



Medicare Home Health Prospective Payment System

Summary of the Home Health Groupings Model Technical Expert Panel Meeting and Recommendations

Report to the Committee on Ways and Means
and the Committee on Energy and Commerce
of the House of Representatives and the
Committee on Finance of the Senate

June 2018

Prepared for:

**Centers for Medicare &
Medicaid Services**

7500 Security Blvd
Baltimore, MD, 21244

Submitted by:

Michael Plotzke
Thomas Christian
Allison Muma
Erica Granor
Seyoun Kim

Abt Associates

6130 Executive Boulevard
Rockville, MD 20852

Table of Contents

Introduction 1

Panel Overview 2

**Summary of Public Comments from CY 2018 Home Health Prospective Payment System
Proposed Rule (82 FR 35270) 4**

Calculation of Resource Use 8

Clinical Groups..... 10

Comorbidity Adjustment..... 13

Admission Source 15

Episode Timing..... 17

Case-mix Comparisons Between HHGM and Current Payment System 19

Open Discussion and Recommendations..... 21

Alternative Payment Model..... 23

Appendix A: Materials Presented to TEP 25

Introduction

The Centers for Medicare & Medicaid Services (CMS) contracted with Abt Associates (Abt) to reassess the current Home Health Prospective Payment System (HH PPS) and develop potentially large-scale payment methodology changes to better align payment with patient needs, to address payment incentives and vulnerabilities in the current system, and to respond to the concerns laid out in the prior 3131(d) Home Health Study Report to Congress and by the Medicare Payment Advisory Commission (MedPAC).

As discussed in prior rulemaking, Abt and CMS have developed a new case-mix system called the Home Health Groupings Model (HHGM). The HHGM was developed to address criticisms of the current payment system and draws upon extensive research that paved the way for reform efforts by examining how the current payment system is used. The HHGM is further described in a technical report¹ and the 2018 Home Health Prospective Payment System (HH PPS) proposed rule (82 FR 35270).²

Abt Associates, as part of their contract with CMS, convened a Technical Expert Panel (TEP) meeting on February 1, 2018 to gain insight from industry leaders, patient representatives, clinicians, and researchers with experience with home health care and/or experience in home health agency management. This TEP satisfies the requirement of section 51001(b)(1) of the Bipartisan Budget Act of 2018 (Pub. L. 115-123), which requires CMS to hold at least one technical expert panel during the period beginning January 1, 2018 through December 31, 2018. The law also stipulated that the TEP must identify and prioritize recommendations regarding the HHGM and alternative case-mix models that were submitted during 2017 as comments to the CY 2018 HH PPS proposed rule.³ Finally, section 51001(b)(3) the Bipartisan Budget Act of 2018 requires CMS to issue a report on the recommendations from the TEP to the Committee on Ways and Means and Committee on Energy and Commerce of the House of Representatives and the Committee on Finance of the Senate, no later than April 1, 2019. This report summarizes the recommendations from the TEP held on February 1, 2018 and satisfies the requirement set forth in section 51001(b)(3) of the Bipartisan Budget Act of 2018.

¹ <https://downloads.cms.gov/files/hhgm%20technical%20report%20120516%20sxf.pdf>

² <https://www.gpo.gov/fdsys/pkg/FR-2017-07-28/pdf/2017-15825.pdf>

³ We note that we received only one comment that included a different case-mix model as a possible alternative to the HHGM in response to the CY 2018 HH PPS proposed rule. The commenter referred to the alternative case-mix model as the Risk-Based Grouper Model (RBGM).

Panel Overview

Purpose

The purpose of this meeting was to gather perspectives and identify and prioritize recommendations regarding the HHGM, as described in the CY 2018 HH PPS proposed rule (82 FR 35270), and alternative case-mix models submitted during 2017 as comments to the CY 2018 HH PPS proposed rule.

Structure

The all-day TEP meeting on February 1st, 2018 covered the following topics:

- Summary of Public Comments from CY 2018 HH PPS proposed rule
- Resource Use
- Clinical Groups
- Comorbidity Groups
- 30-Day Periods
- Case-Mix Weights
- Open Discussion and Next Steps

For each topic, Abt Associates led a discussion and sought feedback and recommendations from the TEP members on how to strengthen the HH PPS.

Materials

Prior to the TEP, Abt Associates conducted a webinar with the TEP participants. The webinar, conducted on January 25, 2018, was intended to provide background on home health payment reform and to provide an explanation for how the current payment system and proposed HHGM works. Abt Associates began by providing a brief overview of the project and discussing how Abt is using the Technical Expert Panel to get feedback on the payment reform analyses they've explored. Abt described components of the proposed payment system, such as resource use, 30-day periods, clinical groups, functional levels, comorbidity groups, and other variables used to group periods into respective case-mix groups. The creation of case-mix weights under the HHGM was also discussed. Additionally, Abt provided summarized comments from the rule and set expectations for the February 1st meeting. Panelists were encouraged to read the public technical report on the

HHGM, which summarizes the analysis from the first version of the HHGM.⁴ Panelists were provided an agenda and a logistics document prior to the meeting. At the TEP, participants were provided with hard copies of the agenda, participant list, presentation slides, and supplementary analysis.

Members

The TEP was composed of industry members, patient representatives, and researchers. When convening the TEP, several groups were contacted that represented home health agencies and staff employed at home health agencies. We asked these groups to nominate one participant with clinical and health management experience. Ultimately, we deferred to each organization to nominate the participant they wished to represent their respective group/association. Panelists who participated in the meeting and the organizations they represent are as follows:

- Evan Christman, Medicare Payment Advisory Commission (MedPAC)
- William Dombi, National Association for Home Care and Hospice (NAHC)
- Kathleen Holt, Center for Medicare Advocacy (CMA)
- Luke James, representing the Partnership for Quality Home Healthcare (PQHH)
- Robert (Bud) Langham, representing the American Physical Therapy Association (APTA)
- Jenny Loehr, representing the American Speech-Language-Hearing Association (ASHA)
- Melanie Morris, representing Elevating Home
- Peter Notarstefano, LeadingAge
- Timothy Peng, Visiting Nurse Service of New York (VNSNY)
- Karen Vance, Representing the American Occupational Therapy Association (AOTA)

Additionally, three researchers accepted an invitation to participate on this TEP:

- David Grabowski, Ph.D., Professor of Health Care Policy, Harvard Medical School
- Bruce Kinoshian, MD, Associate Professor of Medicine, University of Pennsylvania
- Sally Clark Stearns, Ph.D., Professor of Health Policy and Management, University of North Carolina, Chapel Hill

⁴ <https://downloads.cms.gov/files/hhgm%20technical%20report%20120516%20sxf.pdf>

Summary of Public Comments from CY 2018 Home Health Prospective Payment System Proposed Rule (82 FR 35270)

Topics Addressed

Major topics addressed in the public comments that CMS received in response to the Calendar Year (CY) 2018 HH PPS proposed rule (82 FR 35270) were as follows:

- **Length of payment period:** The HHGM changes the unit of payment from a 60-day episode to 30-day period. If a 60-day episode has visits provided only during the first 30 days, home health agencies (HHAs) would only be paid for one period under the HHGM. Some commenters were concerned that frontloading visits within the first 30 days can be beneficial for the patient, and the 30-day periods would result in an incentive to not frontload so that the agency could generate a second 30-day period. There was also concern that a 30-day period may discourage agencies from admitting patients needing care that spans multiple periods.
- **Admission source:** A patient's admission source is determined by the care the patient receives in the 14 days prior to the start of the 30-day period. Under the HHGM, being admitted into home health following an institutional stay results in more resource use under the home health benefit (and therefore higher case-mix weights and payment). There were concerns that HHAs would be disincentivized from taking community admissions (there were mixed comments on whether this is beneficial). Commenters recommended including emergency room and observational stays that occurred in the 14 days prior to home health admission as "institutional." Because a late period with institutional admission source is paid more than an early period with a community admission source, commenters recommended a 5-day lookback period instead of a 14-day lookback period for designating institutional/community admission.
- **Episode timing:** Under the HHGM, the first 30-day period is early and any subsequent 30-day period is considered late. Under the current payment system, first and second 60-day episodes are early. The early period is paid more than late periods. There were concerns that the early and late designation would discourage necessary therapy or other service provision that was needed after the first 30-day period. Commenters also suggested that the length of the 60-day gap that determines whether a 30-day period is in a particular sequence of episodes should be re-evaluated to allow for a new sequence to start with a hospitalization.
- **Clinical groupings:** In the HHGM, one way to categorize patients is by a clinical grouping based on a principal diagnosis code. Commenters indicated that two of the clinical groups are focused heavily on therapy (Neuro/Stroke Rehabilitation and

Musculoskeletal Rehabilitation). The Medication Management, Teaching and Assessment (MMTA) group accounts for over 60 percent of 30-day periods. TEP members thought MMTA was too broad a category because it captured too many periods and there are not enough clinical groups that focus on therapy. Commenters thought the MMTA and behavioral health clinical groups are paid too low. Commenters also thought the clinical grouping relied too heavily on the principal diagnosis.

