode spending of $5.1 billion in 2008, which represents about 5.3 percent of all post-discharge spending for 2008.
  - Achieving Medicare savings of $100 billion over 10 years would require a reduction of aggregate post-discharge spending of $7.3 billion in 2008, which represents about 7.5 percent of all post-discharge spending for 2008.

RESULTS FOR MODERATE RESTRUCTURING OF CARE BEYOND CACEP (Model 1B):
If an explicit policy were to be implemented that produced Medicare savings of $70 billion over 10 years (2014-2023), Medicare post-discharge episode payments would need to be reduced by 5.3 percent in 2008. These estimates already include the savings from Model 1A, and are not additive.

This model estimates that $5.1 billion would need to be removed from the total Medicare fee-for-service episode payments, according to the proportion of each care setting following the clinically appropriate shift in Model 1A. Of the 5.3 percent reduction in post-discharge spending, savings from SNF care could represent about one-half of the total savings (2.5 percent), while IRFs could represent one-quarter (1.3 percent) of the savings. Readmissions and LTCH services each represent about 10 percent (0.5 percent) of the total savings (Exhibit 5.5).

Physician services only represent a small proportion of the total savings, as they are held-harmless in this model after the shifting of care shown in Model 1A. That is, in order to ensure patient safety and to offset the reduction of care in other settings, we assume no further reduction in payments for physician services.

Exhibit 5.5: Simulated Savings by Care Setting for Moderate Restructuring of Care beyond CACEP

Care Setting	Savings Required in 2008 to Achieve 10-Year Target (in Millions)	Percent of Medicare Post-Discharge Spending*	Percent Savings of Total Medicare Payments by Setting
OP Therapy	-$5	-1.1%	0.0%
HHA	$242	4.3%	-0.2%
IRF	$1,226	21.9%	-1.3%
SNF	$2,403	12.4%	-2.5%
LTCH	$506	16.6%	-0.5%
Readmission	$526	1.8%	-0.5%
Physician	$92	0.4%	-0.1%
Outpatient	$31	0.6%	0.0%
ER	$13	1.1%	0.0%
DME	$21	1.5%	0.0%
Other IP	$18	2.2%	0.0%
Hospice	$46	2.9%	0.0%
Total	**$5,119**	**5.3%**	**-5.3%**

* Post-discharge spending includes payments for care after discharge from the index acute care hospitalization.
Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

RESULTS FOR AGGRESSIVE RESTRUCTURING OF CARE BEYOND CACEP (Model 1C):

For a policy to achieve $100 billion in Medicare savings over the 10-year study window (2014-2023), Medicare post-discharge episode payments would need to be reduced by 7.5 percent in 2008, including the savings from Model 1A.

This model estimates that $7.3 billion would need to be removed from the total Medicare fee-for-service episode payments, according to the proportion of each care setting following Model 1A. Of the 7.5 percent reduction in post-discharge spending, savings from SNF care could comprise about one-half of the total savings (3.5 percent), while IRFs could comprise slightly less than one-quarter (1.6 percent) of the savings. Readmissions comprise 0.9 percent of the total savings and LTCH services 0.6 percent of the total savings. (Exhibit 5.6)

Exhibit 5.6: Simulated Savings by Care Setting for Aggressive Restructuring of Care beyond CACEP

Care Setting	Savings Required in 2008 to Achieve 10-Year Target (in Millions)	Percent of Medicare Post-Discharge Spending*	Percent Savings of Total Medicare Payments by Setting
OP Therapy	$19	4.1%	0.0%
HHA	$542	9.6%	-0.6%
IRF	$1,524	27.2%	-1.6%
SNF	$3,399	17.5%	-3.5%
LTCH	$594	19.5%	-0.6%
Readmission	$845	2.9%	-0.9%
Physician	$92	0.4%	-0.1%
Outpatient	$95	2.0%	-0.1%
ER	$33	2.8%	0.0%
DME	$51	3.7%	-0.1%
Other IP	$24	2.9%	0.0%
Hospice	$69	4.4%	-0.1%
Total	**$7,286**	**7.5%**	**-7.5%**

* Post-discharge spending includes payments for care after discharge from the index acute care hospitalization.

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

Hospital Reduction Model for Ambulatory Care Sensitive Conditions (Model 2)

Model 2 investigates how potential Medicare savings could be achieved under a policy that creates incentives for providers to prevent hospitalizations for ambulatory care sensitive conditions, thus eliminating the acute care hospitalizations for these conditions. As presented in our descriptive statistics, the index acute care hospitalization represents approximately one-half of the Medicare spending for post-acute care episodes.

MODEL 2 – HOSPITAL REDUCTION MODEL FOR AMBULATORY CARE SENSITIVE CONDITIONS

GOAL: The goal of this model is to provide additional home and ambulatory-based care during the pre-acute care episode in order to avoid the index acute care hospitalization while ensuring continued clinical stability and patient safety in the home. Rather than a "readmission" reduction model, we are presenting an index "admission" reduction model for ambulatory care sensitive conditions. These are conditions that AHRQ and researchers have identified preventive quality measures for as they should seldom result in an acute care hospitalization as long as the patient is receiving quality, non-facility-based care.[155,156]

METHODOLOGY: This model includes both the pre- and post-acute care periods for episodes with an index acute care hospitalization for an ambulatory care sensitive condition. There are no restrictions on first setting or care setting episodes in this model. Because our definition of an index acute care hospitalization requires that the patient have no facility-based or home health care 15 days prior to the hospital admission, there is a low proportion of facility-based care in the pre-acute care episodes. As a result, there is no direct way to determine a patient's level of independence (function) or homebound status. Therefore, this model extends home health care to a broader population with ambulatory care sensitive conditions who are at risk for a hospitalization (including non-homebound patients). The goal of this model is to reduce the prevalence of these hospitalizations. In essence, this model allows for the home health benefit to be used for preventative care (in addition to restorative care).

Based on the average Medicare spending for post-acute care episodes (including the index acute care hospitalization), we model a 50 percent reduction of the post-acute care episodes and index hospitalizations for ambulatory care sensitive conditions. As a sensitivity analyses, we also model a 25 percent and 75 percent reduction. Savings estimates are based on the reduction in the index acute care hospitalization for ambulatory care sensitive conditions and the associated post-acute care episode that follows.

[155] Agency for Healthcare Research and Quality. Prevention Quality Indicators Overview. http://www.qualityindicators.ahrq.gov/Modules/pqi_overview.aspx.

[156] List of ambulatory care sensitive conditions available at: http://archive.ahrq.gov/data/safetynet/billappb.htm

These post-acute care episode savings are offset by an increase in home health, ambulatory care (including physician visits), and planned readmission spending, to ensure patient safety and stability during the pre-acute episode. This model allows home health to provide more ongoing care and resembles the services and focus of VA's HBPC. Consistent with the literature (see link to literature section, below), we estimate a 75 percent offset to the savings to account for the additional care provided. For example, for every $1 saved through an avoided hospitalization, the cost of supportive care would increase home health costs (utilization) by $0.75. Total savings are calculated by determining the reduction in the index acute care hospital admission and subsequently avoided post-acute care episodes, offset by the additional cost required to avoid the index acute are hospitalization.

LITERATURE-BASED ASSUMPTIONS: There are two key assumptions supported by the current literature.

Assumption 1: Acute care hospitalizations for ambulatory care sensitive conditions can be avoided. Literature suggests that receiving primary care can reduce or eliminate the need for an acute care hospitalization for these conditions.[157] Specifically, primary prevention, such as preventative care by personal and community-wide efforts, early detection and monitoring of acute episodes, and follow-up and monitoring of chronic conditions has been shown to prevent hospitalizations.[158] Quality Improvement Organizations (QIOs) appear to have reversed a national trend of increased hospitalizations from home settings by working with individual agencies that provide home health care.[159]

Assumption 2: The cost of services needed to avoid an acute care hospitalization averages 75 percent of the cost of the hospitalization and post-acute care (i.e., $1 in costs avoided requires $0.75 in additional care). This care extends the pre-acute care episode, as there is no index acute care hospitalization (and therefore, no post-acute care episode). This conservative assumption is supported by the findings of the evaluations of the VA HBPC program (net savings of 24 percent per participant).[160] Consistent with the literature, because of the medical complexity of the population considered, we felt that it would take a substantial amount of care in the home to avoid the index hospital admission and post-acute care episode.[161]

[157] McCall N, Harlow J, Dayhoff D. (2001). Rates of hospitalization for ambulatory care sensitive conditions in the Medicare+Choice population. *Health Care Financing Review* 2(3): 127-145.

[158] Caminal J, Starfield B, Sanchez E. (2004). The role of primary care in preventing ambulatory care sensitive conditions. *European Journal of Public Health* 14 (3): 246-251.

[159] Rollow W, Lied TR, McGann P, et al. (2006). Assessment of the Medicare quality improvement organization program. *Annals of Internal Medicine* 145: 342-53.

[160] Edes T. (2011). Impact of VA home based primary care: access, quality, and cost. National Health Policy Forum (presentation).

[161] Kaye S, LaPlante MP, Harrington C. (2009). Do noninstitutionalized long-term care services reduce Medicaid spending? *Health Affairs* 28(1): 262-272.

