
Effective Management of High-Risk Medicare Populations

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EXECUTIVE SUMMARY

In 2009, the top five percent of Medicare's highest spending beneficiaries represented 39 percent of the program's annual total Fee-for-Service (FFS) costs.¹ These beneficiaries are typically vulnerable older adults with multiple chronic conditions and functional impairment. A perfect storm of events is driving payers and providers to better manage the cost of this population: dramatic changes in Medicare payment policy; growth in Medicare Advantage (MA) plan enrollment; and the aging of the FFS and MA-enrolled populations will make it impossible to avoid considerable financial risk.

In today's market, however, managing health care—and by extension, risk—typically focuses on treating a person's medical conditions, such as congestive heart failure (CHF) or congestive obstructive pulmonary disease (COPD). However, new Avalere research suggests that an exclusive focus on medical conditions limits a plan's ability to identify and manage spending for the members most likely to incur the highest Medicare costs. In other words, a sizable portion of Medicare spending is attributable to characteristics and behaviors that occur outside of the health care delivery system.

To succeed in this era of health system transformation, plans and providers bearing risk—in an accountable care organization (ACO), for example—will need strategies for managing a broad array of care needs for high-risk beneficiaries across multiple settings of care. Avalere modeling demonstrates the potential for substantial cost savings when transitions across the continuum of care are managed through established care coordination interventions. This new research suggests a three-pronged strategy for managing care, and thereby risk, for high-risk populations. Based on this research, we recommend that MA plans and other risk holders:

- **Identify the Right Risk Factors.** Non-medical factors are as powerful as medical factors in determining health care utilization. For example, Avalere modeling shows that functional impairment (based on ability to perform activities of daily living, or ADLs), self-reported fair or poor health, and high use of home health care in the prior year increase a Medicare beneficiary's probability of being high-risk in the subsequent year by approximately 7, 8, and 16 percent, respectively. Therefore, traditional methods of analysis that focus on medical conditions will mask opportunities for intervention. Plans must develop risk profiles using a variety of data sources beyond traditional claims or financial data. These can include health risk assessments (HRAs), medical records, and clinical input;
- **Improve Data Collection through Existing Tools.** Through the HRA process, plans have an important opportunity to collect member information that provides risk-identification information, which goes beyond the medical information available in financial data. Typically, MA plans stress easy HRA administration over

comprehensiveness, but some innovative plans have shown that enhanced HRAs help target appropriate care coordination programs for beneficiaries. Plans should invest further in the HRA process as a conduit for powerful, relevant member information, by adding the key questions necessary to identify future high-risk beneficiaries; and

- **Implement Targeted Care Coordination Programs.** After plans understand the full range of individual factors that contribute to high health care utilization, and identify members at highest risk, they can manage care transitions and support broader care coordination for these members. Effective management of key populations not only improves outcomes for plan members, but can yield a positive return on investment (ROI). Avalere's ROI analysis indicates that, for example, the Transitional Care Model, when targeted at high-risk beneficiaries, can yield an ROI of over 250%. In addition, Avalere found that while some programs have significantly different implementation costs, their effectiveness in impacting key metrics was similar.

Because a significant portion of health care spending can be attributed to non-medical factors, successful population management strategies require innovative functional- and lifestyle-oriented programming that goes beyond the typical benefits provided by MA plans. New research provides a strong business case for plans and other risk holders to identify the highest risk beneficiaries and target care management programs that are proven to decrease that risk. Avalere's modeling and resulting ROI calculator demonstrate clear opportunities for bottom line impact.

Supported by a grant from [The SCAN Foundation](#)—advancing a coordinated and easily navigated system of high-quality services for older adults that preserve dignity and independence.

THE OPPORTUNITY TO TAKE A MORE PROACTIVE STANCE ON MANAGING RISK

A small group of high-risk beneficiaries account for a disproportionate share of total Medicare spending due to their heavy utilization of costly, often hospital-based care. Until the Affordable Care Act (ACA), FFS providers had little reason to coordinate or manage care for these beneficiaries, much less understand the individual characteristics most likely to result in high health care spending. MA plan enrollment was relatively low (9.4 million in 2008, prior to the passage of the ACAⁱⁱ) and, with a few exceptions, the enrolled population tended to be outside of the highest risk pool of Medicare beneficiaries.ⁱⁱⁱ

Far-reaching and dramatic changes in Medicare payment are creating a new health care delivery environment that will reward value over volume. In this value-based delivery system of the future, payers and providers will experience a higher degree of accountability for the health of populations as well as risk for the cost of episodes or bundles of services that extend across multiple sites of care. As MA enrollment grows, and providers take on risk, they will increasingly serve an older, and likely more complex enrolled population, but with lower payments that are tied to quality.

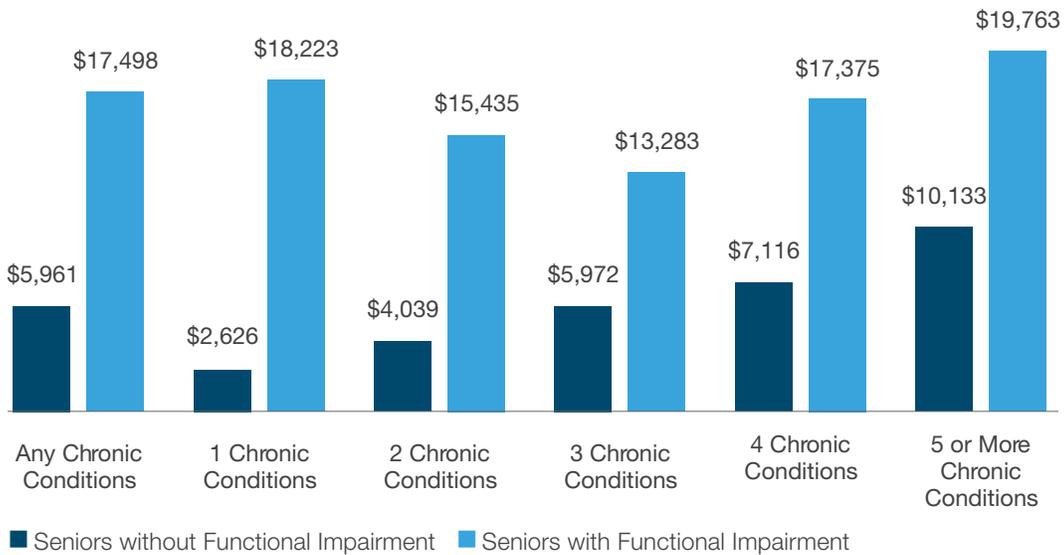
To succeed in this era of health system transformation, provider and insurer organizations will need strategies that go beyond traditional risk mitigation activities (e.g., enrolling healthier-than-average beneficiaries and negotiating lower provider rates). They will need to proactively identify and manage care for the beneficiaries most at risk of high-cost health care utilization. Active care coordination for high-risk populations relies on simple concepts, but the work is hard and extends far beyond traditional disease management.

The challenge that any risk-bearing organization faces in taking on the task of high-risk care coordination is that little research exists to identify the full range of bio-psycho-social factors that lead to high health care utilization. Research tends to focus narrowly on the medical conditions associated with health care utilization because payers have easy access to health information on the claims providers submit for payment. As a result, most MA plans and provider strategies to identify high-risk members rely only on claims data analyses, which overlook characteristics critical to care coordination such as lifestyle factors and functional and cognitive impairment.

The good news is that a growing body of research is providing additional guidance on the full range of individual characteristics that contribute to high health care spending, and therefore indicate areas for targeted care coordination programs. In particular, recent Avalere research focused on the impact of functional impairment, as a proxy for long-term services and supports (LTSS) need, on health care spending. Functional impairment refers to the inability to perform activities of daily living (ADLs) such as bathing and eating, or instrumental activities of daily living (IADLs), such as using the telephone or managing money, without assistance.