- **Comorbidity adjustment:** Under the HHGM, there is a comorbidity adjustment that is based on secondary diagnoses. There were concerns that many patients have multiple comorbidities and the adjustment should account for multiple comorbidities. Commenters recommended that the same adjustment should not be made for all patients (i.e., some comorbidities are more severe, or there are interactions with comorbidities and other characteristics of the patient).
- **Low Utilization Payment Adjustment (LUPA) thresholds:** Under the HHGM, each case-mix group has its own LUPA threshold. In the current payment system, all episodes (regardless of case-mix group) with four or fewer visits are paid as LUPAs. There were concerns that varying the LUPA threshold by case-mix group was complex and that the upper threshold of seven visits (which occurred for some payment groups) was too high.
- **Non-Routine Supplies (NRS) bundling:** Currently, NRS is paid separately from the model used to create the case-mix weights for the 153 Home Health Resource Groups (HHRGs). Two-thirds of NRS payments are made when no NRS were actually provided. Under the HHGM, NRS payment was proposed to be included with the base payment rate. Some commenters felt this would result in overpaying for some cases and underpaying for others (similar to the current system).
- **Regression-determined case-mix weights:** Under the HHGM, a regression was used to determine the payment weights for each group. Regressions have been used to construct the case-mix weights since 2000, at the inception of HH PPS. The regression smooths the payment weights and allows for adjustment of various HHA-level characteristics. One commenter recommended using actual costs in each payment group to form the case-mix weights, rather than a regression-adjusted cost.
- **Resource use data sources and methods:** The HHGM uses cost reports to calculate resource use (which is the dependent variable in the regression used to construct the case-mix weights). The current payment model calculates resource use using wage-weighted minutes of care (WWMC) from the Bureau of Labor Statistics (BLS). Commenters thought that the cost reports may contain questionable data. In particular, some commenters thought that using cost reports would favor facility-based versus freestanding agencies since facility-based agencies can allocate costs

differently. However, some commenters expressed concerns with the WWMC approach not being indicative of all the costs incurred by HHAs in providing care to beneficiaries (e.g., transportation costs) and supported the shift to using cost report data.

- **Other comments:** Additionally, there were comments that under the HHGM there is no longer a categorization for therapy visits. Commenters suggested incorporating age, caretaker's availability, vision, and cognitive status in the payment model. There were also comments on eliminating the Partial Episode Payment (PEP) adjustment and ensuring adequate payments for rural agencies.

Questions

The following questions were posed to the TEP members for discussion:

- Which comments should be explored further?
- What further analyses do you recommend?
- Other comments you have?

Discussion

Major issues raised were as follows:

- **Dual-eligibility:**
One TEP member mentioned the HHGM payment model doesn't include a control for dual eligibles. The TEP member indicated that duals are associated with lower resource use, which would put them at a disadvantage. They made a distinction that dual eligibility could be controlled for in the regression but it does not have to be a payment adjustor in the payment model. It was noted that duals are more likely to be treated at a skilled nursing facility and less severe duals will be more likely to receive care from a home health agency. That may cause it to look like duals are receiving less home health care. Related to duals, there was discussion about including measures related to social determinants of health.
- **Estimate model on different sets of data:**
TEP members suggested many different ways of estimating the model. Other data (such as private insurance or Medicare Advantage) could be used to estimate the HHGM model and would not have data that is contaminated by the current payment system. TEP members suggested that payment models should be estimated separately for different regions since there is variation in utilization and cost across different areas (e.g., health system in Oregon will look different from Vermont). For patients in managed care-heavy areas, TEP members said some of those areas may have practices in place that will incentivize hospitalization while others will not – which

will have implications for the relationships the HHGM model measures. The HHGM model could be estimated separately for those coming from the community versus an institutional stay to determine if the relationships between the other variables in the model and resource use are the same. There was a suggestion of looking at rural areas separately because patients in those areas often have different patterns of care due to staffing shortages. TEP members thought models could be run on patients from PACE programs. TEP members said PACE programs identify red flags about a patient's health quickly and address those concerns quickly. TEP members thought this would also be important for home health.

- **Institutional vs community:**

One TEP member wanted to better understand how admission source (and the underlying characteristics of patients in different admission source categories) impacts payment.

- **Align payment mechanisms:**

TEP members wanted to make sure the Home Health Value Based Purchasing (HHVBP) Model aligns with any changes to the Home Health PPS.

- **Other Comments:**

Some TEP members thought the 144 proposed groups in the HHGM was too small and more groups should be used. Some members indicated that adding more characteristics to the model that would be used to group patients would make payment more accurate.

One TEP member noted that patient characteristics alone may not do a good job in predicting resources used by patients during a home health episode, and further stated that other Medicare prospective payment systems have service thresholds and those thresholds are not necessarily a bad thing. One TEP member encouraged CMS to step back and think about what making changes to the payment system will ultimately do. Another TEP member was interested in understanding unintended consequences that may result from the HHGM.

Recommendations

Recommendations were as follows:

- Include a control variable for dual eligibles in the payment model. However, don't use the coefficient from that variable to calculate case-mix weights.
- Estimate the HHGM model on subsets of HHAs or subsets of patients.
- Estimate the HHGM model using Medicare Advantage or private insurance data.
- Run a pilot of the HHGM before fully implementing it.
- Include more than 144 different payment groups in the HHGM.

Calculation of Resource Use

Topics Addressed

Within the section, Abt reviewed the (1) the Cost Per Minute + Non-Routine Supplies (CPM + NRS) approach to calculating resource use (using cost report data) and (2) the Wage Weighted Minutes of Care (WWMC) approach (using data from the BLS) to calculating resource use. Data on the ratio of costs by discipline for each approach were shown.

Questions

The following questions were posed to the TEP members for discussion:

- Do you favor one resource use method over another – and why?
- Do you have suggestions for improving the measurement of resource use?
- What (if any) are the unintended consequences of selecting either approach?

Discussion

Major themes that were discussed by TEP members during this session were as follows:

- **Cost Report vs. BLS:**
Some TEP members expressed concerns with using cost reports for payment due to perceived inaccuracies in cost reports and said the WWMC approach better reflects their perceptions of costs for therapy versus nursing. It was not clear if a subset of accurate cost reports could be identified. Some TEP members thought the BLS data was timelier and perceived it to be more accurate although it was noted that information from the BLS (used to construct resource use currently) also is not audited and MedPAC indicated that if there are concerns pertaining to the accuracy of cost report data, then the same concerns exist for BLS data. Some TEP members suggested that CMS audit cost reports. Abt and some TEP members indicated that costs reports should reflect actual costs (beyond just the direct cost of the staff) and therefore would be a better estimate of the total costs that agencies incur.
- **Therapy thresholds:**
Because the CPM +NRS approach to determining resource use weights therapy costs less than the BLS, some TEP members were worried that that change along with moving away from therapy thresholds would make it difficult to treat therapy patients.

-
- **Cost report accuracy:**
The specific trimming methodology used for cost reports in the HHGM was discussed and it was suggested that a larger number of agencies be trimmed. One TEP member recommended investigating the accuracy of cost reports, suggesting some home health agencies may put administrative costs under nursing. It was noted that CMS could audit cost reports, but they cannot audit the BLS data. In addition, the TEP discussed that cost reporting can be adjusted in the future to fit the needs of the HHGM while the BLS cannot.
 - **Model HHGM on best practices:**
One TEP member recommended modeling not on past behavior (i.e., what you see in cost reports) but instead to create a system based on best practices (i.e., what do patients actually need?). The TEP discussed that modeling the HHGM on current data (that is driven by incentives in the current payment system) could produce flawed results.
 - **NRS:**
There was concern that bundling the NRS into the model could have a negative effect on wound patients.

Recommendations

Recommendations were as follows:

- CMS should audit cost reports.
- Trim more cost reports when using the CPM + NRS method.
- Introduce the HHGM as a series of changes rather than implementing all aspects of the HHGM simultaneously.
- Set up the HHGM based on best practices instead of past behavior.

Clinical Groups

Topics Addressed

The construction of the clinical groups in the HHGM was quickly reviewed. A number of potential MMTA subgroups were shown as suggestions for breaking up the large size of the MMTA group.

Questions

The following questions were posed to the TEP members for discussion:

- How should 30-day periods be grouped in order to account for differences amongst patient diagnoses?
- Should the MMTA clinical group be divided into additional sub-groups?
 - Is the added complexity of having additional case-mix groups worthwhile?