Hospital-at-home programs are one clinical intervention that has been shown to reduce hospitalizations and health care costs while maintaining a high level of quality. The hospital-at-home program implemented by Presbyterian Healthcare Services in Albuquerque, New Mexico saved 19 percent over costs for similar inpatients, with comparable or better clinical outcomes and higher patient satisfaction.[162] In another study of the hospital-at-home intervention, Frick et al. found that costs were more than 30 percent lower than those of usual acute care hospital.[163]

An evaluation of the Medicare Coordinated Care Demonstration further indicates that some hospitalizations, given the right program design, can be safely prevented through care coordination activities such as frequent in-person patient contact, face-to-face physician visits, and medication management. Four of 11 programs that participated in the demonstration reduced hospitalizations by eight to 33 percent among enrollees who had a high risk of near-term hospitalization based on the presence of chronic conditions (such as cardiovascular disease) and a history of recent hospitalizations.[164]

Key Concepts and Findings for Model 2: Hospital Reduction Model for Ambulatory Care Sensitive Conditions

- **Goal of Model: To avoid preventable index acute care hospitalizations through the clinically appropriate use of additional home and ambulatory-based care, modifying the current Medicare home health model to be preventative as well as restorative**
- **Applicable Episode Type: All pre-and post-acute care episodes with an index acute care hospitalization for an ambulatory care sensitive condition**
- **Key Assumptions and Link to Literature**
  - Assumption 1: Many acute care hospitalizations for ambulatory care sensitive conditions can be avoided.
  - Assumption 2: The cost of care to avoid acute care hospitalizations average 75 percent of the cost of the avoided hospitalization (i.e., $1 in costs avoided requires $0.75 in additional care). This care extends the pre-acute care episode, as there is no index acute care hospitalization and no subsequent post-acute care episode.
- **Medicare Savings Estimates**
  - A 50 percent reduction in index acute care hospitalizations for ambulatory care sensitive conditions could result in Medicare savings of $3.0 billion in 2008, or 1.7 percent of post-acute care episode spending (including the index). Savings could range from $1.5 billion (25 percent reduction) to $4.5 billion (75 percent reduction) in 2008, or between 0.8 percent and 2.5 percent of total Medicare post-acute care episode spending in 2008.

[162] Cyer L, Shannon SB, Van Amsterdam M, et al. (2012). Costs for 'Hospital at Home' patients were 19 percent lower, with equal or better outcomes compared to similar inpatients. *Health Affairs* 31(6): 1237-1243.

[163] Frick KD, Burton LC, Clark R, et al. (2009). Substitutive hospital at home for older persons: effects on costs. *American Journal of Managed Care* 15(1): 49-56.

[164] Brown RS, Peikes D, Peterson G, et al. (2012). Six features of Medicare Coordinated Care Demonstration Programs that cut hospital admissions of high-risk patients. *Health Affairs* 31(6): 1156-1166.

RESULTS: About 16 percent (1.4 million) of the 2008 index acute care hospitalizations in our study are for ambulatory care sensitive conditions, which is consistent with published estimates.[165] Medicare payments for the index hospitalization total about $9.4 billion and the total post-acute care episode (including the index acute care hospitalization) contains $24.1 billion in Medicare spending (Exhibit 5.7). The pre-acute care episodes contain $16.3 billion in Medicare spending, which includes the cost of the index acute care hospitalization. Post-acute care episodes for ambulatory care sensitive conditions have an average Medicare spend of $16,840 (Exhibit 5.8). Therefore, this could be the direct savings from avoiding the hospitalization.

Exhibit 5.7: Distribution of Episode Spending for Ambulatory Care Sensitive Index Acute Care Hospitalizations (Model 2) (2008)

	Number of Episodes	Percent of Episodes	Pre-Acute Episode Paid* (in millions)	Post-Acute Episode Paid* (in millions)	Index Paid (in millions)
Total Episodes with Linked Pre- and Post-Acute Care	9,173,580	100.0%	$123,129	$180,095	$83,057
Episodes with Non-Ambulatory Care Sensitive Conditions	7,745,400	84.4%	$106,882	$156,044	$73,688
Episodes with Ambulatory Care Sensitive Conditions	1,428,180	15.6%	$16,246	$24,051	$9,370

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.
* Pre- and Post-Acute Episode Paid includes the Index acute care hospitalization payments.

In modeling a 50 percent reduction in index hospitalizations for ambulatory care sensitive conditions and subsequent post-acute care episodes, Medicare post-acute care savings are estimated to be $12.0 billion in one year (Exhibit 5.8). However, this would be offset by $9.0 billion in additional home health, ambulatory, and planned readmission spending (including physicians). Therefore, a 50 percent reduction in these hospitalizations and post-acute care episodes could result in total Medicare savings of $3.0 billion in 2008.

Exhibit 5.8: Estimated Savings for 50 Percent Reduction in Index Acute Care Hospitalizations for Ambulatory Care Sensitive Conditions (Model 2) (2008)

	Number of Episodes	Average Episode Paid for Avoidable Post-Acute Episodes	Post-Acute Care Savings (in millions)	Home Health Outlays (in millions)	Total Net Savings (in millions)
50% Reduction in Ambulatory Care Sensitive Condition Index Admissions	714,090	$16,840	$12,025	-$9,019	$3,006

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

[165] O'Brien E. (2005). Long-term care: understanding Medicaid's role for the elderly and disabled. The Kaiser Commission on Medicaid and the Uninsured:3.

Our sensitivity analyses suggest that a 25 percent reduction in index hospitalizations for ambulatory care sensitive conditions and subsequent post-acute care episodes could result in Medicare savings of $1.5 billion, which consists of a reduction of $6.0 billion for post-acute care episodes and an increase of $4.5 for additional home health and other community-based services.

A 75 percent reduction in index hospitalizations for ambulatory care sensitive conditions and subsequent post-acute care episodes could result in Medicare savings of $4.5 billion in 2008, which consists of a reduction of $18.0 billion for post-acute care episodes and an increase of $13.5 billion for additional home health and other community-based services.

Hospital Readmission Reduction Models Within HHA First Setting Episodes (Models 3-4)

MedPAC has estimated that Medicare spends $17.4 billion in unplanned hospitalizations within 30 days of the hospital discharge.[166] Within our post-acute care episodes, $29.5 billion is attributed to rehospitalizations within 60 days (16.4 percent of total episode spending). In an attempt to reduce the hospital readmissions, starting in 2014, a portion of hospitals' Medicare reimbursement will be linked to their reported rehospitalization rate within 30 days. If this penalty were to be instituted within a bundled payment system, bundlers could directly hold each provider responsible for the quality of care they provide, and the subsequent cost of rehospitalizations.

In these models, we estimate the potential Medicare savings by reducing the rate of hospital readmissions within HHA first setting episodes. This does not mean, however, that the patient was readmitted directly from the HHA setting. Rather, this analysis captures all readmissions (regardless of the setting preceding the readmission) within the 60-day HHA first setting episode. Therefore, this model investigates the impact of extending the HHA benefit to provide more longitudinal care in order to reduce hospital readmissions. While these patients are homebound immediately following discharge from the index acute care hospitalization, some readmissions may be due to a change in homebound status, forcing providers to discontinue HHA services. To the extent that this discontinuation leads to hospital readmissions, this model allows the provision of home health services to non-homebound patients in order to provide continued care and avoid a hospital readmission.

In this section, we present the methodology and results for regional and national readmission reduction models. The regional models are conducted at the HRR- and MS-DRG level relative to national median readmission HRR rates per 1,000 Medicare fee-for-service beneficiaries. The national models reduce hospital readmissions by defined

[166] Medicare Payment Advisory Commission. (2007). Chapter 5: Payment policy for inpatient readmissions. *Report to Congress, Promoting Greater Efficiency in Medicare.* (Washington, DC: MedPAC).

percentages. Both models are offset by an increase in home health use to keep the patient safe at home.

MODEL 3: REGIONAL READMISSION REDUCTION MODEL

GOAL: Model 3 investigates the potential Medicare savings that could be realized through a reduction in hospital readmission rates per 1,000 beneficiaries at the HRR-level among HHA first setting episodes based on MS-DRG-specific national median readmission rates.

METHODOLOGY: These models are limited to HHA first setting episodes. Within each HRR, an MS-DRG-specific rehospitalization rate per 1,000 beneficiaries is calculated. In HRRs that exceed the national median rate, readmissions are reduced to the median rate. Medicare savings are estimated based on the average avoided MS-DRG-specific readmission expenditures.

These models assume that some level of readmissions within HHA first setting episodes could be avoided. We model an increased utilization of home health care to offset these reductions. Consistent with Model 2, we estimate a 75 percent offset to the savings to account for the additional care that would need to be provided. For example, for every $1 saved through avoided rehospitalizations, the cost of supportive care would increase home health costs (utilization) by $0.75. Total savings are calculated by determining the reduction in rehospitalizations, offset by the additional cost required to avoid that rehospitalization.

LITERATURE-BASED ASSUMPTIONS: There are two key assumptions that are based upon the findings of current literature.

Assumption 1: HRRs with a readmission rate above the MS-DRG-specific national readmission rate can be reduced to the national median. Significant variation in Medicare per capita spending has been noted in several studies, with studies finding that less than half of the variation in spending across areas is explained by population mix and differences in the price of services.[167,168] Evaluations of the VA HBPC in 2002 and in 2007 found that being enrolled in the HBPC decreased participants' hospital bed days by 62 percent and 59 percent respectively. Furthermore, enrollment in HBPC was associated with a 21 percent reduction in hospital readmissions.[169]

Assumption 2: Every $1 of hospital savings will be replaced by $0.75 of supportive care. This conservative assumption is also supported by the findings of the evaluations of the VA HBPC program (net savings of 24 percent per participant).[170] Because of the medical

[167] Gold M. (2004). *Geographic variation in Medicare per capita spending: Should policy-makers be concerned?* Robert Wood Johnson Foundation.

[168] Orszag PR. (2008). *Geographic Variation in Health Care Spending.* Congressional Budget Office.

[169] Edes T. (2011). Impact of VA home based primary care: access, quality, and cost. National Health Policy Forum (presentation).

[170] Edes T. (2011). Impact of VA home based primary care: access, quality, and cost. National Health Policy Forum (presentation).

complexity and/or frailty of the population considered, we felt that it would take a substantial amount of care in the home to reduce hospital readmissions.[171]

Key Concepts and Findings for Model 3: Regional Readmission Reduction Model

- **Goal of Model: To reduce the average readmission rate per 1,000 fee-for-service beneficiaries among HHA first setting episodes to the MS-DRG-specific national median HRR readmission rates**
- **Applicable Episode Type: All care provided for HHA first setting episodes**
- **Key Assumptions and Link to Literature**
  - Assumption 1: HRRs with a readmission rate above the MS-DRG-specific median national readmission rate can be reduced to the national median
  - Assumption 2: Every $1 of hospital savings will be replaced by $0.75 of supportive care
- **Medicare Savings Estimates**
  - Across all HRRs, Medicare could realize a total savings of $520 million by reducing spending for readmissions by $2.1 billion and providing $1.6 billion in additional home health care. Total savings represent 2.2 percent of total Medicare spending for HHA first setting episodes, and 0.3 percent of total Medicare episode spending in 2008.