Data from a 2011 Avalere and The SCAN Foundation study suggest that when an underlying chronic condition accompanies an inability to care for oneself independently, per capita health care spending can double (Figure 1).^{iv} For example, high health care spending, such as emergency department (ED) visits, may result as much from the risk of falls associated with diabetes as it does the medical complications.

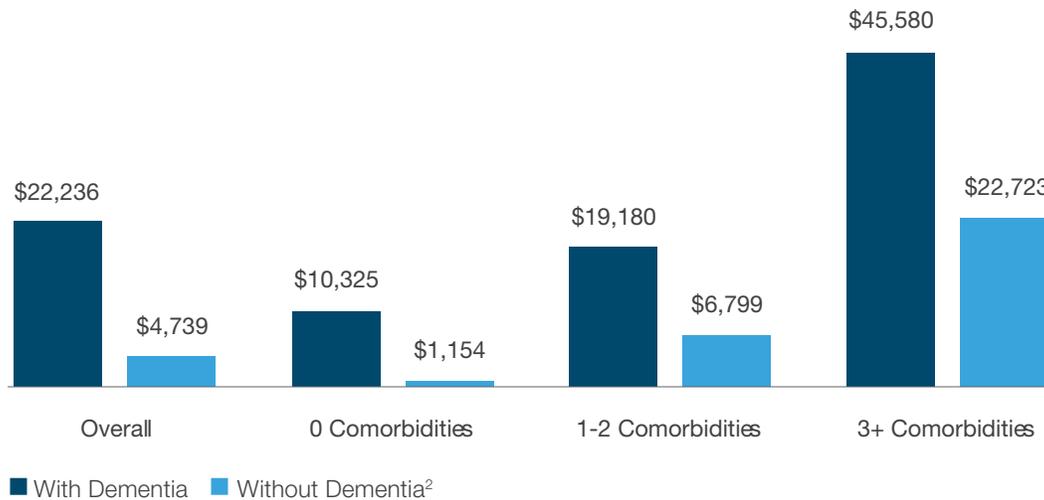
Figure 1: 2006 Per Capita Medicare Spending by Chronic Conditions and Functional Impairment



Source: Avalere Health analysis of the 2006 Medicare Standard Analytic Files.

A similar analysis on cognitive impairment (CI) reveals the same relationship. Medicare spends almost four times as much for beneficiaries with cognitive impairment, such as Alzheimer’s disease or dementia, than for those who do not have a cognitive impairment. In fact, the per capita Medicare cost for an individual with CI is over \$45,000 when three or more comorbidities are involved compared to \$22,723 (Figure 2).

Figure 2: Per Capita Medicare Spending By Presence of Alzheimer’s/other Dementia Diagnoses and Number of Comorbidities, 2009



Source: Avalere Health analysis of the 2009 Medicare Standard Analytic Files

The output of these analyses led us to theorize that psychosocial characteristics may strongly predict health care spending even when other characteristics are held constant. As such, programs aimed at coordinating the care of individuals with functional impairment and other psychosocial high-risk indicators could offer opportunities for savings.

With funding from The SCAN Foundation, Avalere conducted research to test this theory and to offer practical suggestions to plans for collecting and analyzing a more complete set of data using their HRA instruments. Specifically, the goals of this work were to

- Promote greater understanding of "high-risk" Medicare beneficiaries and the characteristics that are predictive of high Medicare service use and spending;
- Evaluate the state of HRAs used by MA plans and recommend key improvements; and
- Illustrate a quantifiable range for the ROI for selected care coordination programs.

The research had three components: 1) a multi-variate model using a combination of survey and claims data from the Medicare Current Beneficiary Survey (MCBS) cost and use file 2007 – 2010; 2) a literature review and interviews to determine how HRAs are used; and 3) an ROI analysis and calculator for evidence-based care management and care transitions programs. The following report presents the findings and their implications.

IDENTIFYING HIGH-RISK BENEFICIARIES¹

As a first step towards understanding the opportunity and challenges of managing the high-risk Medicare population, Avalere analyzed the person-level characteristics associated with high Medicare spending with a focus on identifying predictive non-medical characteristics, such as functional and cognitive impairments and social support needs, among others.

To accomplish this goal, Avalere conducted a quantitative analysis of Medicare FFS beneficiaries in the MCBS for years 2007 through 2010. The MCBS is a useful data source for these purposes since it combines patient-level claims data with the results of a panel survey that includes non-claims based items such as the patient's self-reported health status, functional and cognitive impairments, social support needs, and other socio-demographic information.

While the breadth of beneficiary-level information provided through the MCBS creates important analytic opportunities, sample size issues posed challenges for testing the characteristics of very high-utilizers (top 5%). Accordingly, we analyzed the spending data for the top 20 percent of Medicare FFS spenders to ensure adequate sample sizes.

Our goal was to test the relative power of person-level characteristics to predict whether a beneficiary will be in the top 20 percent of Medicare FFS spending and to test this power across five domains: demographics, clinical condition and inpatient/outpatient utilization, functional impairment, cognitive impairment, and social support/residential status. We selected these domains and the variables within each based on the findings from a literature review and an analysis of their reliability in the MCBS. We reviewed the sample sizes for each survey question and used only those variables we assessed as reliable.

We then applied logistic regression models to determine which person-level characteristics were associated with the largest increases in the probability of being a high-risk Medicare beneficiary, defined as being in the top 20 percent of total Medicare FFS spending in the subsequent year. For example, we used a beneficiary's person-level characteristics from 2009 to predict 2010 spending, and then compared actual 2010 spending to expected spending to determine which characteristics were most associated with being in the top 20 percent of spending. These regression models computed results using 2007 and 2008 data, and were tested on 2009 and 2010 data to calibrate and test the reliability and accuracy of the model specifications. A more detailed explanation of our methodology is provided in the Appendix.

Key Findings from Predictive Models

As expected, several of the characteristics that increase the probability of being high-risk are related to a beneficiary's medical condition. The baseline probability of being a high-risk Medicare FFS beneficiary is 20 percent—since we've defined “high-risk” as having Medicare spending in the top 20 percent. The predictive models produced a range of changes in probability between -4.9 percent (for beneficiaries who have experienced a stroke in the prior year) through +16.2 percent (for beneficiaries with more than 41 home health visits in the prior year). For example, beneficiaries who have experienced a stroke in the prior year have a lower probability of being high-risk in the subsequent year, by almost 5 percent. Conversely, beneficiaries with high home health utilization in the prior year have a 16 percent higher likelihood of having high Medicare spending in the next year. As Table 1 shows, having diabetes with complications increases a Medicare beneficiary's probability of being in the high-risk group by 8.8 percent. Perhaps the single largest contributor to being high-risk in a given year is being a high spender in the prior year. For example, a beneficiary who was in the top 10 percent of Medicare FFS spending in the prior year is 11.3 percent more likely to be in the top 20 percent of spending in the next year; similarly, those who were in the top 20 percent in the prior year are 8.8 percent more likely to be in the top 20 percent in the next year.

Table 1: Key Medical Contributors to High Medicare Spending

MEDICAL BENEFICIARY-LEVEL CHARACTERISTIC	INCREASE IN HIGH-RISK PROBABILITY ¹
High Medicare home health utilization (41 or more visits) in the prior year ⁴	16.2%
High Medicare spending in the prior year (PMPM)	
Being in the top 10 percent of spending in the prior year	11.3%
Being in the top 20 percent of spending in the prior year	8.8%
Diabetes with complications	8.8%
Neurological or mental health conditions	
Neurological conditions	8.8%
Psychological conditions	6.4%
Cardiovascular conditions	
Acute Myocardial Infarction	8.6%
Vascular conditions without complications	7.5%
High hospital outpatient (34 or more visits) utilization in the prior year	7.8%
Kidney disease	6.8%

However, and potentially more importantly, some non-medical characteristics increase the probability of being high-risk but cannot be definitively identified using administrative claims. These characteristics play a major role in predicting whether a beneficiary will be high-risk in a given year (Table 2). For example, requiring assistance with ADLs and/or IADLs increases a beneficiary’s likelihood of being high-risk by about 7 percent. Across the various non-clinical, or non-medical, beneficiary-level characteristics, we found that the strongest single predictor of being high-risk was high home health utilization in the prior year. This factor increases a beneficiary’s likelihood of being in the top 20 percent of Medicare spending by about 16 percent. Another non-clinical risk factor is fair or poor self-reported health, which increases a beneficiary’s likelihood of being high-risk by approximately 8 percent. In addition, having a high volume of hospital outpatient services (over 40 visits in the prior year) or being 85 years of age or older are associated with increases of almost 7 percent, for each factor, in the probability of being high-risk in the following year.