Discussion

Major issues raised by TEP members during this session were as follows:

- **MMTA:**

The majority of TEP members indicated that the MMTA group should be split into subgroups. Potential subgroups that Abt presented included:

 - Surgical/Procedural Aftercare
 - Cardiac/Circulatory
 - Endocrine
 - Infectious/Blood Forming Diseases/Neoplasms
 - Respiratory
 - Other

TEP members indicated these subgroups seemed reasonable. Some TEP members indicated that having more subgroups would be preferable to having fewer subgroups.

One TEP member noted that MMTA isn't really just one group, that it is also divided into 24 other groups already (i.e., mixtures of admission source, timing, functional level, and comorbidity adjustment). The biggest of those consists of 10% of 30-day periods. One TEP member saw MMTA being a reference group. One TEP member suggested categorizing patients by secondary diagnosis under MMTA. One suggestion was that if clinical groups are retained, more groups are needed. TEP members suggested that CMS should control for risk factors of hospitalization and social determinants of health.

- **Additional clinical groups:**

One TEP member suggested making a clinical group based on the instrumental activities of daily living (IADLs) items on the OASIS. It was mentioned there should be a dementia group, but it was not clear how exactly that group would be constructed. Similarly there was a suggestion for a complex rehabilitation clinical group but it was also unclear how that group would be constructed.

- **Comprehensive models:**

One TEP member suggested a model where instead of a person being categorized into one specific clinical group, the patient could be categorized into a mixture of clinical groups. A fuzzy set model should be used to classify patients by the percent they were a member of each group (i.e., a patient could be 75% MMTA, 15% wound, and 10% behavioral). This is a more complex model, but some TEP members indicated they would prefer the model to be more accurate even if it meant more complexity.

- **OASIS items:**

There was some discussion about where those with a urinary tract infection would be grouped. One TEP member indicated the groupings and corresponding functional levels did not take into account enough functional and cognitive items; specifically that IADLs should be used. There was a suggestion for adding an adjustment for those with dementia, which could be based on a set of symptoms instead of diagnoses. One TEP member noted that the explanatory power of OASIS items isn't as strong as the experience of the people in the field and that adding more OASIS items to the model will not help that much.

- **Unintended consequences:**

There was some concern that a person with a non-therapy diagnosis may not get therapy (even if it is needed). One TEP member was concerned that some groups (like Complex) may have some users that need a high level of therapy and they wouldn't get it under the HHGM. One TEP member indicated that there are always tradeoffs and the HHGM better addresses those patients with high nursing needs, but this may cause less emphasis to be placed on therapy. One TEP member was concerned that this model will only capture the needs of the patients who are already able to get care. The TEP member believed that if there are potential patients that could be getting home health (and would benefit from home health) but aren't currently receiving home health, then the construction of the HHGM will not address their needs.

- **Comorbidities:**

One TEP member suggested that comorbidities need to be considered with this discussion and those comorbidities are really more than just diagnoses. The TEP member suggested that there are issues shoehorning patients into discrete buckets.

-
- **Outcomes:**
Outcomes were suggested as a way to adjust for payment, but it was also mentioned that it would be difficult to incorporate outcomes into a prospective payment system since the outcomes would happen well after the episode began. One TEP member suggested using more variables to capture functional level, but another member noted that in their past experience this would not change how the functional level was created (i.e., patient characteristics can only do so much to capture the functional level). Another TEP member argued that their functional needs are accounted for based on their admission. TEP members indicated that a patient’s status and plan of care evolves after several weeks of care and figuring out what a patient needs is like “peeling an onion.” Speech-language pathology needs may be identified in the back half of the episode so under the HHGM the TEP thought it may be less likely that a patient would receive those services.
 - **Purpose of the clinical group:**
One TEP member indicated that the patient’s status and needs change throughout a home health episode and the clinical group is informative in understanding those changes. One TEP member indicated that there is a disconnect in trying to base care on clinical diagnoses and that isn’t really how agencies provide services. It was also said that clinicians focus on impairments not diagnoses.
 - **Risk adjustment:**
One TEP member wanted to use the risk adjustment methodology from the CMS quality measures within the HHGM functional model.

Recommendations

Recommendations were as follows:

- Add IADLs to the functional model.
- Split MMTA into subgroups. The subgroups that Abt presented seemed reasonable. Also consider splitting the MMTA subgroup labeled as “other”.
- The TEP recommended a “dementia group” and a “complex rehabilitation clinical group” but did not yet have clear recommendations for how to construct those groups.
- Set up clinical groups so a patient can be classified into multiple groups (e.g. 50% MMTA and 50% Behavioral Health).
- Consider the alternative case-mix model idea (Risk-Based Grouper Model) that was included in the comments in response to the CY 2018 HH PPS proposed rule (see Appendix A for more information).
- Using the International Classification of Functioning to help identify the clinical and functional nature of patients.
- Adjust for payments using outcomes.
- Put more emphasis on other characteristics, including impairments and comorbidities.
- Control for risk factors of hospitalization and social determinants of health.

Comorbidity Adjustment

Topics Addressed

Information on comorbidities for home health users using the Chronic Condition Warehouse (CCW) Chronic Condition Flags were shown. The comorbidity adjustment within the HHGM was reviewed. Alternative approaches to the comorbidity adjustment were also shown (e.g. multiple comorbidity adjustment levels, different comorbidity adjustments for different clinical groups, and different numbers of home health 30-day periods within each comorbidity adjustment level).

Questions

The following questions were posed to the TEP members for discussion:

- Is it more desirable to have more 30-day periods receive a smaller comorbidity adjustment or fewer periods receive a larger comorbidity adjustment – and why?
- What is the best approach to adjust for comorbidities?

Discussion

Major themes that were discussed by TEP members during this section were as follows:

- **Number of comorbidity adjustment levels:**
TEP members indicated it would be an improvement to have multiple comorbidity adjustment levels (to account for multiple comorbidities), instead of having a binary adjustment as was described in the HHGM in the proposed rule. TEP members suggested having the data guide which levels to set.
- **Comorbidity adjustment by clinical group:**
TEP members preferred having different magnitudes of comorbidity adjustments based on the clinical group of the patient. That is, the comorbidity adjustment may have a larger impact for someone in the neurological rehabilitation clinical group compared to the MMTA clinical group. Additionally, TEP members said the percentage of 30-day periods that receive a comorbidity adjustment does not need to be fixed across the clinical groups. TEP members suggested letting the data help determine how many comorbidity adjustment levels there should be within each clinical group and what percentage of 30-day periods should be in each level. TEP members liked specificity and complexity over simplicity if the complexity improved accuracy.
- **Interaction between comorbidities:**
TEP members suggested including interactions between comorbidities in the model. One member mentioned that CMS has already identified a number of dyads and triads

of comorbidities using the chronic conditions. Some of those may or may not be relevant for the HHGM. Some TEP members suggested examining all interactions.

- **Impairments vs. primary diagnoses vs. secondary diagnoses:**
Some TEP members suggested creating the case-mix groups using impairments instead of primary and/or secondary diagnoses. Using OASIS assessments was suggested although it was unclear what the best source of information would be for those impairments.
- **Important comorbidities :**
One TEP member said using comorbidity interactions might make some comorbidities stand out. Some important comorbidities include pulmonary, psychological, or diabetes-related. When looking at a list of comorbidities, one TEP member indicated Atrial Fibrillation can be a stable diagnosis in certain situations so it would have little bearing on costs of care in certain situations so it may not be appropriate to control for that. There was discussion around whether to include or exclude secondary diagnoses that are closely related to the primary.
- **Unintended consequences:**
One TEP member indicated that regardless of how the system is set up, the home health agency will focus on the impairment, comorbidity, primary diagnosis, or secondary diagnosis that brings in the highest reimbursement.
- **Effects of the condition:**
Another TEP member agreed that the effects of a condition (e.g., shortness of breath) are what is most important, rather than the diagnosis itself (e.g., COPD).

Recommendations

Recommendations were as follows:

- Include multiple comorbidity adjustments in the HHGM instead of a binary adjustment.
- Set the levels for the comorbidity adjustment groups based on the data.
- Model the impact of the comorbidity adjustment so it varies by the clinical group of the home health user.
- Include interactions of comorbidities in the model.
- Instead of using diagnoses, use impairments. There were no clear recommendations yet of what impairment information to use.

Admission Source

Topics Addressed

The admission source adjustment in the HHGM was briefly discussed. Information showing the infrequent nature of emergency department visits and observational stays without hospitalizations prior to home health episodes was shown.

Questions

The following questions were posed to the TEP members for discussion:

- How should admission source be controlled for?
- Are there concerns with only accounting for institutional versus community admission source?
- Should a shorter or longer lookback be used?