RESULTS FOR REGIONAL READMISSION REDUCTION MODEL (MODEL 3): Exhibit 5.9 shows that within the 89 MS-DRGs with high utilization,[172] there was a $2.16 billion in Medicare expenditures for readmissions during a 60-day post-acute care episode for HHA first setting episodes. By reducing the regional variation and decreasing the readmission rate of high-utilization HRRs to the national median (readmission rate per 1,000 fee-for-service beneficiaries across HRRs), Medicare could realize about $1.3 billion in savings (about 58 percent of total readmission spending). This could reduce the number of index acute care hospitalizations for ambulatory care sensitive conditions by approximately 38 percent (from 331,940 admissions to about 205,340).

However, in order to achieve this result, care provided by home health would need to increase by about $954 million. As a result, Medicare could realize $318 million in savings. Across the "Other MS-DRGs," there was $1.2 billion in readmission spending, which could be reduced by $807 million. These savings would be offset by $606 million in additional supportive care by home health. This could produce total annual savings of $202 million.

Across all MS-DRGs and HRRs, Medicare could realize a total savings of $520 million by reducing spending for readmissions by $2.1 billion (about 62 percent of total readmission spending), but providing $1.6 billion in additional home health care. This

[171] Kaye S, LaPlante MP, Harrington C. (2009). Do noninstitutionalized long-term care services reduce Medicaid spending? *Health Affairs* 28(1): 262-272.

[172] See Exhibit 2.5 for a description of the MS-DRG filter.

represents 2.2 percent of the total Medicare spending for HHA first setting episodes, and 0.3 percent of total Medicare episode spending in 2008.

Exhibit 5.9: Estimated Savings for Regional Readmission Reduction Model for HHA First Setting Episodes (Model 3) (2008)

MS-DRG Group	Total Readmission Paid (in millions)	Readmission Savings (in millions)	Home Health Outlays (in millions)	Total Net Savings (in millions)
Select 89 MS-DRGs	$2,160	$1,272	-$954	$318
Other	$1,205	$807	-$606	$202
Total	**$3,364**	**$2,079**	**-$1,560**	**$520**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

MODEL 4: NATIONAL READMISSION REDUCTION MODELS

GOAL: Model 4 investigates the potential Medicare savings that could be realized by reducing the national average readmission rate among HHA first setting episodes by 25 percent, 50 percent, and 75 percent. This model differs from Model 3 in that it does not target high readmission rates among HRRs. All HRRs are impacted by this model.

METHODOLOGY: These models are limited to HHA first setting episodes and include all care provided across settings during the 60-day post-acute care episode. At the MS-DRG-level, hospitalization rates are calculated nationally. Savings are estimated as a national reduction in readmission spending.

Similar to Model 3, since these models assume that readmissions with HHA first setting episodes could potentially be avoided, we model an increased utilization of home health care. Consistent with Models 2 and 3, we estimate a 75 percent offset to the savings to account for the additional care provided. For example, for every $1 saved through avoided rehospitalizations, the cost of supportive care would increase home health costs (utilization) by $0.75. Total savings are calculated by determining the reduction in rehospitalizations offset by the additional cost required to avoid that rehospitalization.

LITERATURE-BASED ASSUMPTIONS: There are two key assumptions that were based upon the findings of current literature.

Assumption 1: A portion of hospital readmissions within home health first setting episodes can be avoided. According to the literature, there are several lines of evidence that suggest that readmissions can be reduced. The first is based upon specific interventions at the time of discharge to enhance coordination and transition planning that

has been shown to reduce readmission.[173] Also, supportive palliative care can both reduce rehospitalizations and increase patient satisfaction.[174]

Assumption 2: Every $1 of hospital savings will be replaced by $0.75 of supportive care. As noted above, we base this assumption on the VA experience with the HBPC program, which achieved 24 percent net savings.[175]

Key Concepts and Findings for Model 4: National Readmission Reduction Models

- **Goal of Model: To reduce the average readmission rate among HHA first setting episodes by 25 percent, 50 percent, or 75 percent through more long-term use of home health care.**
- **Applicable Episode Type: All care provided for HHA first setting episodes**
- **Key Assumptions and Link to Literature**
  - Assumption 1: A portion of hospital readmissions from the home health first setting can be avoided
  - Assumption 2: Every $1 of hospital savings will be replaced by $0.75 of supportive care
- **Medicare Savings Estimates**
  - Medicare could save between $210 million and $631 million by reducing readmissions by 25 percent to 75 percent. In order to achieve these savings, there could be an increase in home health spending ranging from $631 million to $1.9 billion. This is between 0.2 percent and 0.7 percent of post-discharge episode spending, and 0.1 percent and 0.4 percent of total Medicare episode spending in 2008.

RESULTS FOR NATIONAL READMISSION REDUCTION MODEL (MODELS 4A, 4B, 4C):

Exhibit 5.10 shows savings that could accrue from reducing hospital readmissions during an HHA first setting episode by 25 percent, 50 percent, and 75 percent. Within the select 89 MS-DRGs (high utilization MS-DRGs), there was $2.16 billion in Medicare expenditures for readmissions during a 60-day post-acute care episode for HHA first setting episodes. By reducing readmissions by 25 percent, Medicare could reduce readmission spending by $540 million and realize a total of $135 million in savings, which includes the increase in spending for additional home health care of $405 million. At the 50 percent reduction, Medicare could reduce readmission spending by $1.1 billion and realize a total Medicare savings of $270 million across these top MS-DRGs, including an increase of $810 million in home health spending. Lastly, a 75 percent reduction in hospital readmissions nationally for HHA first setting episodes could reduce readmission spending by $1.6 billion and produce total savings of $405 million, which includes an increase of $1.2 billion in home health spending.

[173] Jack BW, Chetty VK, Anthony D, et al. (2009). A re-engineered hospital discharge program to decrease rehospitalization: A randomized controlled trial. *Annals Internal Medicine* 150: 178-187.

[174] Jencks SF, Williams MV, Coleman EA. (2009). Rehospitalizations among patients in the Medicare fee-for-service program. *New England Journal Medicine* 360: 1418-1428.

[175] Edes T. (2011). Impact of VA home based primary care: access, quality, and cost. National Health Policy Forum (presentation).

The "Other MS-DRGs" could reduce readmissions ranging from $301 million with a 25 percent reduction to $903 million with a 75 percent reduction. After the home health offset, total Medicare savings ranging from $75 million to $226 million could be realized.

Across all MS-DRGs, Medicare could reduce readmissions ranging from $841 million (25 percent reduction) to $2.52 billion (75 percent reduction). The additional home health care needed to avoid these readmissions ranges from $6.3 billion to $1.9 billion. This could result in total Medicare savings ranging from $210 million to $631 million. This represents between 0.9 percent and 2.7 percent of the total Medicare spending for HHA first setting episodes, and 0.1 percent and 0.4 percent of total Medicare episode spending in 2008.

Exhibit 5.10: Estimated Savings for National Readmission Reduction Model Among HHA First Setting Episodes (Model 4A, 4B, 4C) (2008)

MS-DRG Group	Total Readmission Paid (in millions)
Select 89 MS-DRGs	$2,160
Other MS-DRGs	$1,205
Total	**$3,364**

MS-DRG Group	Readmission Savings (in millions)	Home Health Outlays (in millions)	Total Net Savings (in millions)
Model 4A - 25% Reduction			
Select 89 MS-DRGs	$540	-$405	$135
Other MS-DRGs	$301	-$226	$75
Total	**$841**	**-$631**	**$210**
Model 4B - 50% Reduction			
Select 89 MS-DRGs	$1,080	-$810	$270
Other MS-DRGs	$602	-$452	$151
Total	**$1,682**	**-$1,262**	**$421**
Model 4C - 75% Reduction			
Select 89 MS-DRGs	$1,620	-$1,215	$405
Other MS-DRGs	$903	-$678	$226
Total	**$2,523**	**-$1,892**	**$631**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

In the next chapter, we project our one year (2008) savings estimates for each simulation model to a five- and 10-year estimate.

Projected Impact of Modeled Savings

Our simulation models estimated Medicare fee-for-service savings in 2008 based on post-acute care episodes (except for the modeled reduction in ambulatory care sensitive admissions – Model 2 – which includes the pre-acute care episodes as well). Based on the one-year savings estimates for 2008, we projected savings to Medicare over a five-year (2014-2018) and a 10-year period (2014-2023). In this chapter, we present our projected savings to Medicare fee-for-service spending and note the implications for Medicare trust fund solvency for Models 1A-1C. We also estimate the projected savings if the simulations could be expanded to include Medicare Advantage.

As presented in the Analytic Methodology chapter, savings estimates were developed according to CBOs 2012 current law baseline of total Medicare fee-for-service spending. Annual growth in the current law baseline by care setting is applied to the episode-specific Medicare expenditure levels for 2008. Similar to the savings presented in the previous chapter, beneficiary copayments and deductibles are excluded.

Savings estimates are projected assuming a four year, 25 percent per year, phase-in of the program or assumptions under consideration. Savings estimates are calculated annually and over a five- and 10-year period. Consistent with CBO convention, we offset our aggregate savings with a 25 percent Part B premium offset.

Projected Fee-for-Service Savings

Exhibit 6.1 shows the five- and 10-year savings estimates for each of the simulation models for the Medicare fee-for-service population. We present the findings for each type of model separately.