Among other non-medical characteristics, we found that the beneficiary’s living situation also increased their likelihood of experiencing costly adverse events which lead to being in the top 20 percent of spenders, such as whether the beneficiary lives in a residential care setting (such as an assisted living facility) or nursing home rather than living in the community. For those who lived in residential care settings or nursing homes, the likelihood of being high-risk in the next year increased by 4.5 percent and 1.8 percent, respectively, relative to community-dwelling beneficiaries.² There are many other beneficiary-level characteristics associated with being high-risk in any given year. For details on the impact of additional variables, please refer to the Appendix.³

Table 2: Key Non-Medical Contributors to High Medicare Spending

NON-MEDICAL BENEFICIARY-LEVEL CHARACTERISTIC	INCREASE IN HIGH-RISK PROBABILITY ¹
Self-reported fair or poor health status	8.1%
Having moderate functional impairment ⁵	6.9%
Age 85 and older	6.6%
Living in a residential setting in the prior year	4.5%
Living in a nursing home in the prior year	1.8%

These results point strongly to a very important set of beneficiary characteristics that predict risk of high Medicare spending: those that are associated with difficulties related to activities of daily living—in other words, needing LTSS. As shown in Table 2, heavy use of home health care (under the Medicare FFS benefit) in the prior year, having moderate functional impairment, and living in settings that provide LTSS have a significant impact on the likelihood of being in the top 20 percent of Medicare spending. These characteristics, as well as advanced age, all indicate a need for LTSS.

There were many potentially important characteristics that did not appear as powerful in our analysis because of statistical and modeling limitations. Some of these characteristics include having high emergency department utilization in the prior year and having select multiple chronic conditions. Despite the relatively lower changes in probability of a few non-medical characteristics, we believe that together these characteristics indicate the importance for health plans and other at-risk organizations to take a closer look at their costly populations to develop a more sophisticated understanding of the predictors of risk.

This analysis supports the opportunity for MA plans and other risk bearers to reduce their costs and increase quality by targeting high-risk members with care coordination services. While avoiding hospitalizations is a key goal in general, there is an opportunity to improve care continuity as this particularly frail subset of the Medicare population is transferring across settings of care; often, from hospital to post-acute and long-term care services.

Using Critical Data to Effectively Identify High-Risk Members

The greatest gap in population health management tools is the availability of member-level data to better identify clinical and financial risk. Currently, most plans have an incomplete picture of their members' health profiles because they are analyzing only the data available in the member's medical claims history.

Paid claims are one narrow piece of a member's profile and are limited to the elements that are used to pay providers. Administrative claims and/or enrollment data do not provide information about improvements in functional ability, whether a member lives alone, or whether the member has proper nutrition, for example. As such, plans need other sources of data to create a more comprehensive member profile. Specifically, there are three main sources of information we have identified that can be leveraged to fill the gaps in the membership profiles:

1. **Administrative data:** Information collected from enrollment and claims-based files that consists primarily of a member's recent medical conditions, health care utilization (including pharmacy data), and expenditures.

2. **HRAs:** A screening tool currently used by MA plans to supplement administrative claims data. This tool could be expanded to capture information about a member's functional and cognitive abilities, social support needs, and additional lifestyle characteristics. This critical information can both inform risk stratification as well as individualized care planning efforts.
3. **Clinical input:** Though we did not test such input in our predictive model, there is evidence that additional clinical and medical information (beyond what is gathered in an HRA) is useful for ongoing risk detection and care coordination efforts. Particularly in the context of electronic records, information that clinicians collect about a member through day-to-day interactions over time can be used to ensure that members' risk scores and care coordination programs remain accurate and effective. Plans should continuously refine their risk stratification modeling as they learn more about their member population via clinical input.

Plans can incorporate and utilize these three sources to generate a more complete picture of members. While a plan may have little control over the format and content of claims and clinical input, the plan (and providers) can specify the types of information collected in the HRAs. Altogether, combining claims data, HRA responses, and clinical input into an MA plans' risk stratification analysis can significantly increase the plan's ability to predict whether a member will be high-risk and thereby enroll the member in the most cost-effective care coordination program.

Hypothetical Case Study

The following hypothetical example illustrates how incorporating more member-level information into risk prediction models can improve a plan's ability to identify members who would likely benefit from targeted care coordination programs to reduce unnecessary, high-cost utilization. The claims-level utilization and spending data presented in this example are derived from the Medicare Standard Analytic Files (SAFs) for 2011 and 2012. Avalere created fictional member-level data, for example, high blood pressure, bone loss, smoking status, exercise, and nutrition, to name a few) to illustrate the type of information that could be collected from administrative records, HRAs, and clinical input. All of these components are likely to improve the plan's ability to better identify high-risk members and target interventions customized for the member's needs.

Case Study: A plan has a member, Ruth, who had \$128,000 in Medicare spending in 2012, consisting of two inpatient stays, four readmissions, and nine ED visits. Using Medicare claims history alone, the plan might assume that her demographic and clinical characteristics (female, 91 years of age, with COPD and high Medicare

spending in the prior year) were the main causes of her spending this year. With this limited medical history, our analysis shows that the combination of these particular member-level factors (i.e., high Medicare spending in the prior year, older age, and diabetes) would lead the plan to predict the member's likelihood of being high-risk at approximately 35 percent—a relatively low risk member. Since the plan would not have identified this member as high-risk, the plan would not have enrolled her in any care coordination programs. Over the course of the year, this member could incur significant spending without much explanation due to the limitations of claims data.

Figure 3

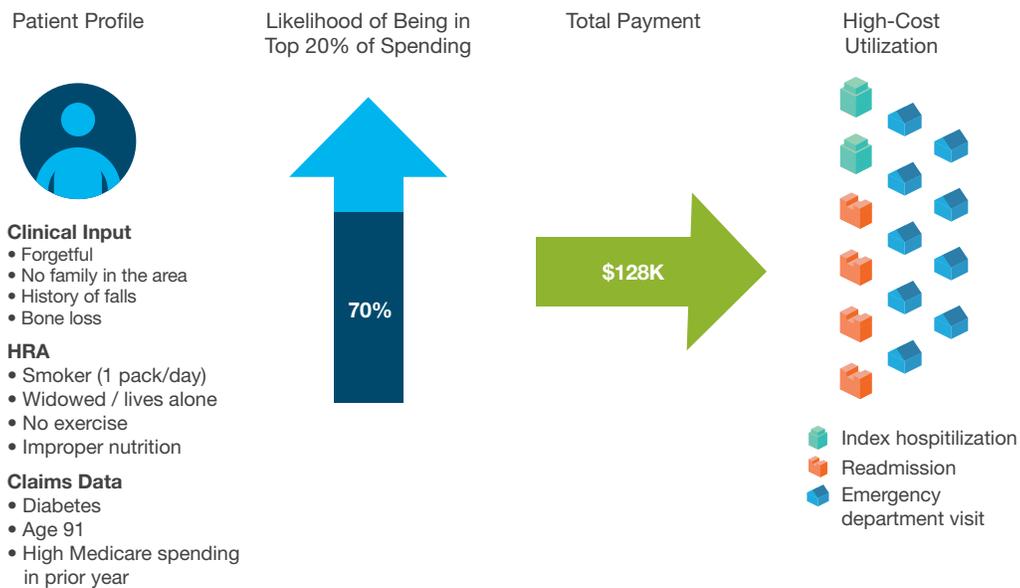


As seen in Figure 3, claims data restricts the plan's understanding of this member's risk factors to only three characteristics: (1) diabetes, (2) age 91, and (3) high historical Medicare spending. However, there are eight other characteristics that could increase Ruth's risk score if they were uncovered: (1) forgetfulness, (2) no family in the area, (3) a history of falls, (4) bone loss, (5) smoker, (6) lives alone, (7) no exercise, and (8) improper nutrition. As seen in Figure 4, these characteristics, as part of a sophisticated risk prediction model, could raise Ruth's risk of being high-risk closer to 70 percent.