Discussion

Major themes that were discussed by TEP members during this section were as follows:

- **Important adjusters:**
Some members of the TEP indicated that multiple hospitalizations and the length of hospital stay are important adjusters. Additionally, it was suggested that there should be different controls for whether a hospitalization was planned or unplanned. They suggested that it is important to understand the trajectory of the patient's care (e.g., whether the patient had a hospitalization followed by a skilled nursing facility stay).
- **Weighting incentivizes institutional admissions:**
Since institutional admissions have higher case-mix weights in the HHGM there was a concern that those institutional admissions would be over-incentivized.
- **Other issues:**
There was discussion around whether or not 14 days was an appropriate lookback period. One TEP member wondered if there should be an adjustment based on socio-economic status. There was discussion that how admission source is paid for could influence how health systems are set up, and if paying more for institutional admissions could incentivize ACOs to buy home health agencies and create pathways from hospitals to their own agencies. There was concern about the mismatch between the length of the 30-day period and the timing of the OASIS (every 60 days). One TEP member thought that paying by admission source could encourage admission to

a high-cost setting. Resources are placed to keep patients out of institutions and there are fears this model would incentivize institutional admission.

Recommendations

Recommendations were as follows:

- Include adjustments for multiple hospitalizations and the length of the hospital stay in the HHGM.
- Adjust for whether an inpatient stay was planned or unplanned in the HHGM.
- Run the HHGM model interacting the admission source variable with the clinical group variable.
- Do not include emergency department visits and observational stays in the institutional admission source.
- Although unrelated directly to community versus institutional admission source, during the discussion there was discussion that CMS should use an Area Deprivation Index to adjust for differences across geographic areas.

Episode Timing

Topics Addressed

Episode timing in the HHGM and the HHGM 30-day period length were discussed. Average visits were shown for 60-day episodes by 15-day increments (showing that the first half of a 60-day episode has more visits on average than the second half). A number of different HHGM payment regression models were reviewed. These models show differences in coefficients and goodness of fit when there are variations such as using 30-day periods versus 60-day episodes, the inclusion versus the exclusion of fixed effects, the use of CPM+NRS versus the WWMC to calculate resource use, and the use of different combinations of HHGM adjustors.

Questions

The following questions were posed to the TEP members for discussion:

- What time period should episodes cover? What are the trade-offs between having a shorter versus a longer episode?
- How should episode timing be accounted for?
- Other thoughts?

Discussion

Major themes that were discussed by TEP members during this section were as follows:

- **Justification for 30-day period:**
TEP members were not convinced that a difference in the number of visits across 60-day episodes (i.e., more visits on average during the first 30 days compared to the last 30 days of an episode) should lead to a 30-day period. TEP members indicated the 30-day threshold was arbitrary and smaller thresholds (e.g., 15 days) could have been chosen but it would make the system look more like fee-for-service. Some TEP members indicated the 30-day periods did not increase the model fit enough to justify the switch from a 60-day episode.
- **Stakeholder burden:**
There was concern that having a shorter period would lead to more stakeholder burden (e.g., a claim for the first 30-days and another claim for the second 30-days would need to be submitted).

-
- **System manipulation:**
TEP members thought home health agencies would manipulate payment around the new time period. For example, agencies could discharge a patient after 30 days and readmit them again after 60 days (so a new sequence of periods begins) in order to get a higher first episode payment for the subsequent payment. In addition, there was concern that the length of the period could impact when visits are performed (e.g., HHAs would potentially spread out visits over two 30-day periods under the new system to receive additional reimbursement). Existing research supports frontloading visits, so more visits occur earlier in a home health episode, but TEP members fear that agencies will react to payment incentives even if research suggests otherwise.
 - **Status quo:**
TEP members noted home health agencies are used to 60-day episodes and other payers also operate using a 60-day episode.
 - **Unmeasured resource use:**
A few TEP members indicated that the data showing visits declined over the length of a 60-day episode did not take into account that there was more care coordination in the later part of the home health episode (which was not measured in the claim).
 - **More accurate diagnoses:**
One TEP member indicated that a 30-day period would allow home health agencies to put patients in a more appropriate diagnosis group sooner after learning more about the patient during the course of care. Other members thought this was too easy to manipulate.

Recommendations

Recommendations were as follows:

- More research should be done into the frontloading of visits and determine how the HHGM may impact that.

Case-mix Comparisons Between HHGM and Current Payment System

Topics Addressed

Average case-mix weights under three different payment systems (current payment system, HHGM with 30-day periods, and HHGM with 60-day episodes) were shown. Average case-mix weights were shown for a variety of categories including HHGM episode characteristics (e.g., by clinical group), home health agency characteristics (e.g., by ownership type), and patient characteristics (e.g. by risk of receipt of parenteral nutrition).

Questions

The following question was posed to TEP members:

- What are your thoughts or comments on the average case-mix comparisons between the HHGM and the current payment system?

Discussion

Major issues that were raised by TEP members during this section were as follows:

- **Neuro and wound clinical groups:**
There was concern that episodes in the neurological rehabilitation clinical group did worse under the HHGM compared to the current payment system. TEP members indicated their neuro rehab patients are getting more complex as time goes on. TEP members said the wound clinical group looks like it may be doing much better under the HHGM because the HHGM calculation of resource use bundles together the NRS (which would impact the wound group) with visits.
- **Capturing data:**
It was mentioned that comparisons of case-mix between the current payment system and the HHGM doesn't capture unmet services that the patient isn't being provided.
- **Interpretation of figures:**
The TEP discussed that the figures showing average case-mix weights across the current payment system and the HHGM were designed so the total payments across both systems were identical, only the distribution of payments changed. One TEP member mentioned that since the regression has agency fixed effects that may be the cause of there being little difference in the average case-mix weight across the figures while looking at agency characteristics.

- **Unintended consequences:**

One TEP member indicated the difference in average weights across the clinical groups would over incentivize caring for certain groups. However, it was also mentioned that the model is more complicated than just differences between clinical groups. TEP members said other aspects of the HHGM (timing, admission source, comorbidity adjustment, functional level) also play a role in the case-mix weight that is assigned.

Recommendations

Recommendations were as follows:

- Show average case-mix differences at the agency level so that each agency understands the impact of the HHGM on their business.

Open Discussion and Recommendations

Discussion

Each member of the TEP was given an opportunity to make closing remarks and indicate what they felt were the most important next steps to take regarding the HHGM.

Major themes that were discussed by TEP members during this section were as follows:

- **Take examples from other models:**
It was noted that it is important to not inject distractions into the payment system. A 30-day period might inject distortions that CMS will have to clean up and patients could potentially suffer. CMS should model payments after what the agencies doing well on the HHVBP are doing. CMS should model payments based on agencies with a good star rating.
- **Approximating payment and accurate data:**
It was noted that it may be better to have far more payment categories than 144. Additionally, it is important for CMS to have better quality cost report data.
- **Testing the model:**
TEP members suggested testing the model for a limited number of agencies. There was also concern that the model's impact on agency margins should be better understood.
- **Incremental change:**
Multiple TEP members indicated that payment reform should be incremental rather than many simultaneous changes and to proceed slowly so that this is an evidence-based system.

Recommendations

Recommendations identified were as follows:

- CMS should model payments after what the agencies doing well on the HHVBP are doing.
- CMS should model payments based on agencies with a good star rating.
- CMS should improve the quality of cost report data.
- More payment groups should be included in the HHGM.
- Test the HHGM on a limited number of agencies before implementing it for all HHAs.
- Payment reform should be incremental instead of having multiple large changes occurring simultaneously.

-
- CMS should better estimate how the HHGM will impact quality outcomes, access, and behavioral changes. There was no clear recommendation from the TEP on how to do this.
 - Payments should be made on outcomes, not volume.
 - CMS should consider the alternative case-mix model discussed in comments to the CY 2018 HH PPS proposed rule.
 - CMS should ensure the HHGM allows that everyone who is entitled to the home health benefit can receive it.
 - Interactions in the models (e.g., comorbidities, clinical versus functional) should be explored more.
 - Safeguards should be implemented to reduce unintended consequences (like a dramatic reduction in therapy). There were no clear recommendations from the TEP on what safeguards should be implemented. CMS should consider which pieces of the model are essential and make sure the models don't prevent patients from receiving services.

Alternative Case-Mix Model

During the TEP meeting, TEP members recommended that Abt and CMS consider an alternative case-mix model, the Risk-Based Grouper Model (RBGM), submitted by a provider of home health services as a comment to the CY 2018 HH PPS proposed rule. This was the only comment submitted that included a case-mix model as a possible alternative to the HHGM. Originally, the Partnership for Quality Home Healthcare nominated an individual from the company that submitted the alternative case-mix model as comment to the CY 2018 HH PPS proposed rule. We were hoping to have more discussion about the RBGM during the TEP, as the comment submitted during the CY 2018 HH PPS proposed rule did not provide sufficient information for CMS to evaluate the model, but PQHH replaced that individual prior to the TEP with another nominee. As stated earlier, we asked these groups/associations to nominate one participant with clinical and health management experience and ultimately deferred to the organization on who they decided to represent the organization. Therefore, discussion regarding the RBGM was limited during the TEP as CMS did not receive sufficient information in the public comment materials regarding the RBGM to present information on that model to the TEP members. CMS prioritized this recommendation and following the TEP, Abt, CMS, and representatives from the provider had an in-person meeting to further discuss their alternative case-mix model the RBGM.