Projected Impact of Modeled Savings

Exhibit 6.1: Projected Medicare Fee-for-Service Five- and 10-Year Savings Estimates for Simulation Models (in billions)

	One-Year Medicare Savings (2008)		Five-Year Medicare Savings 2014-2023 (in billions)	Ten-Year Medicare Savings (2014-2023)
	One-Year Medicare Savings (2008)	Percent of Post-Discharge Spending* (2008)		
1) Restructuring through Clinically Appropriate and Cost-Effective Placement (CACEP) Models				
Model 1A: Cascade of Care to Most Clinically Appropriate and Cost-Effective Setting Model	$2.5	2.6%	$12.6	$34.7
Model 1B: Moderate Restructuring of Care Beyond CACEP	$5.1	5.3%	$25.2	$70.0
Model 1C: Aggressive Restructuring of Care Beyond CACEP	$7.3	7.5%	$35.9	$100.0
2) Hospital Reduction Model for Ambulatory Care Sensitive Conditions				
Model 2: Hospital Reduction Model for Ambulatory Care Sensitive Conditions	$3.0	1.7%**	$13.9	$37.7
3) Hospital Readmission Reduction Models Within HHA First Setting Episodes				
Model 3: Regional Readmission Reduction Model	$0.5	0.5%	$4.0	$10.3
Model 4A: National Readmission Reduction Model (25%)	$0.2	0.2%	$1.6	$4.2
Model 4B: National Readmission Reduction Model (50%)	$0.4	0.4%	$3.3	$8.3
Model 4C: National Readmission Reduction Model (75%)	$0.6	0.7%	$4.9	$12.5

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2007-2009, wage index adjusted by setting and geographic region and standardized to 2009 dollars. Medicare Savings include care from all facility-based and ambulatory care settings, and excludes beneficiary co-payments and Part D.

* Post-discharge spending includes all payments for care after discharge from the index acute care hospitalization.

** Represents the percent of post-acute care spending, including the index acute care hospitalization.

RESTRUCTURING THROUGH CLINICALLY APPROPRIATE AND COST-EFFECTIVE PLACEMENT MODELS:

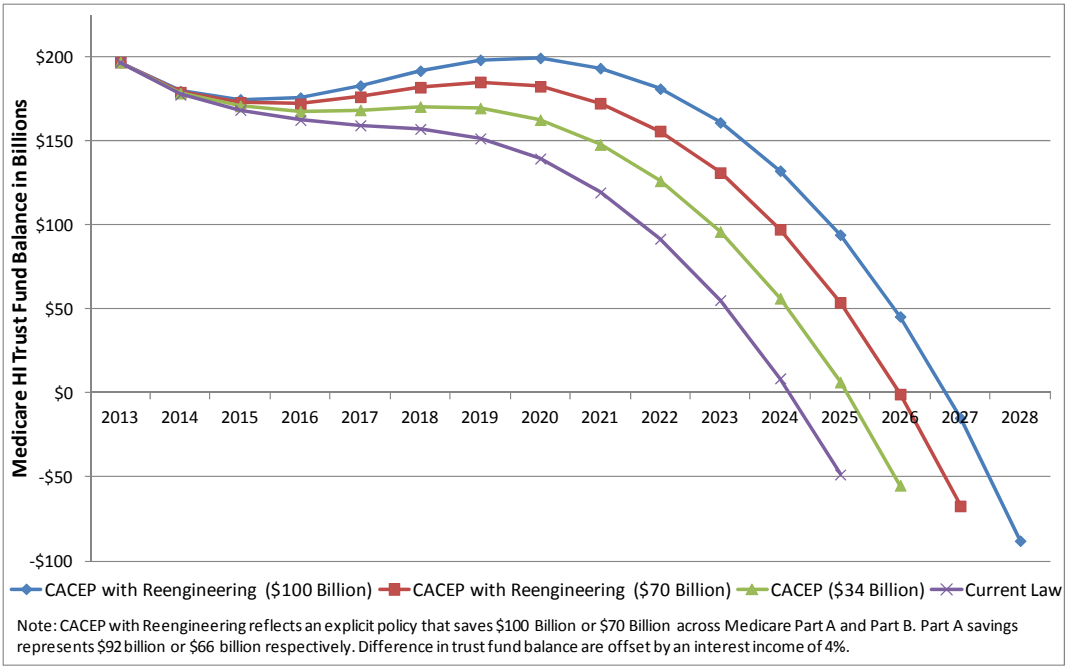
Our models suggest that under the existing care delivery structure and processes, most patients are generally placed in the clinically appropriate and cost-effective setting based on their functional status and clinical characteristics. Therefore, the potential for Medicare savings is somewhat limited. We estimate that improvements in clinically appropriate and cost-effective placement could result in $34.7 billion in Medicare savings over 10 years, or five percent of projected 10-year post-acute care spending. In order for the system to achieve $70 billion in savings over 10 years, moderate restructuring would need to take place, while $100 billion in savings would require significant restructuring.

Based on the projected balance of the Medicare trust fund over the study period, we model the effect of savings of $70 billion and $100 billion on the fund's solvency. Since Medicare trust fund only relates to Medicare Part A spending, the trust fund would not realize the full impact of the $70 billion or $100 billion in savings. Based on the distribution of payments

across care settings, we estimate that $66 billion of the $70 billion and $92 billion of the $100 billion is attributed to Part A spending. We also assume that interest of 4 percent would be applied to Medicare savings estimates, consistent with the Board of Trustees methodology.[176]

Our analyses suggest that Model 1C, which set Medicare savings targets to $100 billion between 2014 and 2023, could extend the life of the trust fund by about 2.5 years beyond CBO's intermediate cost assumptions of 2024. Model 1A, which set Medicare savings targets to $70 billion between 2014 and 2023, could extend the trust fund by approximately two years. Exhibit 6.2 illustrates the impact on the trust fund of implementing Models 1B or 1C.

Exhibit 6.2: Modeled Impact of Clinically Appropriate and Cost-Effective Placement with Restructuring of Care on the Life of the Trust Fund



Note: CACEP with Reengineering reflects an explicit policy that saves $100 Billion or $70 Billion across Medicare Part A and Part B. Part A savings represents $92 billion or $66 billion respectively. Difference in trust fund balance are offset by an interest income of 4%.

Source: Dobson | DaVanzo analysis of research identifiable 5% SAF for all sites of service, 2007-2009.
The Board of Trustees. (2012). 2012 Annual Report of the Board of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds. Retrieved from: https://www.cms.gov/ReportsTrustFunds/downloads/tr2012.pdf

[176] The Board of Trustees. (2012). 2012 Annual Report of the Board of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds. Retrieved from: https://www.cms.gov/ReportsTrustFunds/downloads/tr2012.pdf

Projected Impact of Modeled Savings

HOSPITAL REDUCTION MODEL FOR AMBULATORY CARE SENSITIVE CONDITIONS

Efforts to reduce ambulatory care sensitive conditions have the potential to greatly impact 10-year projected Medicare expenditures for post-acute care. A targeted approach that avoids 50 percent of the index acute care hospitalizations for ambulatory care sensitive conditions could produce savings of $37.7 billion over 10 years.

READMISSION REDUCTION MODELS:

Due to the focused nature of the readmission reduction models, the five- and 10-year savings estimates are modest. Among readmission reduction models, the regional model (Model 3) produces savings that could be between the national readmission model at 50 percent and 75 percent reductions ($10.3 billion over 10 years). This suggests that targeting specific hospital readmissions within HHA first setting episodes within specific regions can produce the same overall Medicare savings as about an across-the-board two-thirds reduction in hospital readmissions within HHA first setting episodes at the national level.

Projected Medicare Advantage Savings

Medicare Advantage expenditures represent 21 percent of total Medicare expenditures in 2008.[177] Therefore, if these simulation results were to be applied to the Medicare Advantage population, we could expect the five- to 10-year Medicare fee-for-service savings to increase by at least 21 percent. While our data do not allow us to determine the use of health care services among Medicare Advantage plans, obtaining this service-level information could be a useful analysis.

These findings suggest that there are several potential paths to significant Medicare fee-for-service savings. However, none of these models in isolation can stabilize the growth in Medicare spending over the near future. Ultimately, more savings will be required of the Medicare program if it is to be made sustainable. These results suggest that restructuring the Medicare delivery system to the magnitude presented in this paper is necessary. Furthermore, these changes should be implemented as soon as possible to avoid even greater cuts to the Medicare program under current payment policies and budget negotiations.

[177] Medicare Payment Advisory Commission. (2009). A Databook: Healthcare Spending and the Medicare Program.

Simulation Among Part D Enrollees

Results have been presented in the previous chapters of analyses of Medicare Part A and B payments for episodes of care across all care settings. Medicare prescription drug payments represent the remaining subset of payments covered under the Medicare fee-for-service service program during episodes. To reflect *total* Medicare payments during an episode of care, this chapter addresses the prescription drug payments for those beneficiaries enrolled in Part D.

There are two primary reasons why the inclusion of these payments is important to the interpretation of our results. First, inclusion of Part D payments allows for a better comparison of the relative Medicare payment differences among post-acute care episodes by first setting. Due to the varying structures of each prospective payment system, the services provided within each setting under Medicare Part A and Part B are not directly comparable. For example, a patient receiving home health care (under Part A or Part B) will have to pay out-of-pocket for their prescription drugs through Part D, while patients admitted to either a SNF, IRF, or LTCH will have their prescription drugs included in the Part A PPS payments for the respective setting. Therefore, the relative difference in aggregate Medicare payments using only Part A and Part B services does not reflect the same service mix.

Second, inclusion of Part D prescription drugs allows us to better understand how drug use contributes to the clinically appropriate placement of patients, and the ability of patients to remain safely in the home. Since CACEP studies placement of patients in the most appropriate setting, the ability of a patient to remain in the home safely is a large determinant of whether the patient can receive home health as opposed to facility-based care. In addition to the functional ability of the patient and the presence of a caregiver, the patient's compliance in taking prescription drugs while remaining in the community may be an important determinant of patient safety in the home setting.

Simulation Among Part D Enrollees

Methodology in Brief

As a voluntary program, not all patients represented in our five percent sample of Medicare beneficiaries are enrolled in Part D. However, about 59 percent of episodes were for a patient enrolled in Part D at the time of their index acute care hospitalization. This includes all dually-eligible patients, as they are automatically enrolled in Part D.

Part D claims were obtained from CMS and linked to our five percent sample of Medicare beneficiaries for 2007 to 2009.[178] The prescription drug claims identify when each prescription drug was filled (and refilled), the drug type and name, the day supply provided, the Medicare and beneficiary out-of-pocket payment amount, and whether the patient was in the "donut hole" or receiving catastrophic drug coverage. This information allowed us to allocate each prescription drug across each CACEP patient episode. For example, if a patient refilled a 30-day prescription 15 days prior to the index acute care hospitalization, we allocated half of the cost of the prescription to the patient episode. The total Medicare payment for all drugs allocated to the episode was calculated (reflecting Medicare payment amount, exclusive of beneficiary co-payments and third party payments).