Ruth's high-cost utilization that year may have been due to her tendency to fall, leading to a \$20,000 ED visit, or improper nutrition, which could lead to multiple \$35,000 readmissions as it impedes her ability to recover or manage her comorbid conditions. In this way, her high-cost utilization can be mostly explained by the

characteristics found through HRAs and clinical input; claims data alone would not capture these key contributors to her high spending. If the plan used a diverse range of data sources for risk stratification efforts, it would have a better understanding of why this member incurred \$128,000 in health care expenditures in 2012.

Figure 4



OPPORTUNITY TO ENHANCE THE USE OF HRAS

As discussed, one data collection tool that offers a particularly strong opportunity to improve identification of high-risk members is the HRA. HRAs can strengthen risk stratification and care management activities by capturing key information about members' health (e.g., family history, lifestyle, and functional status) that are not stored in claims data. As part of this study, Avalere conducted a qualitative analysis of the state of HRA administration to identify current practices and opportunities for improvement.

To evaluate the state of HRAs used by payers, Avalere reviewed federal and state regulations as well as literature from over 50 scientific publications, research studies, and news articles. In addition, Avalere conducted interviews with more than 10 HRA experts from health plans, HRA vendors, and a physician group practice to supplement the literature review.⁶ This qualitative analysis sought to understand common HRA practices, potential shortcomings, and recommendations for improvements.

Background on HRAs

HRAs are health-related questionnaires that are conducted telephonically, in-person, online, or through mailed questionnaires. Essentially, HRAs ask members to assess their health status across a variety of dimensions, such as functional impairment (e.g., ADL/IADL needs), family history, lifestyle, nutrition, behavior, and social support, with the goal of generating a more complete picture of the enrollee. HRAs are able to identify health behaviors and risk factors that would not be picked up in claims data.^v

The Center for Medicare & Medicaid Services (CMS) requires MA plans to administer HRAs as part of the annual wellness visit, which is now required by plans for all Medicare Advantage plan members. The stated purpose of an HRA is to provide a systematic way of identifying a member's health status, risk of injury, modifiable risk factors, and urgent health needs to ultimately inform a personalized prevention or care plan in 34 elements.^{vi} CMS did not require that MA plans utilize a specific HRA form. Instead, it requested that the Centers for Disease Control and Prevention (CDC) create and publish guidance on HRA questionnaires and administration. In December 2011, the CDC released its recommendations on HRAs, which included a sample HRA questionnaire; however, the example did not contain all of the 34 elements required by CMS.^{vii} MA plans have limited guidance from CMS, and therefore significant flexibility in how they administer and what data they collect via HRAs.

Most MA plans prioritize quick and easy HRA administration and high response rates over longer HRAs administered by clinicians. However, some MA plans have developed innovative, strategic uses of HRAs in order to identify high-risk members.

Uses of Enhanced HRAs

MA plans and vendors often build upon existing HRA questionnaires to create updated or customized versions. Most health plans that were interviewed for this study stated that they tweaked available HRAs, such as CMS',^{viii} SF-7 or SF-12,^{ix} Pra or PraPlus,^x and/or competitors', to build their own HRA. Plans can further customize existing HRAs to target specific high priority populations. For example, *LifePlans Inc.*, a firm interviewed for this study, works with health plans to collect specific non-medical information on their HRAs. For example, *LifePlans* customized HRAs for plans specializing in end-stage renal disease (ESRD) and diabetes prevention and management.

Enhanced HRAs can effectively uncover risk factors within high-risk Medicare populations. *LifePlans* advises its health plan clients to collect data such as whether a member had: (1) difficulty with more than two ADLs and no paid caregivers, (2) three hospitalizations in

the last six months, and/or (3) three or more falls in the last six months. *LifePlans* has found, anecdotally, that the two characteristics that appear to best predict potentially high-risk members are (1) balance problems in the past week or (2) difficulty chewing and/or swallowing.

HRAs can also help plans identify LTSS needs and keep members with these needs in the community by identifying necessary resources and supports. For example, Peak Health Solutions, a health care management services company that offers coding and auditing, risk adjustment, education, and data analytics services, uses HRAs to help its health plan clients identify LTSS needs. Peak's indicators for assessing LTSS needs include family and caretaker support; difficulty with ADLs; physical status; home modifications like grab bars in the shower, use of a walker, or, hospital bed; and needs assistance toileting and/or dressing. In general, interviewees noted that HRAs can assess LTSS needs by evaluating the following domains:

- ADLs and/or IADLs
- Behavioral/ mental health
- Cognitive function
- Family and caregiver support
- Frailty and fall risk
- Functional status
- Having a regular primary care physician
- Living situation (e.g., lives alone)
- Skin issues (e.g., wounds, ulcers)
- Home safety (e.g. whether the member has grab bars in the shower, has a ramp, uses a walker, or has a hospital bed)
- Nutrition and/or access to proper meals
- Transportation

These examples highlight some innovative uses of HRAs that collect extensive information about key member populations. Enhanced HRAs may require more financial investment on the part of the plan, but the ability to meaningfully assess risk can allow plans to better coordinate the care of their members. In addition, enhanced HRAs can benefit plans and providers by improving patient satisfaction scores and member retention rates; this is especially true in the case of in-person HRAs.

Using HRAs to Support Care Coordination Programs

Currently, MA plans can use data collected by HRAs to refer a member to care management and/or assist in the development of a care plan; however, not all MA plans do this. Using HRAs to support care coordination efforts presents an important opportunity for MA plans to improve their members' quality of life, enhance population management, and decrease future costs.

While most of the health plans interviewed for this study handled care management in-house, some used HRA vendors, like Peak Health Solutions and OptumInsight's QualityMetric, for additional care planning services. Peak Health Solutions creates physician referrals for plan members and makes home modification recommendations, while QualityMetric provides complex care management services such as home visits by nurses and other community-based services. In addition, some HRA vendors create reports with recommendations based on individual responses; these reports are sent to the individual's primary care provider and/or care manager at the plan. These extra services help plans manage their member population and may also help engage members and their providers in their care management efforts.

Another innovative way to use HRAs is as a patient education tool. For example, two HRA vendors that conduct in-person assessments stated that they go beyond communicating with providers by sending recommendations to the member for purposes of patient engagement and education. The goal of these efforts is to help members take control of their own health by arming them with the tools to improve it.

In summary, some plans are using the HRA process and/or HRA vendors to strengthen care management by identifying and providing special services that can help members and their providers manage their health. Plans that use enhanced HRAs to support risk stratification and care management efforts will have a competitive edge in an evolving Medicare paradigm that rewards population management and spending efficiency. The next section estimates the return on investment potential for plans that utilize effective and targeted care coordination interventions to meet both quality and cost goals.

THE ROI FROM EFFECTIVE CARE TRANSITION AND COORDINATION INTERVENTIONS

Identifying high-risk members alone does not reduce utilization and spending. In order to reduce spending, plans need to implement effective care management and care transition programs that prevent and reduce high-cost utilization.