Based on material provided to CMS subsequent to the TEP, we understand the RBGM uses certain OASIS-based risk adjustment models developed and used for the home health quality reporting program to help set an episode's case-mix weight.

These risk adjustment models⁵ included the following:

- Acute Care Hospitalization
- Emergency Room Use with Hospitalization
- Improvement in Ambulation / Locomotion
- Improvement in Bed Transferring
- Improvement in Toilet Transferring
- Improvement in Lower Body Dressing
- Improvement in Upper Body Dressing
- Improvement in Bathing
- Improvement in Management of Oral Medications

⁵ The risk adjustment models were constructed by researchers from the University of Colorado and a document describing the models is available at <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HomeHealthQualityInits/Downloads/HHQILogisticRegressionModelsforRiskAdjustmentUpdated.pdf> [Accessed March 1, 2018]

The basic premise of the RBGM is to determine a predicted value of each of the above measures for each home health episode. Those predicted values are then averaged together (note, the predicted values are weighted differently depending on the measure). Each episode's combined average predicted values from the models are compared to the overall combined average predicted value across all episodes to determine a case-mix weight. This approach to determining case-mix weights is correlated with costs, but does not appear to do a better job at estimating costs compared to the HHGM.

Many aspects of the RBGM are similar to how the HHGM is set up. For example, OASIS items are used in the risk adjustment process. The RBGM uses more OASIS items than the HHGM. However, many of the OASIS items the RBGM uses were tested for inclusion in the HHGM and were found to have an unreliable pattern of resource use or are too easy to manipulate.⁶

Abt Associates and CMS have other concerns with the RBGM that include:

- Certain risk adjustment models used in the RBGM use indicators of the number of therapy visits. As part of the Bipartisan Budget Act of 2018, CMS is required to eliminate the use of therapy thresholds as part of the case-mix adjustment process.
- The risk adjustment models used in the RBGM were created to be used with Start of Care and Resumption of Care assessments, but the RBGM would also use information from follow-up assessments to calculate predicted probabilities of each measure. It is unclear if the risk adjustment models behave as expected when using follow-up assessments.
- The RBGM may be difficult to implement in the claims processing system since there are nine measures and each has many variables associated with it.
- The RBGM is focused on outcomes. Focusing on outcomes is outside the scope of CMS's statutory authority for case mix adjustment under section 1895 of the Social Security Act, which charges CMS with using a case-mix adjustment process that explains variations in the costs of providing care. Furthermore, while the Center for Medicare and Medicaid Innovation is currently testing a value-based purchasing model for home health care, the results of that demonstration model are not known at this time.
- The RBGM may overemphasize high risk patients with the potential for improvement and not pay enough attention to patients that require maintenance care to prevent or slow further deterioration of their condition.

⁶ See Chapter 7.1 of the Technical Report "Overview of the Home Health Groupings Model" <https://downloads.cms.gov/files/hhgm%20technical%20report%20120516%20sxf.pdf>

Appendix A: Materials Presented to TEP

Home Health Prospective Payment System
Technical Expert Panel
February 1, 2018, 9:00 a.m. – 4:15 p.m.



Abt Associates
4550 Montgomery Ave # 800N
Bethesda, MD 20814

Agenda

9:00 – 9:15 Welcome and Introductions (Michael Plotzke)

9:15 –10:00 Summary of public comments from CY 2018 Home Health Prospective Payment System Proposed Rule (82 FR 35270) (T.J. Christian)

- **Overview of main themes related to the Home Health Grouping Model’s case-mix adjustment methodology**
 - **Comments from the audience**
-
-

10:00 – 10:45 Calculation of Resource Use (Michael Plotzke)

- **Comparison of the BLS and CPM + NRS approaches to calculating resource use**
 - **Comments from the audience**
-
-

10:45 – 11:00 Break

11:00 – 11:45 Clinical Groups (Michael Plotzke)

- **Description of clinical groups**
 - **Discussion of the size of the MMTA clinical group**
 - **Comments from audience**
-
-

11:45 – 12:30 Lunch

12:30 – 1:15 Comorbidity Adjustment (Michael Plotzke)

- **Explanation of comorbidity adjustment**
 - **Alternative approaches to adjusting for comorbidity**
 - **Comments from audience**
-
-

1:15 – 1:45 Admission Source (Michael Plotzke)

- **Explanation of Admission Source**
 - **Comments from audience**
-
-

1:45 – 2:00 Break

2:00 – 2:45 Episode Length and Timing (Michael Plotzke)

- **Comparison of 30-day periods versus 60-day episodes**
 - **Comments from audience**
-
-

2:45 – 3:15 Case-mix Comparisons Between HHGM and Current Payment System (T.J. Christian)

- **Examination of case-mix weights across the HHGM and the current payment system by characteristics of home health agencies**
 - **Comments from audience**
-
-

3:15 - 4:15 Free response and next steps (Michael Plotzke)

- **Ideas for alternative case-mix systems**
 - **Discussion of any topics previously or not previously discussed**
 - **Next steps**
-
-

**Home Health Prospective Payment System
Technical Expert Panel Meeting
February 1, 2018
Meeting Attendees**



Participants

Evan Christman
Medicare Payment Advisory Commission (MEDPAC)

William Dombi
National Association for Home Care & Hospice (NAHC)

Kathleen Holt
Center for Medicare Advocacy

Luke James
Representing the Partnership for Quality Home Healthcare

Bud Langham
Representing the American Physical Therapy Association

Jenny Loehr
Representing the American Speech-Language-Hearing Association (ASHA)

Melanie Morris
Representing Elevating Home

Peter Notarstefano
LeadingAge

Timothy Peng
Visiting Nurse Service of New York

Karen Vance
Representing the American Occupational Therapy Association (AOTA)

Observers

Jennifer Bogenrief
Representing the American Occupational Therapy Association (AOTA)

Joy Cameron
Representing Elevating Home

Mary Carr
Representing the National Association for Homecare & Hospice

Kara Gainer
Representing the American Physical Therapy Association (APTA)

Steve Guenther
Representing the Partnership for Quality Home Healthcare

Sara Warren
Representing the American Speech-Language-Hearing Association (ASHA)

Researchers:

David Grabowski, Ph.D.
Professor of Health Care Policy
Harvard Medical School

Bruce Kinosian, MD
Associate Professor of Medicine
University of Pennsylvania

Sally Clark Stearns, Ph.D.
Professor of Health Policy and management
University of North Carolina, Chapel Hill

Abt Associates, Inc.

Michael Plotzke, Ph.D., Principal Investigator
Allison Muma, MHA, Project Director
Thomas Christian, Ph.D., Associate
Seyoun Kim, MHS, Analyst
Erica Granor, Associate Analyst



Home Health Groupings Model

Technical Expert Panel

February 1, 2018



Purpose of the Meeting



- Gather perspectives on the Home Health Groupings Model (HHGM) as described in the 2018 Home Health Prospective Payment System Proposed Rule (82 FR 35270)
- Abt and CMS will use feedback received today to strengthen the Home Health Grouping Model and/or consider alternative payment models

Introductions



- Please provide a short introduction and describe what you are hoping to achieve during today's meeting

Ground Rules



- CMS is observing the TEP meeting but will not participate in the discussions
- Abt is recording the audio of the meeting today.
 - We will provide a publically available summary of the main points made at the meeting
 - Notes will not attribute comments to individual people or organizations
- Topics discussed will relate to technical aspects of the case-mix adjustment model
 - Issues related to CMS policy decisions (i.e. budget neutrality adjustments) are better discussed in a different venue as those topics are unrelated to the work Abt does
- Do not distribute material provided or discussed in this meeting

Ground Rules



- We have a very large group today
 - Only participants seated at the table can participate in the conversation
 - We want to make sure everyone and every organization has the opportunity to participate
 - During the meeting I will be doing my best to make sure we hear from a variety of different people
 - We will have time at the end to circle back to unfinished topics if I need to limit the length of a conversation

Please consider the following



- Case-mix adjustment is only one aspect of a payment system – but it is the aspect we are tasked with discussing
- Additionally, by law, CMS is to:
 - “The Secretary shall establish appropriate case mix adjustment factors for home health services in a manner that explains a significant amount of the variation in cost among different units of services.”
- Approaches to case-mix adjustment need to be actionable
 - CMS cannot case-mix adjust using data they aren’t collecting