Literature suggests that lack of noncompliance with prescribed medications can lead to increased use of health care services, as well as hospital, emergency room, and physician office visits.[179] One study found that at least 10 percent of all hospitalizations are caused by lack of compliance with medication regimens.[180] Due to the correlation between medication adherence and patient stability, a patient's compliance with a medication regimen may determine if that patient will be able to remain safely in the home or will need to be placed in a facility-based setting.

Since prescription drugs are provided to patients while receiving care in a facility, we calculated a community-based compliance score for each patient episode. This score captures patient compliance in refilling prescriptions while the patient is in his/her home, including time the patient is in home health care or receiving care from other ambulatory care settings. Home health care is included in this calculation, as the patient is still ultimately responsible for taking his/her own prescriptions daily, and only interacts with a home health nurse during the visits. Compliance scores were calculated for five specific drug types: beta blockers, anti-hypertensives, statins, asthma controllers, and Coumadin. Compliance rates for all other drug types were not calculated.

[178] Data were obtained under DUA #21007. As a DUA requirement, CMS has approved this chapter for release, as it adheres with CMS cell-size limitation policy.

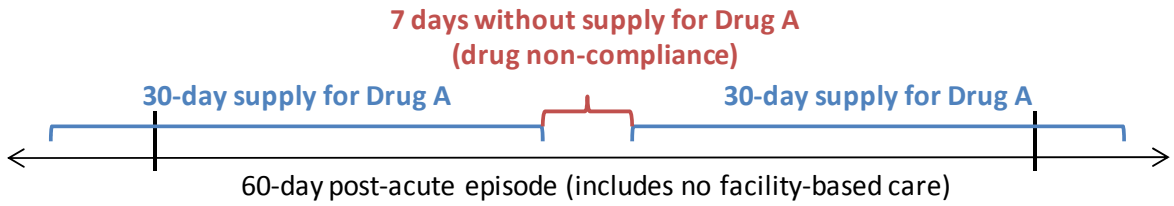
[179] Sokol MC, McGuigan KA, Verbrugge RR, Epstein RS. (2005). Impact of medication adherence on hospitalization risk and healthcare cost. *Medical Care* (43)6; 521-530.

[180] Berg JS, Dischlet J, et al. (1993). Medication compliance: a healthcare problem. Annals of Pharmacotherapy 27(suppl.); S5-S24. As cited in Houston Miller N. (1997). Compliance with treatment regimens in chronic asymptomatic diseases. *American Journal of Medicine*; 102(2A):43-49.

Simulation Among Part D Enrollees

For purposes of this analysis, medication compliance for the selected drug types is determined as the number of days per episode covered under a drug refill divided by the total number of community-based days. An illustrative example is presented in Exhibit 7.1. In this example, the patient is in the community for the entire 60-day post-acute care episode and receives no facility-based care. The 30-day supply of Drug A is completed during the episode, but the next refill of Drug A is not filled until one week later (i.e., 37 days after the first 30-day supply was filled). In this instance, the patient's compliance rate for Drug A is 88.3 percent (60 days minus 7 days, divided by 60 community-based days). The compliance rate for each drug is averaged together within the drug types analyzed. Prescriptions that are not refilled (e.g., a temporary use of Coumadin) are not incorporated into the compliance rate. We do recognize, however, that there are other ways that a patient can be non-compliant with their prescribed drug regimen (such as not taking the prescriptions as directed), but alternative measures of compliance cannot be calculated using administrative claims data.

Exhibit 7.1: Illustrative Example of Calculating Drug Compliance Rates



This chapter compares the patients (on both their clinical and demographic characteristics as well as on health care utilization) who are enrolled versus those not enrolled in Part D. We also compare the Part D payments for drugs taken during the post-acute care episodes and compare total Medicare episode payments by first setting. Using the total Medicare episode payment for Parts A, B, and D services, number of medications, and outpatient compliance score, we replicated the cascade of care to clinically appropriate and cost-effective setting (Model 1A) presented in the previous chapter. The goal of this analysis is to estimate the total Medicare savings that could occur if clinically appropriate and cost-effective placement took into account the Part D Medicare payments, the presence of prescription drugs, and patient compliance.

Simulation Among Part D Enrollees

Descriptive Statistics of Clinical and Patient Demographic Characteristics by Part D Status

This section compares the clinical and demographic characteristics for patient episodes enrolled in Part D compared to those not enrolled in Part D. This information is important to understanding how the patient populations differ and if prescription drug coverage has an impact on the distribution of care settings during post-acute care episodes.

CLINICAL CHARACTERISTICS

Exhibit 7.2 shows the average Medicare episode payment (Part A and B only) for patient episodes by Part D status. The average Medicare episode payment for patient episodes is similar across groups, with those enrolled in Part D only slightly higher ($19,757 versus $19,451). We note that the average Medicare episode payment in Exhibit 7.2 only includes Part A and Part B payments – Part D payments are not included for Part D patient episodes. The distribution of episodes by first setting for Part D versus non-Part D episodes is very similar except for the distribution of episodes in HHA and SNF first settings. Patients not enrolled in Part D have a higher proportion of HHA first setting episodes compared to those enrolled in Part D (13.5 percent compared to 11.7 percent). Conversely, patients enrolled in Part D have a higher proportion of patient episodes with a SNF first setting than those not enrolled (17.1 percent versus 15.0 percent). Given these minimal distributional differences, average Medicare episode payments are very similar across the two groups. This suggests that Part D coverage does not materially impact the Medicare Part A and Part B post-acute care episode payment, by first setting, despite the differences in dual eligibility.

Exhibit 7.2: Distribution of Episodes and Average Medicare Episode Payments by Part D Status by First Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

	Enrolled in Part D		Not Enrolled in Part D	
First Setting	Percent of Episodes	Average Medicare Episode Payment	Percent of Episodes	Average Medicare Episode Payment
HHA	11.7%	$20,643	13.5%	$20,565
SNF	17.1%	$28,923	15.0%	$29,956
IRF	2.5%	$44,754	3.3%	$44,058
LTCH	0.7%	$88,217	0.6%	$93,381
STACH	2.8%	$29,880	2.5%	$29,943
Community	52.2%	$14,878	53.3%	$14,272
ER	3.4%	$16,587	2.4%	$16,361
OP Therapy	1.6%	$15,923	1.1%	$14,421
Hospice	2.0%	$17,744	2.0%	$17,619
Other IP	0.5%	$23,177	0.3%	$24,921
No Care	5.5%	$14,981	6.2%	$14,556
Overall Average	**100.0%**	**$19,797**	**100.0%**	**$19,451**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service (including Part D), 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments.

Exhibit 7.3 shows the distribution of average Medicare episode payments by Part D status by primary chronic condition. Overall, the distribution of episodes by primary chronic condition differs slightly based on Part D status. On average, the population enrolled in Part D coverage has slightly more severe conditions, as indicated by a higher average HCC score for community-risk (3.56 vs. 3.25) (data not shown). The higher severity of patients is indicated in the distribution of patient episodes among the highest-severity conditions.

Patients with Part D coverage have a higher proportion of episodes with a primary chronic condition of CHF*COPD (26.6 percent versus 22.8 percent) and DIABETES*CHF (14.2 percent compared to 12.3 percent) than those not enrolled in Part D. For patient episodes with Part D coverage, the top five most severe primary chronic conditions represent 62.5 percent of all patient episodes, compared to 59.0 percent of patient episodes not enrolled in Part D. However, patient episodes without enrollment in Part D have a higher proportion of episodes with osteoporosis, rheumatoid arthritis/osteoarthritis (RA/OA) and CHF*RENAL. Despite the differences in the proportion of episodes by primary chronic condition, there is little difference in the average Medicare episode payment by chronic condition. It may be the presence of a

primary chronic condition that influences a patient's decision to enroll in Part D, but we could not examine this hypothesis using administrative data alone.

Exhibit 7.3: Distribution of Episodes and Average Medicare Episode Payments by Part D Status by Primary Chronic Condition for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

	Enrolled in Part D		Not Enrolled in Part D	
Primary Chronic Condition	Percent of Episodes	Average Medicare Episode Payment	Percent of Episodes	Average Medicare Episode Payment
CHF*COPD	26.6%	$23,043	22.8%	$22,887
DIABETES*CHF	14.2%	$23,077	12.3%	$22,873
CHF*RENAL	5.5%	$22,971	5.8%	$22,951
Lung Cancer	1.8%	$21,984	2.3%	$22,148
Osteoporosis	14.5%	$17,344	15.8%	$17,336
COPD	7.9%	$16,958	7.4%	$17,174
Rheumatoid Arthritis/Osteoarthritis	10.2%	$17,143	12.1%	$17,312
Hip/Pelvic Fracture	0.5%	$25,433	0.6%	$25,502
Heart Failure	2.4%	$17,895	2.9%	$18,133
Alzheimer's Disease	1.3%	$16,207	1.4%	$16,310
Alzheimer's Disease and Related Disorders or Senile	1.4%	$17,996	1.4%	$18,084
Stroke/Transient Ischemic Attack	1.5%	$18,488	2.0%	$17,368
Colorectal Cancer	0.4%	$22,754	0.6%	$21,812
Depression	3.8%	$14,414	2.1%	$14,938
Acute Myocardial Infarction	0.3%	$19,782	0.5%	$19,053
Ischemic Heart Disease	2.7%	$15,071	4.2%	$14,758
Atrial Fibrillation	0.2%	$14,258	0.4%	$13,748
Chronic Kidney Disease	1.0%	$18,920	1.1%	$17,251
Female Breast Cancer	0.1%	$13,801	0.2%	$13,752
Prostate Cancer	0.1%	$11,604	0.3%	$10,917
Endometrial Cancer	0.0%	$14,913	0.0%	$14,074
Diabetes	0.7%	$12,134	0.8%	$11,547
Glaucoma	0.2%	$11,035	0.3%	$11,395
Cataract	0.4%	$11,211	0.7%	$11,259
None	2.0%	$14,161	2.0%	$14,150
Overall Average	**100.0%**	**$19,797**	**100.0%**	**$19,451**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service (including Part D), 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments.