A key reason why many MA plans do not use enhanced HRAs that identify non-medical or LTSS needs is because plans typically are not reimbursed for the services that could address those needs. However, MA plans can provide certain supplemental benefits to their members, if the item or service is primarily health related. Examples of supplemental benefits that plans are allowed to provide include, but are not limited to:^{xi}

- Enhanced disease management (EDM), which includes three types of activities: (1) assigning a target member group to qualified case managers with specialized knowledge about a target disease, (2) providing educational activities through certified/licensed professionals focused on a specific disease or condition, and (3) providing routine monitoring of specific measures, signs, and symptoms for a target disease(s) or condition(s);
- In-home safety assessments by an occupational therapist or other qualified health provider;
- Home delivery of meals if the service is necessary due to an illness or condition and offered for a short duration;
- Health education and general nutritional education;
- Smoking and tobacco cessation counseling;
- Post discharge in-home medication reconciliation;
- Readmission prevention support;
- Telemonitoring;
- Transportation support;
- Bathroom safety devices; and
- Gym and fitness membership benefits.

Although these services are not typically covered by Medicare, these extra services can address some of the characteristics that lead to high-cost utilization, and thus high Medicare spending. In this way, investments to provide or refer members to certain care management programs can generate a positive ROI by reducing their Medicare spending. In particular, working with providers to establish evidence-based care coordination programs can reduce the incidence of hospitalizations and subsequent readmissions, which generates substantial savings for the plan.

Types of Care Transition and Coordination Models

For years, health policy experts have identified poor care transitions as a major contributor to overutilization and spending. In particular, older people with chronic illnesses and functional limitations frequently do not receive adequate care during and after these transitions, which can span community, acute, post-acute, and long-term care settings. As a result, this population accounts for a disproportionate share of health care expenditures. Several models for improving care transitions and coordination have been developed, but existing publically available research on the cost-effectiveness of these models is very limited.

Avalere conducted an ROI analysis to estimate the cost-effectiveness of certain coordinated care models targeted at Medicare beneficiaries. Five care transition models and one care coordination model were selected for the ROI analysis based on their relevance to the target Medicare population, whether they were widely used, and the availability of evidence related to their efficacy. These models included, *Care Transitions Intervention*,^{xii} *Care Transition Intervention (Group Visit)*,^{xiii} *Geriatric Resources for Assessment and Care of Elders (GRACE)*,^{xiv} *Project RED*,^{xv} *Transitional Care Model*^{xvi} and *Project BOOST*.^{xvii}

Table 3: Overview of Care Transition and Coordination Programs Selected for the ROI Analysis

PROGRAM MODELS	OVERVIEW	KEY STRATEGIES
Care Transitions Intervention	Focuses on hospital to home and skilled nursing facility (SNF) to home transitions. A transitions coach empowers patients to manage their care.	<ul style="list-style-type: none"> • Designed to encourage patients and their caregivers to assert a more active role during care transitions. • Transition coaches are advanced practice nurses. They first meet with patient in the hospital to introduce personal health record and arrange a home visit. • The home visit focuses on reconciling all of the patient’s medication regimens. The patient and transition coach rehearse or role-play effective communication strategies so the patient would be prepared to articulate his/her needs. • Following the home visit, the coach maintains the continuity with the patient by telephoning 3 times during the 28-day post-hospitalization period.

Care Transitions Intervention (Group Visit)	A new model of care transition, which has a group of patients regularly visit primary care physicians. The goal of the group visit is to facilitate patients' self-management of chronic illness through education, encouragement of self-care, peer and professional support, and attention to psychosocial aspects of living with chronic illness.	<ul style="list-style-type: none"> • Monthly group visits (generally 8 to 12 patients) with a primary care physician, nurse, and pharmacist held in 19 physician practices. • Visits emphasize self-management of chronic illness, peer support, and regular contact with the primary care team.
Geriatric Resources for Assessment and Care of Elders (GRACE)	Focuses on coordinating information sharing during transitions of care to prevent avoidable hospital admissions. An advanced practice nurse and social worker collaborate with the primary care provider and geriatrics team to coordinate care on an ongoing basis.	<ul style="list-style-type: none"> • Training of the nurse practitioners, social workers, support staff, Primary Care Providers (PCPs), and health center staff. • Advanced comprehensive health assessment and development of individualized care plan. • Implementation of the care plan that requires frequent contact between program staff, PCPs, and the patient. • Use of electronic medical records and tracking system.
Project RED	Focuses on hospital to home transitions. This model outlines ways to identify high-risk patients and give providers an 11-step discharge checklist.	<ul style="list-style-type: none"> • Hire/train nurse discharge advocates (DAs). • Create and teach a personalized discharge plan to the patients. • A clinical pharmacist follows up with the patients after discharge to reinforce the discharge plan and review medications.
Transitional Care Model	Focuses on hospital to home transitions. An advanced practice nurse coordinates care up to three months post-discharge.	<ul style="list-style-type: none"> • Transitional care nurse (TCN) conducts an in-hospital assessment. • TCN provides elderly hospital patients with comprehensive discharge planning and home follow-up services where the patient has access to the TCN via telephone seven days per week for an average of two months post discharge.
Project BOOST	Focuses on hospital to home transitions. This model emphasizes patient engagement and discharge education for high-risk patients immediately after discharge.	<ul style="list-style-type: none"> • Year-long mentoring program aimed at reducing 30-day readmissions. • A broad assessment of admitted patients. • Discharge planning prepared by an interdisciplinary team of health care professionals. • Follow-up calls to patients within 72 hours of discharge on how to care for themselves.

Conducting the ROI Analysis

The ROI calculation accounts for the costs of program implementation as well as the changes in member utilization of inpatient and outpatient Medicare-covered services. The key drivers of high spending are hospitalizations, readmissions, and ED visits; for each model, our analysis sought to identify cost savings in these areas.

Avalere used the 2012 five percent Standard Analytic Files (or Medicare claims), which contain medical and payment information related to health care services provided to Medicare FFS beneficiaries. Based on 16 studies/articles in the literature, we identified the average program costs and expected change in utilization related to the six care transition and coordination programs. In estimating the ROI of each program, we applied an efficacy assumption of 75 percent since the target population in the studies reviewed was similar, but not identical to our definition of high-risk Medicare beneficiaries. Though these models may have more lasting effects, our ROI estimates reflect the one-year impact of each model on high-cost utilization. Finally, these estimates assumed that the program currently runs at a moderate level of maturity. For a program that is in the first year of operation, the program effect would be lower than estimated, and program costs would likely be significantly higher (See Appendix — Task 3 for more details on our methodology).

Findings from the ROI Analysis

Our modeling produced a range of ROI results, the highest of which was an over 600 percent return (full results shown in Table 3), highlighting the cost-savings potential of care management programs.

The ROI for each program model was calculated based on the review of 16 studies/articles related to their efficacy. While these models should not be compared solely based on the ROI results due to the limitations of this study (see Appendix for details), it is clear that certain care transition and/or coordination programs, when targeted at high-risk Medicare beneficiaries/plan members, can yield a positive ROI.

Program models that integrate care transition and long-term care management are cost-effective in reducing high-cost utilizations.

Avalere found that effective models emphasize close coordination amongst care providers, such as nurses, physicians, social workers, and pharmacists, during care delivery and through the transition to the patient's next care setting (or home). The common components of these models include standard discharge protocols, discharge planning and implementation, patient education, and transition counselors performing regular follow-up.

Further, a comprehensive approach that integrates key care transition processes with long-term care management can be highly effective in reducing high-cost utilization. For example, the Care Transition Intervention (Group Visit) and GRACE programs were implemented over two years and they not only engaged a wide variety of health care providers in the care transition process, but also provided appropriate care management through continuous patient education as well as health assessment, monitoring, and counseling. These efforts resulted in substantial reductions in ED visits and hospitalizations.