Agenda



1. Introductions
2. **Background**
3. Summary of Public Comments
4. Resource Use
5. Clinical Groups
6. Comorbidity Adjustments
7. Admission Source
8. Episode Length and Timing
9. Case-Mix Weights
10. Free Response and Next Steps

Background



Motivation – Section 3131(d) Report to Congress



- Examined costs associated with beneficiaries who were: low-income, lived in underserved areas, had high severity of illness

- Report found current payment system produced lower margins for those
 - needing parenteral nutrition
 - with traumatic wounds or ulcers
 - who required substantial assistance in bathing
 - admitted to HH following an acute or post-acute stay
 - who have a high Hierarchical Condition Category score
 - who had certain poorly controlled clinical conditions
 - who were dual eligible

Motivation – MedPAC Annual Reports (2011, 2015)



- The Medicare HH Benefit is ill-defined
- HH payment should not be based on the number of therapy visits
 - Current system incentivizes more therapy visits and fewer non-therapy visits
- HH payment should be determined by patient characteristics

Overview of HHGM



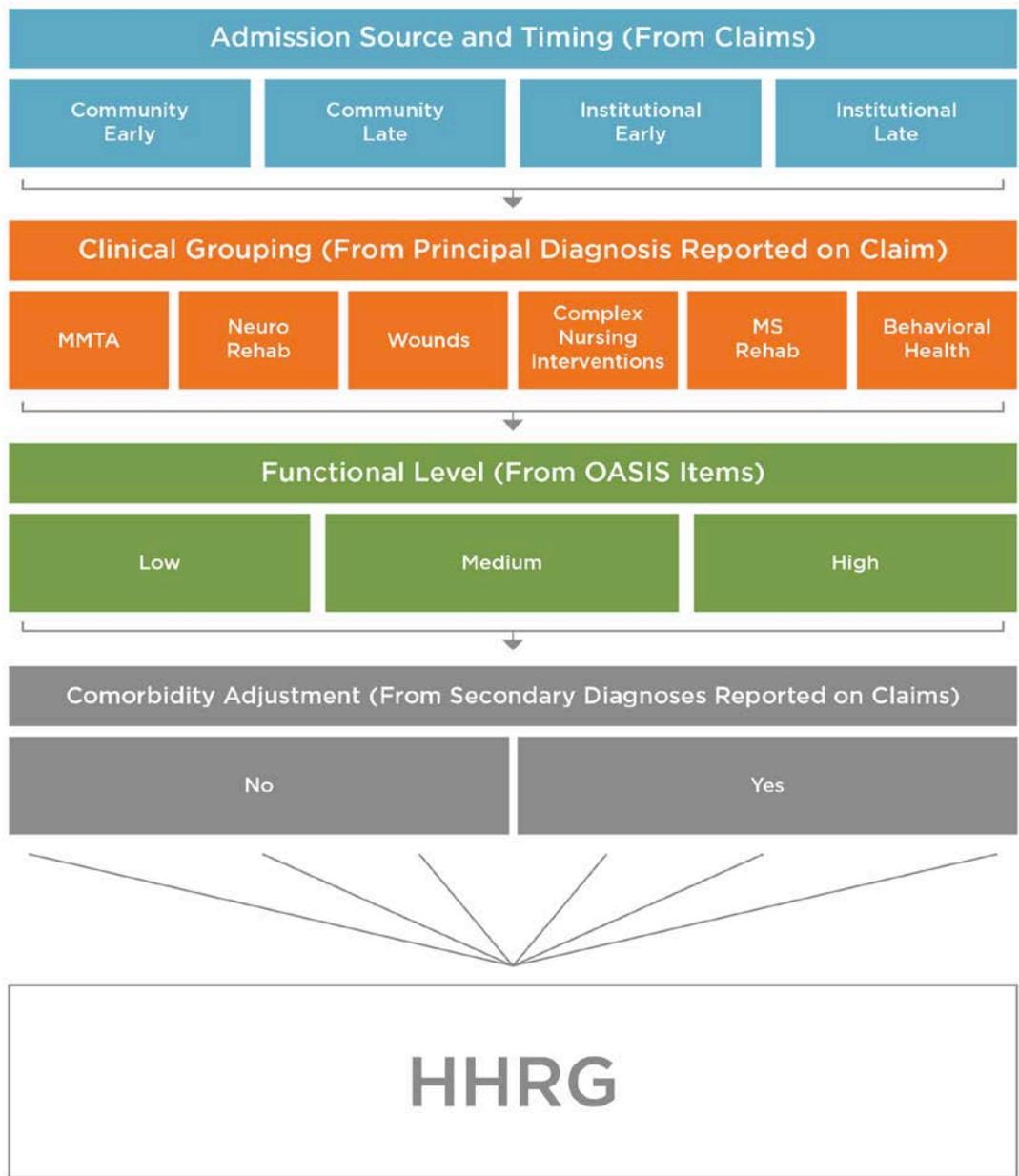
- Each HH period is categorized into different sub-groups within each of the five categories below:
 - Timing (early or late; period is placed into 1 of 2 groups)
 - Referral source (community or institutional source; period is placed into 1 of 2 groups)
 - Clinical grouping (musculoskeletal (MS) rehab, neuro/stroke rehab, wounds, Medication Management Teaching and Assessment (MMTA), behavioral, or complex nursing care; period is placed into 1 of 6 groups)
 - Functional level (low or high; low, medium, or high; period is placed into 1 of 3 groups)
 - Comorbidity adjustment (no or yes; based on secondary diagnoses; period is placed into 1 of 2 groups)

- In total, HHGM produces $2*2*6*3*2 = 144$ different payment groups

Data Used



- Home health episodes (matched to OASIS) from 2016
- Home health cost reports from 2015
- Provider of services files



Under the Home Health Groupings Model, a 30-day period is grouped into one (and only one) subcategory under each larger colored category. A 30-day period's combination of subcategories groups the 30-day period into one of 144 different payment groups.

**Summary of Public
Comments from CY
2018 Home Health
Prospective Payment
System Proposed
Rule (82 FR 35270)**



Comments from the HH Proposed Rule for FY 2018



- HHGM proposed in the FY 2018 rule published in June 2017
- Received 1,347 of comments from stakeholders
- We summarize and discuss comments related to technical components of HHGM
- Purpose: obtain feedback on topics brought up by stakeholders, further analyses needed, additional considerations

HHGM Comments Topics



1. Length of payment period
2. Admission source
3. Episode timing
4. Clinical groupings
5. Comorbidity adjustment
6. LUPA thresholds
7. NRS bundling
8. Regression-determined case-mix weights
9. Resource use data sources and methods
10. Other

Length of Payment Period



- From 60-day episode to 30-day period
 - 60-day episodes are split into equal payments for each 30-day period
 - If only visits during the first 30-day period, only paid for one period
- Concerns
 - Frontloading can be beneficial for the patient; would result in incentive to not frontload to generate a second period
 - Or, may discourage taking patients needing complex care that need multiple periods

Timing



- First 30-day period is early; subsequent periods are late
 - Currently, first and second 60-day episodes are early
 - Early period is paid more than late periods
- Concerns/Recommendations
 - Discourage necessary therapy or other service provision needed after the first 30-day period
 - 60-day gap should be reevaluated to allow for a new sequence to start with hospitalization

Admission Source



- 14-day admission source determines grouping
 - Institutional entrants receiving higher weight/payment
- Concerns/Recommendations
 - Disincentivizes providers from taking community admissions (mixed comments on whether this is beneficial)
 - Recommend including emergency room and observational stays as “institutional”
 - Late period with institutional admission source paid more than early period with community admission source
 - Recommend a 5-day window instead of 14 for designating institutional/community admission

Clinical Groupings



- Six clinical groupings based on principal diagnosis code
 - Two are more therapy heavy (Neuro and MS rehab)
 - MMTA accounts for over 60 percent of episodes
- Concerns/Recommendations
 - MMTA too broad a category (includes too many periods)
 - Not enough therapy groups
 - MMTA and behavioral health paid too low
 - Too much reliance on principal diagnosis

Comorbidity Adjustment



- Secondary diagnosis used to adjust for one of 15 comorbidities, covering these areas:
 - Heart Disease, Cerebral Vascular Disease, Circulatory Disease and Blood Disorders, Endocrine Disease, Neoplasm, Neurological Disease and Associated Conditions, Respiratory Disease, Skin Disease

- Concerns/Recommendations
 - Many patients have multiple comorbidities and adjustment should be made for multiple comorbidities
 - Same adjustment should not be made for all patients (i.e. some comorbidities are more severe, or there are interactions with comorbidities and other characteristics of the patient)

Comorbidities



- **Heart Disease 1:** includes hypertensive heart disease.
- **Cerebral Vascular Disease 4:** includes sequelae of cerebrovascular disease.
- **Circulatory Disease and Blood Disorders 9:** includes venous embolism and thrombosis.
- **Circulatory Disease and Blood Disorders 10:** includes varicose veins of lower extremities with ulcers and inflammation, and esophageal varices.
- **Circulatory Disease and Blood Disorders 11:** includes lymphedema.
- **Endocrine Disease 2:** includes diabetes with complications due to an underlying condition.
- **Neoplasm 18:** includes secondary malignant neoplasms.
- **Neurological Disease and Associated Conditions 5:** includes secondary parkinsonism.
- **Neurological Disease and Associated Conditions 7:** includes encephalitis, myelitis, encephalomyelitis, and hemiplegia, paraplegia, and quadriplegia.
- **Neurological Disease and Associated Conditions 10:** includes diabetes with neurological complications.
- **Respiratory Disease 7:** includes pneumonia, pneumonitis, and pulmonary edema.
- **Skin Disease 1:** includes cutaneous abscesses, and cellulitis.
- **Skin Disease 2:** includes stage one pressure ulcers.
- **Skin Disease 3:** includes atherosclerosis with gangrene.
- **Skin Disease 4:** includes unstageable and stages two through four pressure ulcers.