PATIENT DEMOGRAPHIC CHARACTERISTICS

The demographic characteristics of patients enrolled in Part D are similar to those of patients without Part D coverage. The largest difference is among the proportion of patient episodes that are for dual eligibles. Under current coverage rules, dual eligible patients are automatically enrolled in Part D coverage and have the premiums covered by Medicaid. As a result, 42.3 percent of patient episodes enrolled in part D are dual eligible, compared to just 1.2 percent of patients without Part D coverage (Exhibit 7.4). This small percent may reflect the patient episodes that occurred prior to the patient being granted dual eligibility status. The average Medicare episode payment for non-dual eligibles is very similar by Part D status ($19,527 for those with Part D compared to $19,406 for episodes without Part D). Among the Part D population, dual eligible patient episodes are only slightly more expensive ($20,165).

Exhibit 7.4: Distribution of Episodes and Average Medicare Episode Payments by Part D Status by Dual Eligibility Status for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

	Enrolled in Part D		Not Enrolled in Part D	
Dual Eligibility Status	Percent of Episodes	Average Medicare Episode Payment	Percent of Episodes	Average Medicare Episode Payment
Not Dual Eligible	57.7%	$19,527	98.8%	$19,406
Dual Eligible	42.3%	$20,165	1.2%	$23,185

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service (including Part D), 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments.

Based on the high proportion of dually eligible patients with Part D enrollment, the demographics characteristics of patient episodes vary by Part D status. Exhibit 7.5 presents the distribution of episodes and average Medicare episode payment by patient demographic characteristic.

First, those with Part D coverage are generally younger than those without Part D. About 22 percent of episodes with Part D coverage are 64 years and younger while this age band only represents 8.6 percent of the non-Part D population. Across all age bands, however, those enrolled on Part D have higher average Medicare episode payment. The largest difference is among the 65 to 69 year old population with an average Medicare episode payment of $20,220 for those enrolled in Part D, compared to $18,994 for those not enrolled in Part D.

There are also differences in the distribution of patient episodes by gender. Patient episodes enrolled in Part D have a higher percent of females (likely due to Medicaid eligibility rules) than those not enrolled in Part D (64.7 percent versus 54.2 percent).

Simulation Among Part D Enrollees

There is a smaller difference in the average Medicare episode payment for female episodes by Part D status than for male episodes. Patient episodes for females enrolled in Part D are, on average, only $357 more expensive than non-enrollees, compared to a $756 difference for males.

The difference in the distribution of episodes by race is likely also driven by the high prevalence of dual eligibles. Part D enrollees have a significantly higher proportion of ethnicities represented compared to non-Part D enrollees. About 80 percent of patient episodes enrolled in Part D are White, compared to 90 percent of non-Part D enrollees. As a result, there is a higher proportion of episodes across all remaining ethnic categories for those enrolled in Part D, including Black (13.4 percent compared to 7.4 percent) and Hispanic (2.8 percent compared to 0.7 percent).

The regional distribution of patient episodes does not appear to be significantly impacted by the high proportion of dual eligibles in the Part D population. The distribution of episodes by 10 CMS regions is similar for the Part D and non-Part D populations. The largest differences are among Region IV and V (Atlanta and Chicago). Region IV (Atlanta) has a larger proportion of non-Part D enrollees (23.0 percent compared to 21.5 percent) while Region V (Chicago) has a lower proportion of patient episodes. There also appears to be differences in the average Medicare episode payment by region among enrollees and non-enrollees. The largest difference in the average Medicare episode payment by Part D status is within Region IX (San Francisco). Episodes for patients with Part D are, on average, $1,457 more expensive than for non-Part D enrollees ($21,603 versus $20,146). However, patient episodes for those enrolled in Part D in Region I (Boston) are about $605 less expensive than non-Part D enrollees.

Exhibit 7.5: Distribution of Episodes and Average Medicare Episode Payments by Part D Status by Select Patient Demographic Characteristics for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

	Enrolled in Part D		Not Enrolled in Part D	
Patient Demographic Characteristic	Percent Episodes	Average Episode Payment	Percent Episodes	Average Episode Payment
Age				
64 and Younger	22.5%	$19,749	8.6%	$19,480
65 to 69	13.2%	$20,220	14.5%	$18,994
70 to 74	14.1%	$20,025	16.8%	$19,529
75 to 79	15.0%	$20,109	19.1%	$19,849
80 to 84	15.1%	$19,929	19.2%	$19,740
85 and Older	20.0%	$19,076	21.7%	$19,076
Gender				
Female	64.7%	$19,148	54.2%	$18,791
Male	35.3%	$20,988	45.8%	$20,232
Race/Ethnicity				
White	80.5%	$19,314	90.0%	$19,326
Black	13.4%	$21,962	7.4%	$20,756
Hispanic	2.8%	$21,427	0.7%	$19,711
Asian	1.5%	$22,336	0.5%	$20,406
Other	1.0%	$21,457	0.8%	$20,315
Native American	0.7%	$19,644	0.4%	$18,914
Unknown	0.1%	$20,642	0.1%	$22,588
Region				
Region I-Boston	5.1%	$19,419	5.5%	$20,024
Region II-New York	10.0%	$21,213	10.3%	$20,328
Region III-Philadelphia	11.0%	$20,193	12.2%	$19,771
Region IV-Atlanta	23.0%	$19,297	21.5%	$19,011
Region V-Chicago	17.4%	$19,401	20.3%	$19,206
Region VI-Dallas	11.2%	$20,281	10.5%	$19,946
Region VII-Kansas City	6.6%	$18,334	5.2%	$18,465
Region VIII-Denver	2.9%	$18,268	2.7%	$18,239
Region IX-San Francisco	10.1%	$21,603	9.0%	$20,146
Region X-Seattle	2.7%	$18,608	2.9%	$18,439

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service (including Part D), 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments.

Simulation Among Part D Enrollees

Overall, patients enrolled in Part D appear to be younger, but have a higher proportion of more severe primary chronic conditions. A larger proportion of Part D enrollees are also female, compared to those who are not Part D enrollees. The patient demographic characteristics of this group are likely attributed to the high proportion of patients who are dually eligible for Medicare and Medicaid. Despite the differences in the patient demographic characteristics, those enrolled in Part D have only a slightly higher average Medicare episode payment for Part A and Part B Medicare services. Therefore, there does not appear to be a correlation between Part D status and Part A and Part B spending following an index acute care hospital discharge.

Impact of Dual Eligibility on Medicare Part A and Part B Episode Payments by Part D Status

In order to determine the impact of dual eligibles on the overall average Medicare episode payment for those enrolled in Part D, we compared the average Medicare episode payment for non-dual eligibles enrolled in Part D to those not enrolled in Part D. The results indicate that those enrolled in Part D have a slightly higher average Medicare Part A and Part B episode payment than those not enrolled in Part D ($19,527 compared to $19,406).

The distribution of patient episodes by all demographic characteristics is very similar, indicating that among a non-dual eligible population, enrollment in Part D does not impact Medicare episode payments for Medicare Part A and B, and is not concentrated among specific patient demographic characteristics.

Medication Utilization and Average Episode Payments for Part D Enrollees

With an understanding of how the population enrolled in Part D compares to those without Part D coverage, the remainder of this chapter investigates the use of prescription drugs and Part D payments. That is, in this section we explore how Part D coverage impacts the overall Medicare episode payment for post-acute care patient episodes and the linkage between the number of medications per patient and community-based compliance in taking prescribed medications.

Exhibit 7.6 shows the average number of medications per patient episode at the beginning of each episode (at the time of admission to the index acute care hospitalization) and the average change in the number of medications by the end of the episode, by first setting. On average, patients were prescribed (and filled) 4.3 medications at the time of the index acute care hospitalization. By the end of the patient episode, there was an average increase of 0.9 medications. This is expected given the frequency with which patients are prescribed additional medications following hospital discharge.

Patients discharged to HHA, Community or OP Therapy as a first setting have the highest number of prescriptions at the time of the index hospitalization (about 5 medications per patient episode), but also have the lowest increase in the number of medications. This may be attributed to medication reconciliation (in which some medications for chronic conditions may be eliminated due to duplicate prescriptions) or the smaller number of new medications prescribed upon hospital discharge. Patients with a first setting of

LTCH or Hospice have the lowest number of medications, but higher than average change in the number of medications during the episode.

Among the formal first settings, SNF patients generally have the highest community-based drug compliance while LTCH patients have the lowest. That is, patients that were admitted to a SNF or LTCH following discharge from the index hospitalization have a different compliance rate once they return to the community. HHA first setting patients have a compliance rate similar to SNF patients, which includes their compliance while in home health.

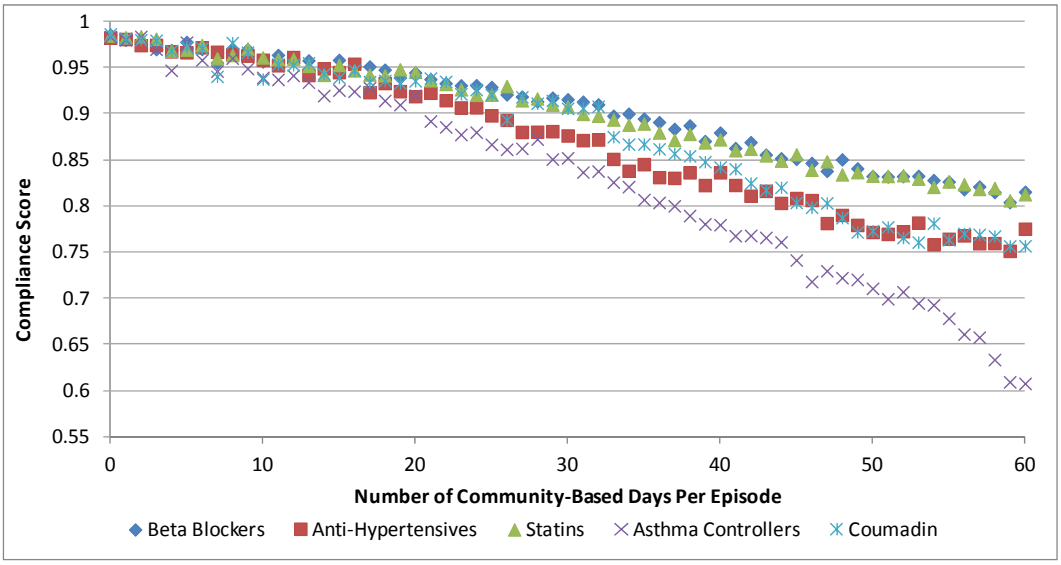
Our analyses suggest that compliance is negatively correlated with the number of days in the community. That is, the more community-based days per episode, the lower the compliance score for each drug type (Exhibit 7.7). Therefore, patients with a facility-based care during their episode will likely have higher compliance since they are in the community fewer days during the episode. These results are generally consistent with our findings by first setting. SNF first setting episodes, which have one of the lowest average community-days per episode, have the highest compliance scores, while Community, ER, and OP Therapy have higher community-based episode days and lower compliance. LTCH and Hospice first setting episodes appear to be anomalous for these trends, as they each treat a very specific type of patient.