Higher program investments are not necessarily associated with higher financial returns; narrower targeting aimed at the highest-risk members may improve ROI.

Based on our assumptions regarding the costs of implementation, greater investment is not necessarily associated with better results. However, available evidence on certain program impacts is limited; some programs may reduce other types of utilization and spending that are not considered in evaluation studies. For example, both the *Care Transition Intervention* and *Project RED* programs focus on reducing 30-day readmissions, so evaluations of these programs measure their impact on this metric. The former involves transitional coaches who educate patients on self-management and the latter emphasizes discharge planning and education for patients. Although the *Care Transition Intervention* costs significantly more to implement than *Project RED* (\$999 per person vs. \$373 per person), its impact on reducing 30-day readmissions is similar (30 percent vs. 33 percent, respectively). However, due to limited data available, much more information and data are needed to fully understand the relationship between program costs and effects on utilization. While the costs of implementation can be reasonably estimated, available research on program impacts are less robust; most studies focus solely on the readmission metric and do not assess broader impacts on utilization, thus many of the selected programs may be more effective than our findings suggest. In addition, better targeting of care management programs across the entire member population could increase overall cost-effectiveness; when deployed with the right populations, costlier interventions can co-exist with less resource-intensive programs to create a positive ROI.

Table 4: ROI Estimates for Five Care Transition/Coordination Programs Serving Medicare Beneficiaries⁷

PROGRAM	ANNUAL COST PER MEMBER	ANNUAL SAVINGS PER HIGH-RISK MEMBER	ROI PER YEAR	PMPM SAVINGS
Care Transition Intervention (Group Visit) ⁸	\$678	\$4,795	607.02%	\$343.06
Transitional Care Model	\$1,492	\$5,334	257.48%	\$320.14
Care Transition Intervention ⁹	\$999	\$2,311	131.3%	\$109.34
GRACE ¹⁰	\$2,201	\$4,291	94.96%	\$174.17
Project RED ¹¹	\$373	\$493	32.37%	\$10.05

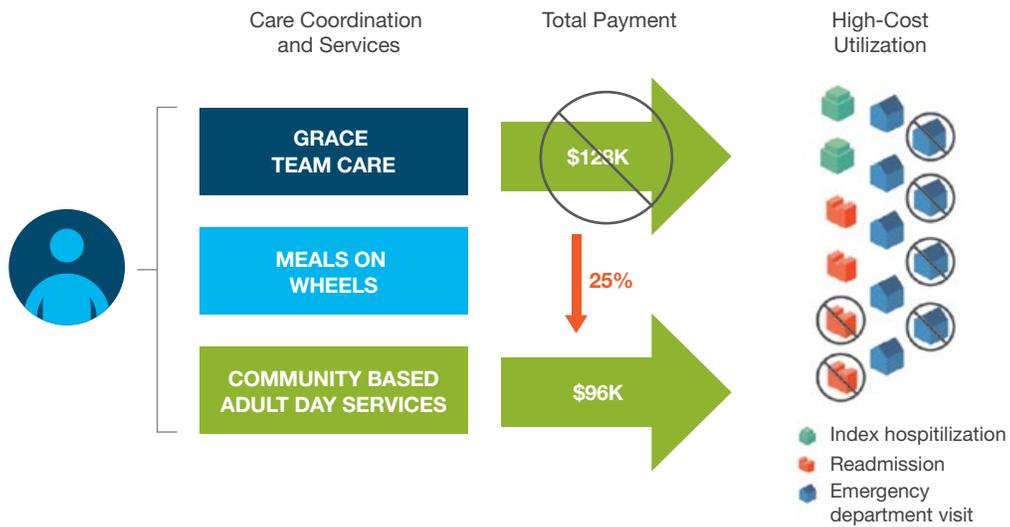
The Promise of Care Coordination Programs

Enrolling high-risk members into effective care transitions and/or coordination programs can help plans reduce their members' health care utilization, and subsequently, their spending.

Hypothetical Case Study Continued

Figure 5 illustrates how care coordination may help reduce a member's high-cost utilization. Based on Ruth's comprehensive health profile garnered from claims, HRA, and clinical input data, the plan could identify her as high-risk and therefore a good candidate for care coordination and functional/lifestyle programming.

Figure 5



To address Ruth’s LTSS needs, lack of social support, and nutrition issues, the plan might enroll her in GRACE; the GRACE team would coordinate her medical care and secure services including Meals on Wheels and Adult Day programs. By coordinating Ruth’s care and services, she might not incur four ED visits and two readmissions, leading to a reduction of \$32,000 in annual spending, or 25 percent.

To realize the potential of enhanced care coordination, MA plans and providers can strengthen their programming in a number of ways, including:

1. Offering services outside the scope of typical MA plan offerings, such as home modifications, fall prevention services, and fully coordinated care models like GRACE for targeted individuals;
2. Establishing, incentivizing, or working with providers to implement care transition models such as those analyzed as part of this study’s ROI analysis; and
3. Referring and coordinating care for beneficiaries with LTSS needs to community-based or other services.



Though these suggested enhancements necessitate upfront investment in both risk identification and processes around care management, our findings strengthen the argument that savings can be produced, especially when resources are well-targeted.

With a national spotlight on population management, MA plans are well-positioned to establish best practices for care management strategies, especially for their vulnerable, high-risk Medicare members. A large body of evidence argues that bending the health care cost curve will require plans and other risk holders to address the range of bio-psycho-social needs with innovative lifestyle and functional programming. With no broad long-term care reforms on the horizon, despite the established increase in Medicare spending related to these needs, plans looking to truly manage care and spending must fill the void by offering care coordination programs that include functional and lifestyle programming or taking advantage of the community-based LTSS that currently exist. MA plans should take responsibility for care coordination and work towards solutions that benefit the people they serve as well as support an effective business model for sustainability.

APPENDIX

Task 1 Methodology

Researchers used the Medicare Current Beneficiary Survey (MCBS) Cost & Use files from 2007 to 2010 and limited the survey beneficiaries to those individuals who met the following criteria: (a) must have survey data and claims data; (b) must be continuously enrolled in Medicare in each year; (c) must have no more than 6 months of Medicare Advantage (MA) enrollment, per year; and (d) must not have a primary diagnosis of cancer on any hospital inpatient, outpatient, or physician claim during the study timeframe.

In order to build and test the reliability of the predictive model, researchers divided the total sample into two equally-sized random groups: the “build group” and the “validation group”. The first group (“build group”) was created using beneficiaries who met the study inclusion criteria in 2007 and 2008. This group was used for building the initial and refined models. The second group (“validation group”) was created using beneficiaries who met the study inclusion criteria in 2009 and 2010. The validation group was used for testing the reliability of the predictive models. This division between the study samples ensures virtually no overlap between the study samples. Beneficiaries who overlapped between the build group and the validation group were excluded from the analysis.

Researchers used the “build group” to develop the prospective risk adjustment model and refinements using beneficiaries’ information from a prior year to predict their expenditures for the “current” year. For example, in the build group model, researchers used beneficiary information from 2007 to estimate a Logit model that predicts a beneficiary’s likelihood of being in the top 20 percent of Medicare spending in the subsequent year, 2008. Beneficiary information includes the factors such as beneficiary demographic and enrollment, clinical condition/utilization, functional and cognitive impairment, and social support (including residential status) characteristics. Researchers also included a factor that flags “high-cost persisters”—beneficiaries who were identified as being in the top 10 or top 20 percent of Medicare spending in both years, after totaling payments across all inpatient settings (acute hospital and post-acute care), hospital outpatient, and other ambulatory care settings. This factor attempts to account for beneficiaries who had short-term acute conditions that caused a one-time/one-year spike in Medicare spending. Running the analysis on the build group produced a list of patient-level characteristic domains and specific variables that are associated with high Medicare spending; however, these results were based on a relatively small group of FFS beneficiaries and could be affected by sampling error.