LUPA Thresholds



- LUPA thresholds will depend on case mix group
 - Currently: one threshold (5 visits) applies to all episodes
 - Proposed: higher of 10th percentile value of visits or 2 visits by payment group (for 30-day period)
- Concerns/Recommendations
 - Single LUPA threshold was simpler
 - Concerns with the upper threshold of 7 for some payment groups
 - Other commenters did support LUPA thresholds by payment group

Non-Routine Supplies Bundling



- NRS payments
 - Currently, NRS is paid separately using a payment model. However, 2/3s of NRS payments are made when no NRS were actually provided
 - Proposed to be included with base payment rate (cost per visit + NRS would be used to determine payment)
- Concerns/Recommendations
 - Commenter felt this would result in overpaying for some cases and underpaying for others (similar to the current system)

Regression-Determined Weights



- Regression method used to determine payment weights for each group
 - Regression used since 2000, inception of HH PPS
 - Smooths the payment weights and allows for adjustment of various HHA-level characteristics
- Concerns/Recommendations
 - One commenter recommended using actual costs in each payment group, rather than a regression-adjusted cost

Resource Use Data and Methods



- HHGM uses cost reports to determine costs per visits
 - Current model using wage-weighted minutes of care (WWMC) from the Bureau of Labor Statistics (BLS)
 - Propose to replace with Cost per Minute + NRS using cost report data

- Concerns/Recommendations
 - Questionable cost report data
 - Favors facility-based versus freestanding HHAs (facility-based can allocate costs differently)

Other



- Disincentivizes therapy provision by removing the utilization component from the current payment model
- Incorporate age, caretaker's availability, vision, cognitive status in the payment model
- Eliminate PEP
- Ensure adequate payments for rural HHAs

Discussion



- Which comments should be explored further?
- What further analyses do you recommend?
- Other comments you have?

Calculation of Resource Use



Measuring Episode Costs



- Need to measure episode costs to design a payment system
- Resource use is an estimate of episode costs
- Multiple approaches considered; two main candidates:
 - Wage Weighted Minutes of Care (WWMC) [payment system currently uses this method]
 - Cost per Minute plus Non-Routine Supplies (CPM + NRS)

Comparison of Approaches



	Wage Weighted Minutes of Care (WWMC)	Cost per Minute plus Non-Routine Supplies (CPM + NRS)
Data Sources	BLS wage estimates, Home Health Medicare claims	Cost Reports, Home Health Medicare claims
General Approach	Wages multiplied by amount of care provided for each discipline	Total costs multiplied by amount of care provided for each discipline
Costs Represented	Wages and fringe benefits directly related to patient visit	Wages, fringe benefits, overhead costs, transportation costs, other non-visiting services labor costs
Imputation Needed?	No	Yes
Non-Routine Supply	Determined through separate model, used NRS cost-to-charge ratio to help set weights	Use NRS cost-to-charge ratio to obtain NRS costs per episode

Resource Use Distribution



	Mean	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile
Average Resource Use (WWMC)	\$347.44	\$42.71	\$128.13	\$266.23	\$492.28	\$907.23
Average Resource Use (CPM + NRS)	\$1,404.45	\$162.43	\$528.80	\$1,080.80	\$1,941.27	\$3,674.27
Average Resource Use (CPM)	\$1,353.70	\$153.38	\$509.19	\$1,040.43	\$1,881.37	\$3,543.12

Selecting a Resource Use Approach



- High correlation between methods (0.86 correlation coefficient)

WWMC advantages

- Incorporates labor categories (e.g., LPN versus RN)
- BLS data are available more quickly
- No imputation needed

CPM+NRS advantages

- NRS is incorporated into one payment system, rather than a separate model
- Includes direct (e.g. staffing) and indirect (e.g. transportation) costs
- More evenly weights skilled nursing and therapy services

- HHGM findings use the CPM+NRS method
- Exploration of differences and their implications continues

Resource Use Ratios by Discipline



Estimated Cost per Hour	Skilled Nursing	Physical Therapy	Occupational Therapy	Speech Therapy	Medical Social Service	Home Health Aide
Average Resource Use (WWMC)	1.00	1.42	1.42	1.55	0.95	0.36
Average Resource Use (CPM + NRS)	1.00	1.19	1.20	1.30	1.69	0.50

- Ratio of therapy to skilled nursing costs per hour is lower for CPM + NRS
- Ratio of MSS to skilled nursing costs per hour is different directions for CPM+NRS and WWMC methods

Discussion



- Do you favor one resource use method over another – and why?
- Do you have suggestions for improving the measurement of resource use?
- What (if any) are the unintended consequences of selecting either approach?