Exhibit 7.6: Average Change in Number of Medications and Community-Based Drug Compliance by First Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

First Setting	Percent of Episodes	Number of Medications at Beginning of Episode	Change in Number of Medications During Episode	Average Community-Based Days per Episode	Community-based Drug Compliance				
					Beta Blockers	Beta Anti-hyper-tensive	Statins	Asthma Control	Coumadin
HHA	11.7%	4.9	0.3	56.9	85.7%	79.2%	84.9%	67.9%	76.5%
SNF	17.1%	3.4	2.3	27.8	92.1%	89.2%	91.9%	83.7%	88.4%
IRF	2.5%	4.1	0.6	37.9	80.2%	75.2%	79.4%	66.9%	71.4%
LTCH	0.7%	2.7	2.9	22.7	69.9%	66.7%	70.7%	65.9%	71.4%
STACH	2.8%	4.4	0.7	48.2	84.9%	79.1%	84.3%	73.6%	82.1%
Community	52.2%	4.9	0.2	57.7	84.2%	79.0%	83.4%	64.4%	79.4%
ER	3.4%	4.4	0.4	56.5	80.6%	75.9%	81.2%	63.1%	77.6%
OP Therapy	1.6%	5.2	0.7	57.4	86.6%	80.4%	85.5%	60.8%	76.2%
Hospice	2.0%	1.1	4.3	58.8	58.4%	53.8%	55.8%	49.6%	56.1%
Other IP	0.5%	4.1	0.6	39.6	75.8%	70.2%	72.9%	60.7%	79.4%
No Care	5.5%	1.4	3.5	59.7	59.4%	65.4%	62.2%	51.7%	50.0%
Overall Average	**100.0%**	**4.3**	**0.9**	**51.8**	**84.1%**	**79.5%**	**83.6%**	**66.9%**	**79.2%**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service (including Part D), 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments.

Exhibit 7.7: Distribution of Compliance Scores by Number of Community-based Days per Episode for 60-Day Post-Acute Care Episodes (2007-2009)



Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service (including Part D), 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments.

Exhibit 7.8 shows the average Medicare episode payment, including Part D payment, by first setting. Across all first settings, the average Medicare episode payment including Part D is $20,563, of which $796 is attributed to Part D drugs. OP Therapy first setting episodes have the highest Part D payment ($1,153), while Hospice ($443) and No Care ($366) first setting episodes have the lowest episode payment. HHA first setting episodes have higher prescription drug payment than the other formal care settings since prescription drugs are covered under the Medicare Part A PPS payments for the facility-based settings. Therefore, only prescription drugs provided once patients are discharged from the facility first setting and return to the community are captured in the Part D payment for these episodes.

Once all Medicare services are captured in the average Medicare episode payment, HHA first setting episodes have a total Medicare payment of $21,510, compared to $29,420 for SNF, $45,348 for IRF, and $88,763 for LTCH first setting episodes. The inclusion of Medicare Part D services does not appear to have a significant impact on the relative payment across first setting episodes.

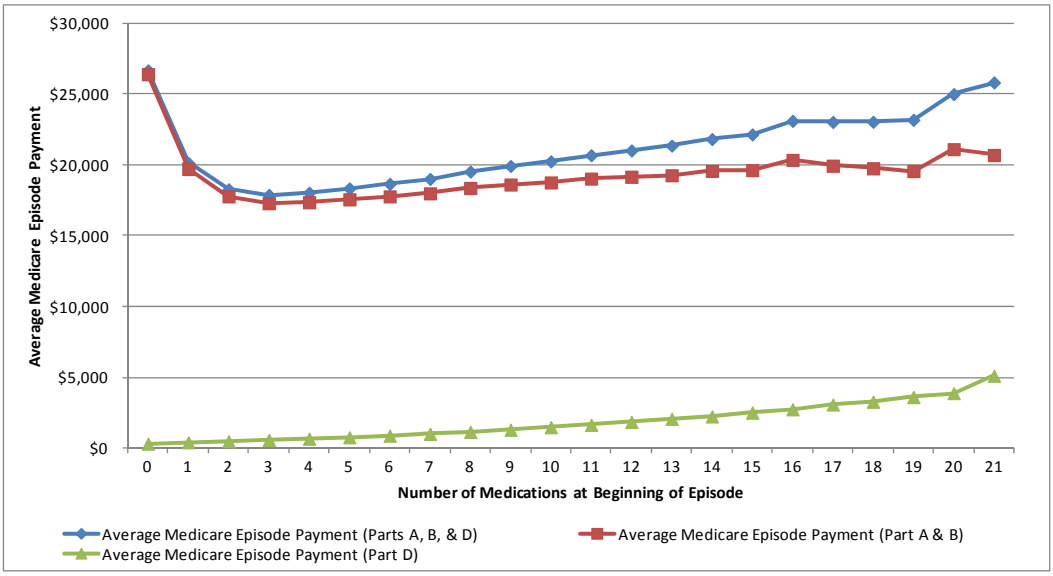
Exhibit 7.8: Average Medicare Episode Payment Including Part D Payments by First Setting for 60-Day Fixed-Length Post-Acute Care Episodes (2007-2009)

First Setting	Percent of Episodes	Number of Medications at Beginning of Episode	Average Medicare Episode Payment		
			Part A & B	Part D	Parts A, B, & D
HHA	11.7%	4.9	$20,643	$889	$21,510
SNF	17.1%	3.4	$28,923	$521	$29,420
IRF	2.5%	4.1	$44,754	$619	$45,348
LTCH	0.7%	2.7	$88,217	$590	$88,763
STACH	2.8%	4.4	$29,880	$901	$30,740
Community	52.2%	4.9	$14,878	$903	$15,756
ER	3.4%	4.4	$16,587	$899	$17,444
OP Therapy	1.6%	5.2	$15,923	$1,153	$17,049
Hospice	2.0%	1.1	$17,744	$443	$18,158
Other IP	0.5%	4.1	$23,177	$1,033	$24,132
No Care	5.5%	1.4	$14,981	$366	$15,303
Overall Average	**100.0%**	**4.3**	**$19,797**	**$796**	**$20,563**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service (including Part D), 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments.

As shown in Exhibit 7.9, as the number of medications at the beginning of the post-acute care episode increases, the average Part D prescription drug cost increases proportionally. However, as the average Part D payments increase by number of medications, there is a linear increase in the average Medicare Part A and Part B payments. The increase, however, is not considerable when there are between three and 15 medications per episode.

Exhibit 7.9: Average Medicare Episode Payment by Number of Medications at the Beginning of the 60-Day Fixed-Length Post-Acute Care Episode (2007-2009)



Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service (including Part D), 2007-2009, wage index adjusted by setting and geographic region, and standardized to 2009 dollars. All episodes have been extrapolated to reflect the universe of Medicare beneficiaries. Medicare Episode Payment includes care from all facility-based and ambulatory care settings and excludes beneficiary co-payments.

Cascade of Care to Most Clinically Appropriate and Cost-Effective Setting Model for Part D Enrollees

Similar to the model we presented in the simulation chapter, we developed the clinically appropriate and cost-effective placement cascade model (Model 1A) for only Medicare fee-for-service beneficiaries with Part D coverage. The goal of this analysis is to estimate the potential Medicare savings across all Medicare services, including Parts A, B, and D for shifting patient pathways to resemble the optimal care based on the clinical, demographic, and functional status of the patient. This model allows us to understand the efficiency of the current delivery model prior to the investigating how care delivery could change with the proper provider incentives.

METHODOLOGY: This model uses the same clinical, functional, and demographic variables as the overall model in order to identify the appropriate formal first setting following discharge from the index acute care hospitalization (see Model 1A in Simulation chapter). However, we include the number of medications for each patient at the beginning of the episode (following discharge from the index acute care hospitalization) in the regressions to control for additional case-mix.

We limited this model to only the hybrid approach that uses and averages the patients' propensity scores from the first two simulations.

Simulation Among Part D Enrollees

Key Concepts and Findings for Clinically Appropriate and Cost-Effective Placement Model among Part D Enrollees

- **Goal of Model: To transfer patients into the most clinically appropriate and cost-effective setting based on the probability of a given patient to receive care in other settings, as calculated through patient demographic, clinical characteristics, and functional status, including the number of Part D medications at the start of the episode**
- **Applicable Episode Type: All care during all LTCH, IRF, SNF, HHA, and outpatient therapy first setting episodes only for patients with Part D coverage**
- **Key Assumptions and Link to Literature**
  - Assumption 1: Variables such as clinical need (MS-DRG) patient characteristics (lives alone, demographics, number of medications filled post-discharge), and regional supply can determine patient placement into HHA immediately following discharge from the acute care hospital
- **Medicare Savings Estimates**
  - Using a hybrid approach that relies on patient functional ability to determine the clinically appropriate and cost-effective placement, but also recognizing the ability for providers to increase their flexibility to treat patients with lower independence, Medicare could save $1.3 billion in one year.

RESULTS FOR CASCADE OF CARE TO MOST CLINICALLY APPROPRIATE AND COST-EFFECTIVE SETTING MODEL FOR PART D ENROLLEES:

Exhibit 7.10 shows the proportion of episodes that are shifted based on the current first setting (before the shift) and the clinically appropriate first setting (after the shift). These results are consistent with the Model 1 results in that they indicate that the majority of episodes in HHA, SNF, and IRF are clinically appropriate in the setting they actually received care from. About 85 percent of HHA first setting episodes remained in HHA, while 80 percent and 68 percent of SNF and IRF first setting episodes, respectively, were appropriately placed.