To test the reliability, and consistency, of the key beneficiary-level characteristics, researchers used the same list of factors to predict which beneficiaries were in the top 20 percent of Medicare spending in 2010, based on beneficiary information from 2009. For both models (build and validation), researchers began with a logistic regression model that aims to predict being in the top 20 percent of spending in one year based on factors from the prior year. This model yielded multiplicative factors for how the predictors jointly determined predicted probability of being a “high-cost” beneficiary. This model allowed the researchers to assess which factors are consistently strong predictors of high-cost (those with large effects on predicted probability and relatively low p-values). Researchers further tested the reliability of the logistic regression model results by estimating a linear regression model that predicted a beneficiary’s PMPM Medicare spending in the following year, and whether that PMPM met the threshold of “high-cost” spending.

Researchers also estimated stratified models such as separating the sample by those who were in the top 20 percent of Medicare spending in the prior year versus those in the bottom 80; as well as separating by those living in a nursing home or assisted living facility versus those living in the community. These models attempted to account for the possibility that the factors that may predict being high-risk are different based on residential status.

LIMITATIONS TO THE PREDICTIVE MODELS

- *Sample size exacerbates the effects of sampling error.* The Medicare Current Beneficiary Survey (MCBS) is a continuous, multipurpose survey of a nationally representative sample of aged, disabled, and institutionalized Medicare beneficiaries. The sample of 16,000 Medicare beneficiaries (including 1,000 living in health care facilities) is drawn from the Medicare enrollment file and is refreshed annually. Although this survey provides a wealth of data on social and functional factors not generally available for research, it also imposes a significant challenge for our analysis is its relatively small sample size. Due to this limitation, the researchers were required to combine variables where there was very minimal sample size, such as with certain condition groups or residential status (assisted living facilities were combined with nursing homes). This also limited our ability to stratify the models by interesting characteristics like dual eligibles or age (younger than 65 and 65 and older). In some of the stratified models, the SAS program was forced to drop select variables that had no people with certain characteristics, and in some cases, the point estimates, p-values, and odds ratios were quite volatile when compared across the build and validation groups. In general, however, researchers feel that the results of the “All Patients” model are both interesting and reliable to make conclusive remarks about the importance of select patient-level characteristics on Medicare spending.

- *Models are based on Medicare FFS beneficiaries, not Medicare Advantage enrollees.* Because the researchers wanted to use the Medicare FFS claims data that accompanied the MCBS survey data, rather than relying on self-reported patient survey data, the sample was limited to Medicare FFS beneficiaries. Although there are differences between the FFS and MA populations, the results of this analysis point to an important core list of characteristics that help plans and risk bearers better manage risk for both Medicare FFS and Medicare Advantage populations.

Task 2 Methodology

Researchers reviewed federal and state regulations and literature from over 50 scientific publications, research studies, and news articles. Resources included the Centers for Medicare & Medicaid Services (CMS), PubMed, HealthAffairs, and the Journal of the American Medical Association, among others.

Researchers limited the literature search to articles from 1995 until the present, and covered a range of search terms, such as ‘HRAs’ and ‘long-term services and supports’ (LTSS), ‘HRAs and care plans’, ‘HRAs and disease prevention’, as well as ‘HRAs and chronic condition management.’

Additionally, researchers identified and interviewed more than 12 leaders from three health plans, three HRA vendors, and one physician group practice. The purpose of the interviews was to evaluate and better understand how health plans use HRAs, the questions included on HRAs, and how care plans and other follow-up services are determined based on responses. Specifically, the interviews focused on how HRAs assessed and informed care plans related to LTSS needs. Additionally, the interviews helped the researchers identify successful HRA practices and current challenges related to HRA administration and subsequent care planning. Interviewees included:

ORGANIZATION	NAME & TITLE
Advance Health	Brian Wise, CEO
Aetna Medicaid	Alan Schaffer, Director of Long Term Services and Supports Karen Wohkittel, Director Health Services, Dual Eligible Products
Aetna Medicare	Randy Krakauer, MD, Vice President, National Medical Director, Medical Strategy
CalOptima	Richard Helmer, MD, Chief Medical Officer Denise Hood, Manager, OneCare Clinical Marie Jeannis, Director, Case Management
Life Plans Inc.	Marc Cohen, PhD, Chief Research & Development Officer
MDVIP	Andrea Klemes, DO, Medical Director
OptumInsight	Ralph Perfetto, PhD, Vice President, Provider Solutions
Peak Health Solutions	Gabe Stein, EVP, Payer Solutions Joanne Jacalan, Director of Clinical Services
Johns Hopkins University / PraPlus	Chad Boulton, Professor, Johns Hopkins University

Task 3 Methodology

BASELINE FOR HIGH-COST UTILIZATION AND MEDICARE SPENDING

Specific analytic steps for obtaining baseline information about Medicare FFS utilization and spending for high-risk beneficiaries are listed below and the findings are shown in the table below.

1. Researchers began by identifying high-risk Medicare beneficiaries by summing each person's total Medicare FFS spending across all inpatient settings, hospital outpatient and ambulatory care, home health, and DME, for the full year.
2. Researchers identified the types of utilization and services that drive high-cost Medicare utilization (i.e., hospitalizations, 30-day readmissions, and ED visits). The researchers also estimated average utilization and Medicare payments for physician and outpatient visits.
3. Researchers then calculated the average payment per utilization type (e.g. hospitalizations, etc.).

CARE UTILIZATION MEASURE	AVERAGE UTILIZATION/ PERSON/ YEAR	AVERAGE PAYMENT/ UTILIZATION
Hospitalization	1.33	\$17,006
All-Cause 30-day hospital readmission	0.17	\$14,696
ED visits	1.89	\$1553
Physician/outpatient visits (Non-ED)	12.2	\$191

EXPECTED PROGRAM EFFECTS

As mentioned, although the six programs included in the analysis all focus on care transitions and management, they differ in terms of resources needed, core strategies, and program effectiveness of reducing high-cost utilization. Due to the limited number of studies on the cost-effectiveness of these programs, in most cases the researchers identified the effects of each model based on one study. However, when more than one study provided outcomes data, researchers calculated the average across the studies. For example, three different *Project RED* interventions reported reductions in hospital readmissions by 46 percent, 25 percent and 28 percent, respectively. Based on this data, it was estimated that *Project RED* could reduce hospital readmissions by an average of 33 percent. The same method was applied in estimating program effect for the other five models. Additionally, our analysis of the care transition models determined that all the programs would likely increase physician or outpatient visits since patients were expected to have a follow-up physician visit following hospital discharge. To account for this increase in utilization, researchers estimated baseline average utilization and payments for physician/outpatient visits (limited to evaluation & management (E&M) type of services) for the top 20 percent of Medicare FFS beneficiaries in terms of spending. It was found that patients averaged approximately 12 visits per year, so that one additional visit is equal to an increase of eight percent; Medicare payments for these visits averaged about \$190. Researchers applied an eight percent increase for physician/outpatient utilization for all models.

ROI & PMPM

Estimating cost savings

To calculate the ROI for each program, the numerator is the net program benefit and the denominator is the program cost. In this analysis, program benefit refers to the average cost-savings achieved through utilization reductions in hospitalization, readmission and ED visits, minus revenue loss due to an increase in physician visits/outpatient care. Further, since not all the studies were targeted at the high-risk Medicare FFS beneficiaries, researchers used an overall efficacy assumption of 75 percent, instead of 100 percent, to account for how the program would impact our targeted beneficiaries. The formula for calculating cost savings is shown below.



For instance, one study indicated that implementing Transitional Care Model could result in a 36 percent reduction in hospitalizations. Since the average annual utilization rate for hospitalization, across the entire sample of Medicare beneficiaries in the top 20 percent of spending, is 1.13 and for physician/ outpatient care is 12.2, and the average payment for hospitalization and physician/ outpatient visits is \$17,006 and \$191, respectively, using the formula shown above, a 36 percent reduction in hospitalizations corresponds with a cost savings of \$5,334, per person per year.

Estimating program costs

As shown in the ROI calculator, the program costs consist of labor and overhead expenditures. The labor costs are broken down into two categories, direct patient care (i.e., program activities directly targeted at program participants); and indirect care (i.e., mainly training and education activities for the care delivery team prior to and during the intervention). Since most studies did not include specific cost data for fixed or variable expenses, reasonable assumptions were made for these categories. In estimating the average program costs, it was assumed that each program includes some amount of staff training and education and these indirect patient care costs account for an additional 20 percent of total labor costs, so that training and education change proportionally with total labor hours. The overhead costs refer to other expenses associated with program implementation, which may include general program supplies, telephone bills and utility costs, staff benefits, other general administrative services and maintenance, IT infrastructure, and other capital costs.

For instance, all three *Project RED* studies suggested that implementing this intervention mainly includes nurses creating and teaching a personalized discharge plan to the patients, and pharmacists conducting follow-up telephone calls with the patients after discharge to reinforce the discharge plan. Based on this information, researchers calculated the average program cost for *Project RED*, assuming that for each patient the program requires four hours of a nurse's time and one hour of a doctor's time for discharge planning and education and another hour of pharmacist and physical therapist's time for the follow-up.¹²

Calculating ROI & PMPM

Based on the estimated average cost savings and program costs, the ROI calculator computes the difference between these two financial inputs to obtain the net program savings or loss. For example, the total program costs for *GRACE* Team Care are estimated at \$2,201 per person a year, and the average savings are \$4,291, so the net program savings are \$2,090 a year. Based on these data, the ROI and PMPM are calculated as follows.

One Year ROI: $(\$2090 \div \$2201) \times 100\% = 94.96\%$

One Year Savings/Loss per Member per Month (PMPM): $\$2090 \div 12 = \174.17

LIMITATIONS TO THE ROI ANALYSIS

- Due to the limited research available on the cost-effectiveness of care management models, the analysis is based on the review of 16 publically available studies or articles about these eight care models, among which some studies are more robust than others in terms of the evaluation design, methodological techniques, and program costs. The program costs and effects used in the analysis are just estimates based on assumptions pulled across the literature. Actual program costs and effect may vary, and are dependent upon such factors as the size of the program, resources used, intensity and scope of the activities, and the approach to implementing the model.
- Also, due to the scarcity of literature in this area, the studies that were reviewed focused on three specific high-cost services—hospitalizations, readmissions, and ED visits. These programs may impact other utilization such as urgent care services or drug utilizations or costs. Also, the model only calculates the potential impact of these care coordination programs on high-risk Medicare beneficiaries. There is the potential that these programs would also improve care and reduce costs for other populations, such as other risk groups. Those spillover effects have not been included in the analysis.

- Similarly, the analysis used program effect estimates as they were reported in the studies. There is the potential that reductions in one of these high-cost services may impact the use of other high-cost services. For example, a program that focuses on reductions in hospitalizations may also see changes in readmission rates and ED visits, since these other high-cost services tend to occur as a result of each other. Most hospitalizations are admitted through the ED, so presumably if the hospitalization was reduced; it's likely that the ED visit was also reduced. Likewise, since readmissions are, by definition, a hospitalization that occurred within a period of time (in this case, 30-days) following the hospital discharge, it's likely that reducing the hospital admission in the first place may reduce the readmission. These dynamic effects were not included in the analysis. More research and testing would need to be conducted to estimate these compounding impacts.
- The baseline for physician/ outpatient care utilization and payments limited physician services to Evaluation & Management (E&M) visits, new patient visits, consultations, and diagnostic and preventive services. Services excluded are as follows: radiology, laboratory, ambulatory surgery, ambulance, anesthesia, supplies and other miscellaneous categories, as well as all Part B drugs such as injections and infusions. Based on the review of the models it was determined that increases in the physician visits among the patients did not involve much intensive outpatient care. Rather, the visits focused on follow-up on discharge planning instructions or care plans, early detection of health problems and helping patients better manage their chronic illness. Nevertheless, on a case-by-case basis, it is possible that an individual program may increase physician and outpatient visits of a more intense nature. If so, both the average utilization and payment for outpatient care would be higher than estimated in the model, hence fewer cost savings and lower ROI.

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- 1 High-risk Medicare beneficiaries were defined as those individuals with FFS spending in the top 5 percent of Medicare spending across all settings of care (i.e., hospital inpatient, outpatient/ ambulatory care, post-acute, hospice, and durable medical equipment). We also built ROI models for other strata of high-cost, including the top 1 percent, top 10 percent, top 20 percent, those with functional impairments, and those individuals living in nursing homes in the prior year.
- 2 This finding, however, may be a result of multicollinearity where one variable (e.g., living in a nursing home) is linearly predicted from the others (e.g., living in a residential setting) with a non-trivial degree of accuracy. In this situation the coefficient estimates, and probability increases, of the logistic regression may change erratically in response to small changes in the model or the data. Please note, multicollinearity does not reduce the predictive power or reliability of the model as a whole; it only affects calculations regarding individual predictors. Consequently, the model results may not give valid results about any individual predictor, but should instead be used to assess the bundle of predictors.
- 3 Notably, acute inpatient care and physician visits in the prior year were inversely correlated with high Medicare spending. This finding, however, could be a result of the multiple correlation of utilization with other factors, such as being in the top 10 or 20 percent of Medicare spending in the prior year.
- 4 This patient-level characteristic refers to the Medicare home health benefit which covers eligible home health services like intermittent skilled nursing care, physical therapy, speech-language pathology services, continued occupational services, and more for people with traditional Medicare.
- 5 Moderate functional impairment is defined as requiring assistance with two to five activities of daily living (ADLs), such as eating, dressing, and bathing, and/or instrumental activities of daily living (IADLs), such as managing money, using the telephone, and doing housework. We also included a variable for "high functional impairment" which is defined as more than 6 ADLs and/or IADLs.
- 6 Please see Appendix at the end of this paper for an in-depth explanation of the methodology of the HRA analysis.
- 7 *Project BOOST* was also reviewed as part of the ROI analysis, but is not included in Table 4 because of the limitations of the evidence. While some program evaluations consider broader impacts, such as reductions in all hospitalizations or emergency department use, studies of *Project BOOST* only consider its impact on readmissions within 30 days. This limited impact data combined with a relatively high implementation cost resulted in a negative ROI; due to these limitations, this finding should not be compared with those shown in Table 3.
- 8 It is a two-year intervention program. The study found that the program reduced hospitalization of older adults by 45.7 percent in two years. To estimate one-year impact of the program, a 75 percent efficacy assumption was applied.
- 9 The study found that the program reduced 180-day hospital readmissions by 17 percent. To estimate one-year impact, a 75 percent efficacy assumption was applied, assuming that the program effect can be sustained for a year to some extent.
- 10 It is a two-year intervention program. The study provided efficacy data for year 1 and year 2, and we estimated the one-year impact of the program by averaging these two-year data.
- 11 Three RED studies were reviewed and they all provided data on program effects in reducing 30-day readmissions. To estimate one-year impact of RED, we calculated the average across the studies.
- 12 See the ROI calculator for details of the assumptions used in estimating the program cost for each model, which may serve as a guide to estimating the cost for similar interventions.

About Us

Avalere is a vibrant community of innovative thinkers dedicated to solving the challenges of the healthcare system. We deliver a comprehensive perspective, compelling substance, and creative solutions to help you make better business decisions. We partner with stakeholders from across healthcare to help improve care delivery through better data, insights, and strategies. For more information, please contact Reggie Williams at RWilliams@avalere.com. You can also visit us at www.avalere.com.

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