We estimate that about 15 percent of HHA first setting episodes would be able to safely receive care from OP Therapy, but 70 percent of OP Therapy episodes could receive care from HHA with lower overall Medicare episode payments. About 15 percent of SNF first setting episodes could receive care from HHAs, while 19 percent of IRF first setting episodes could receive care from SNFs.

LTCH first setting episodes continue to have the largest overall shift, as only 44 percent of episodes remain in LTCHs, while 10 percent could be treated in IRFs and 46 percent could be treated in SNFs. Again, we do not expect that the increased volume in IRFs would upset the 60 percent provider threshold.

Exhibit 7.10: Distribution of Patient Episodes by Current First Setting and Simulated Clinically Appropriate First Setting: Hybrid Approach among Part D Enrollees

		Clinically Appropriate (Simulated) First Setting				
		OP Therapy	HHA	SNF	IRF	LTCH
Current First Setting	OP Therapy	30%	70%			
	HHA	15%	85%			
	SNF	5%	15%	80%		
	IRF	4%	10%	19%	68%	
	LTCH			46%	10%	44%

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

Exhibit 7.11 presents the distribution of episodes by current first setting and simulated clinically appropriate first setting. Overall, the proportion of episodes that receive care in OP Therapy or HHA first settings increases while the proportion in SNF, IRF, and LTCH first settings decreases. OP Therapy has the largest increase in episodes – from 7.5 percent of episodes to 10.1 percent. HHA could experience an increase in the proportion of all episodes, from 34.6 percent to 42.4 percent.

Of the remaining formal care settings, SNF could experience the smallest decrease in the proportion of episodes – from 46.6 percent to 40.0 percent. IRF and LTCH could experience a more significant reduction.

Exhibit 7.11: Distribution of Episodes by First Setting: Hybrid Approach Among Part D Enrollees

First Setting	Current First Setting	Clinically Appropriate First Setting
OP Therapy	7.5%	10.1%
HHA	34.6%	42.4%
SNF	46.6%	40.0%
IRF	9.5%	6.6%
LTCH	1.9%	0.8%
Total	**100%**	**100%**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

With the patient shifting assumptions presented above, Medicare could reduce its average post-discharge episode payment by about 1.4 percent, or to an average Medicare episode post-discharge payment of $10,440 (excluding the index acute care hospitalization). This would result in a decrease for the formal (and OP Therapy) care settings, but would hold the remaining care settings in aggregate relatively harmless.

Exhibit 7.12: Distribution of Average Medicare Post-Discharge Episode Payment (Excluding the Index Acute Care Hospitalization) by Care Setting: Hybrid Approach among Part D Enrollees

Care Setting	Current First Setting	Clinically Appropriate First Setting
OP Therapy	$51	$54
HHA	$614	$622
SNF	$2,118	$2,050
IRF	$612	$564
LTCH	$332	$296
Subtotal	**$3,727**	**$3,586**
Readmission	$3,218	$3,209
Physician	$2,575	$2,570
Outpatient	$522	$529
ER	$130	$134
DME	$153	$154
Other IP	$88	$88
Hospice	$171	$171
Subtotal	**$6,858**	**$6,855**
Total	**$10,585**	**$10,440**

Source: Dobson | DaVanzo analysis of research-identifiable 5% SAF for all sites of service, 2008, wage index adjusted by setting and geographic region.

Given that patient episodes for Part D enrollees approximate 60 percent of all episodes, this savings estimate is consistent with the Model 1A results. That is, episodes impacted by clinically appropriate and cost effective placement, are expected to receive the same percent reduction in Medicare post-discharge episode spending.

Discussion and Conclusions

Based on published literature and the use of linked Medicare identifiable patient-level claims data files, this report provides information on how the Medicare program can better utilize home health care to transform the health care system. CMS is promoting the use of similar data to evaluate system reform on a "real time" basis, such as for the ACOs and the BPCI initiative. We used these data to develop descriptive statistics showing the clinical components and payments of Medicare post-acute care, pre-acute care, and non-post-acute care community-based episodes, as well as to conduct simulations at the patient and episode levels. These data and analyses could be highly useful to private and public sector stakeholders who are considering various ways to make the health care system more effective by reengineering the way care is delivered.

Our findings are based on the premise that home care can be supportive of improved care coordination and more successful care transitions, such that some patients – when clinically appropriate – use more cost-effective home care rather than other care settings. Our models assume aggressive implementation of existing innovative care delivery models that have been developed over the last several decades. CMS is currently piloting, demonstrating, and evaluating new delivery models using the types of data files utilized in this study. These developments render the findings of this study ever more important.

Need to Manage Care Transitions

The literature supports the need to improve care transitions in order to reduce readmission rates and to improve patient care outcomes. Many government programs and projects are now geared toward improving care transitions.

For example, one opportunity for community-level collaboration is the Community-Based Care Transitions Program (CCTP) authorized under Section 3026 of the ACA. CCTP serves as a platform to encourage new partnerships to reduce re-hospitalizations at the community level. This demonstration creates a payment mechanism to support hospitals and

community-based providers to form relationships, understand their shared patient population, explore how care is provided in their communities, and implement complementary improvements in each setting of care. This emphasis on the community signifies a structural change in health care delivery and change in a paradigm toward a more holistic approach to care delivery. Care transition programs have been proven successful in reducing re-hospitalizations, such as Naylor's Transitional Care Model and Coleman's Care Transitions Intervention™, as well as a recent integrated primary care-based pilot study on a clinical transitions program for vulnerable elderly patients.[181]

In CCTP, community-based organizations (CBOs) will use care transition services to effectively manage Medicare patients' transitions and improve their quality of care.[182] Up to $500 million in total funding is available for 2011 through 2015. The CBOs will be paid an all-inclusive rate per eligible discharge based on the cost of care transition services provided at the patient level and of implementing systemic changes at the hospital level.

An initiative similar to CCTP is the State Action on Avoidable Rehospitalizations (STAAR), a project of the Institute for Healthcare Improvement, supported by a grant from the Commonwealth Fund.[183] Hospitals participating in the initiative are expected to form a cross continuum team consisting of a hospital and those providers and community agencies with which the hospital frequently shares patients. Each hospital is asked to partner with the "senders" (usually hospital providers), the "receivers" (usually nursing facilities or community-based care providers), and patient and family representatives to collaborate in improving communication and coordination at points of transition from the hospital to the next setting of care. This effort has resulted in 148 hospitals working in partnership with more than 500 CBOs across four states. However, there are no publicly available data to use in evaluating whether the project is achieving its primary goal of reducing avoidable rehospitalizations yet.

These programs and projects offer opportunities in care transitions to work with CBOs and integrate home-based care into the care continuum, especially in CCTP. By building partnerships at the community level, where home health services are being delivered, home health can serve as a "receiver" from other providers or as an alternative to facility-based care. Home health providers serve as a natural point of transition for improving both communication and coordination between patients, their caregivers, and other providers.

[181] Syed H, Chen C, Crane SJ, et al (2012). Hospital readmission and the value of a care transitions program for the elderly: a retrospective cohort study. Primary Health Care: Open Access 2(2): 1000113.

[182] Centers for Medicare and Medicaid Services (CMS). CCTP webpage. Accessed online at: http://innovations.cms.gov/initiatives/Partnership-for-Patients/CCTP/index.html

[183] Boutwell AE, Johnson MB, Rutherford P. (2011). An early look at a four-state initiative to reduce avoidable hospital readmissions. Health Affairs 30(7): 1272-1280.

Conclusion

As former president Franklin D. Roosevelt once said, "The country demands bold**,** persistent experimentation."[184] The existing health care system is unsustainable. The types of reforms discussed and modeled in this study may not be powerful enough to bring the rate of growth of health care expenditures completely in line with overall economic growth. However, if reforms are not broadly implemented over the next few years, the opportunity costs of increasing health care expenditures will become ever more burdensome. If that happens, the types of reform initiatives and provider payment reductions that might result from a deficit-driven political process may not produce better care for Medicare beneficiaries or any other patients.

Although the simulation models presented are based primarily on post-acute care episodes, the implications of our savings models can be applied to both the pre-acute care and non-post-acute care community-based episodes to explore the potential for clinical interventions and Medicare savings outside of a hospitalization or post-acute care services. This is especially true for our ambulatory care sensitive admission reduction model.

Considering our results to date, we have identified areas for future research that could be used to better address the ongoing needs of policymakers, the home health community, and public and private sector decision makers. CMS is promoting "mixed methods" study protocols that integrate qualitative and quantitative study approaches. As we consider research that can build on and extend our initial results, researchers should make use of both qualitative and quantitative methods in their work.

Literature has asserted that appropriate patient placement after discharge from an acute care hospital is critical to quality of care. However, additional research is needed to understand the decision-making process for how patients are transitioned from one setting to the next. It may be informative to conduct a series of site visits to integrated delivery systems and those with "best practices" to inform our understanding of how home care can be better integrated into the fabric of the discharge process. These visits could also help researchers better understand the regional differences we have observed to date in the data. Our database could also be used to identify areas of the country that are obtaining bolder results.

It is equally important to have a better understanding of the clinical profile and precipitating circumstances of patients who are admitted from the community and/or readmitted to the acute care hospital, including a better understanding of the care that preceded the readmission. The functional status of patients over time (as identified in the post-acute care assessment data) may be able to help track patient improvements or declines prior to a readmission. Another area worth exploring is the complexity of how management (or lack

[184] Dionne EJ. (1997). Roosevelt, America's original man from hope. The Washington Post Company.

of management) of prescription drugs impacts patient care and readmission rates. Additional research is also needed to better understand which patients would benefit most significantly from transition to lower intensity care settings in other episode types.

Our descriptive statistics and modeling indicate the need for more powerful payment systems. We contemplate a hybrid payment system that pays on MS-DRGs as does the IPPS, but also pays on patient demographic, clinical and, perhaps, functional status, similar to the Medicare Advantage program. This hybrid system might be appropriate, as payment bundles reflect fixed capitated payments that need to be allocated across multiple providers. Such a payment system might require different payment levels across sites of care (e.g., one level for LTCH settings, and another level for home health), allowing administrators to distribute bundled payments set at varied levels across settings.