Clinical Groups

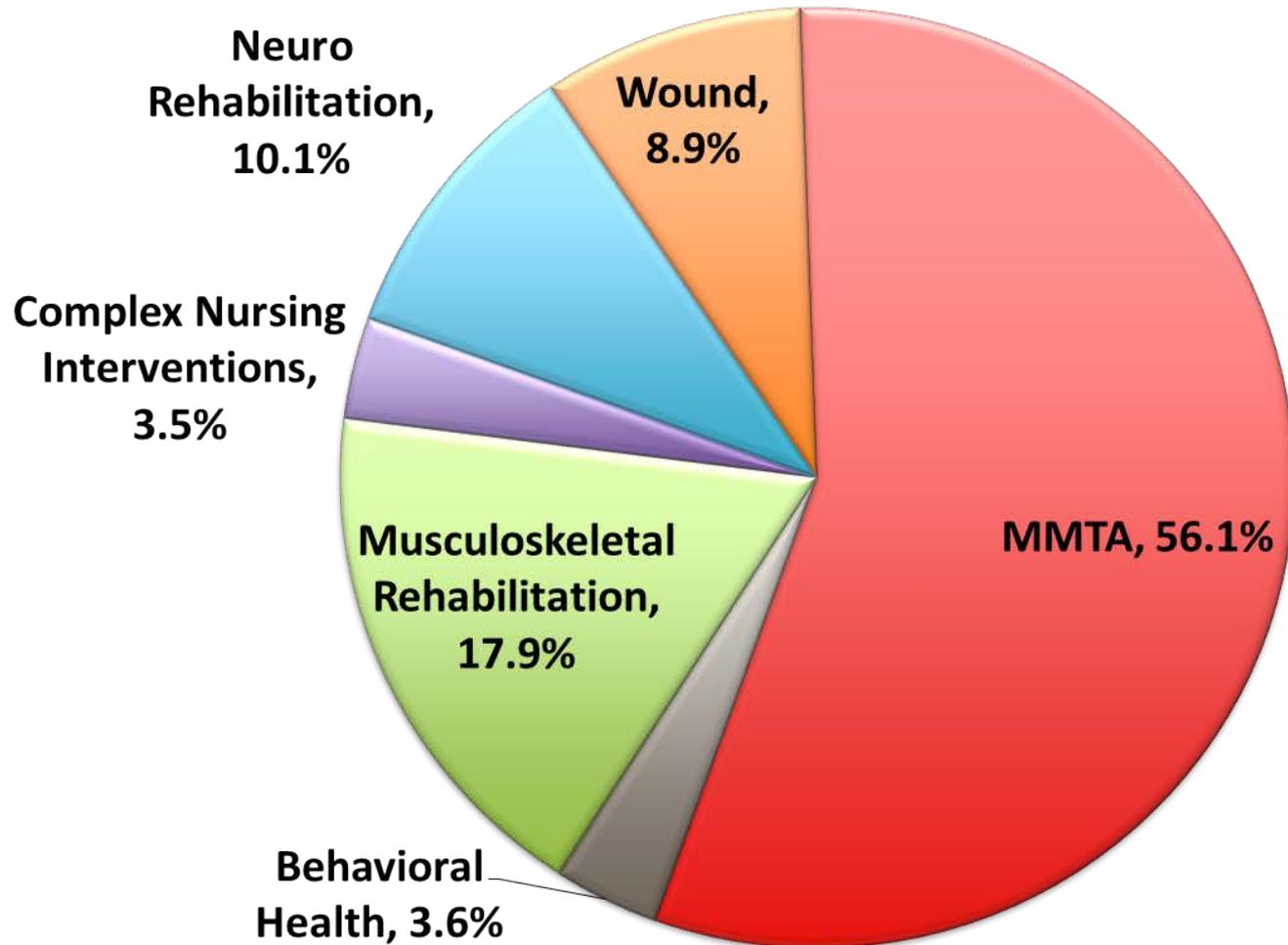


Description of the Six Clinical Groups



Clinical Group	Main reason for HH encounter is to provide:
Musculoskeletal Rehabilitation	Therapy (PT/OT/SLP) for a musculoskeletal condition
Neuro/Stroke Rehabilitation	Therapy (PT/OT/SLP) for a neurological condition or stroke
Wounds—Post-Op Wound Aftercare and Skin/Non-Surgical Wound Care	Assessment, treatment and evaluation of a surgical wound(s); assessment, treatment and evaluation of non-surgical wounds, ulcers burns and other lesions
Complex Nursing Interventions	Assessment, treatment, and evaluation of complex medical and surgical conditions including IV, total parenteral nutrition, enteral nutrition, ventilator, and ostomies
Behavioral Health Care	Assessment, treatment, and evaluation of psychiatric conditions
Medication Management, Teaching and Assessment (MMTA)	Assessment, evaluation, teaching, and medication management for a variety of medical and surgical conditions not classified in one of the above groups

Percentage of Periods by Clinical Group



MMTA Subgroups



Average Resource Use by MMTA Subgroup

Subgroup	N	%	Mean	Median
Surgical/Procedural Aftercare	306,069	6.0%	\$1,602.37	\$1,321.56
Cardiac/Circulatory	1,610,900	31.8%	\$1,423.45	\$1,108.80
Endocrine	435,313	8.6%	\$1,493.07	\$1,027.65
Infectious/Blood Forming Diseases/Neoplasms	488,469	9.6%	\$1,439.33	\$1,133.12
Other	1,518,941	30.0%	\$1,362.78	\$1,034.10
Respiratory	705,118	13.9%	\$1,403.24	\$1,111.27
Total	5,064,810	100.0%	\$1,420.77	\$1,095.87

Most Common Diagnoses: Surgical/Procedural Aftercare



- Encounter for surgical aftercare following surgery on the circulatory system (Z48.812): 42.3%
- Aftercare following surgery for neoplasm (Z48.3): 22.1%
- Encounter for surgical aftercare following surgery on the digestive system (Z48.815): 19.3%

Cumulative Percentage is 83.7%

Most Common Diagnoses: Cardiac



- Heart failure, unspecified (I50.9): 16.9%
- Unspecified atrial fibrillation (I48.91): 9.4%
- Hypertensive chronic kidney disease with stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease (I12.9): 7.5%
- Atherosclerotic heart disease of native coronary artery without angina pectoris (I25.10): 6.8%
- Venous insufficiency (chronic) (peripheral) (I87.2): 6.5%
- Hypertensive heart disease without heart failure (I11.9): 5.4%

Cumulative Percentage is 52.6%

Most Common Diagnoses: Respiratory



- Chronic obstructive pulmonary disease, unspecified (J44.9): 33.9%
- Chronic obstructive pulmonary disease with (acute) exacerbation (J44.1): 32.9%
- Pneumonia, unspecified organism (J18.9): 11.2%
- Chronic obstructive pulmonary disease with acute lower respiratory infection (J44.0): 5.7%

Cumulative Percentage is 83.7%

Most Common Diagnoses: Endocrine



- Type 2 diabetes mellitus with hyperglycemia (E11.65): 24.3%
- Type 2 diabetes mellitus with diabetic neuropathy, unspecified (E11.40): 20.3%
- Type 2 diabetes mellitus with diabetic polyneuropathy (E11.42): 17.6%
- Type 2 diabetes mellitus with diabetic chronic kidney disease (E11.22): 15.2%
- Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene (E11.51): 3.4%

Cumulative Percentage is 80.7%

Most Common Diagnoses: Infectious /Blood Forming Diseases/Neoplasms



- Urinary tract infection, site not specified (N39.0): 29.7%
- Anemia, unspecified (D64.9): 5.3%
- Vitamin B12 deficiency anemia due to intrinsic factor deficiency (D51.0): 4.6%
- Malignant neoplasm of prostate (C61.): 3.1%
- Infection following a procedure, subsequent encounter (T81.4XXD): 3.1%
- Enterocolitis due to Clostridium difficile (A04.7): 2.8%
- Multiple myeloma not having achieved remission (C90.00): 1.8%

Cumulative Percentage is 50.3%

Most Common Diagnoses: Other



- Essential (primary) hypertension (I10.): 40.5%
- Type 2 diabetes mellitus without complications (E11.9): 21.7%
- Benign prostatic hyperplasia with lower urinary tract symptoms (N40.1): 1.7%
- Other chronic pain (G89.29): 1.7%

Cumulative Percentage is 65.6%

MMTA Subgroups



- If nothing else about the HHGM model changed, each additional clinical group would result in $2*2*3*2 = 24$ additional case-mix groups
- Separation in case-mix weights between the groups likely would not be large due to the limited difference in resource use across the MMTA subgroups
 - Surgical/Procedural Aftercare looked like the MMTA sub-group with the largest difference in resource use, but it was only \$100-\$200 larger than the other groups

Questions



- How should periods be grouped in order to account for differences amongst patient diagnoses?
- Should the MMTA clinical group be divided into additional sub-groups?
 - Is the added complexity of having additional case-mix groups worthwhile?

Comorbidity Adjustment



Comorbidity Adjustment: Motivation



- The primary HH diagnosis determines the HHGM clinical group
- However, secondary diagnoses also contain relevant information indicating patient need for case-mix adjustment, even after accounting for other aspects of the HHGM
- A **comorbidity** is defined as a medical condition coexisting in addition to a primary diagnosis
 - Comorbidity is tied to worse health outcomes, more complex medical need and management, and higher care costs

Most Common CCW Chronic Condition Flags for Beneficiaries Receiving Home Health	% of Beneficiaries
Hypertension	94.7%
Hyperlipidemia	87.3%
Anemia	82.8%
Rheumatoid Arthritis/Osteoarthritis	79.5%
Ischemic Heart Disease	71.1%
Cataract	70.8%
Chronic Kidney Disease	60.5%
Depression	57.5%
Diabetes	55.4%
Heart Failure	55.0%
Chronic Obstructive Pulmonary Disease and Bronchiectasis	48.7%
Asthma	41.6%
Alzheimer's Disease and Related Disorders or Senile Dementia	38.9%

Most Common CCW Chronic Condition Flags for Beneficiaries Receiving Home Health	% of Beneficiaries
Acquired Hypothyroidism	38.5%
Osteoporosis	33.3%
Stroke	31.1%
Atrial Fibrillation	30.1%
Glaucoma	26.9%
Benign Prostatic Hyperplasia	23.2%
Alzheimer's Disease	14.9%
Hip/Pelvic Fracture	11.4%
Acute Myocardial Infarction	10.8%
Female/Male Breast Cancer	7.4%
Prostate Cancer	6.4%
Colorectal Cancer	5.0%
Lung Cancer	3.7%
Endometrial Cancer	1.6%

Comorbidities Specific to Home Health



- A HH specific comorbidity list was developed with broad clinical categories used to group comorbidities within the HHGM:
 - heart disease
 - respiratory disease
 - circulatory disease
 - cerebrovascular disease
 - gastrointestinal disease
 - neurological conditions
 - endocrine disease
 - neoplasms
 - genitourinary/renal disease
 - skin disease
 - musculoskeletal disease
 - behavioral health
 - infectious diseases

Comorbidities Specific to Home Health



- When evaluating comorbidities for HHGM inclusion, we assigned those with at least 0.1% of periods to subcategories
- For remaining comorbidities, we determined each subcategory's associated average resource use and flagged those with higher than average increased costs for a **comorbidity adjustment group**
- Periods having at least one comorbidity included with the adjustment group will receive an adjustment (roughly 16.7%)

Frequency of Periods and Resource Use Estimates by Comorbidity Presence



Comorbidity Group	# 30-Day Periods	% 30-Day Periods	Mean Resource Use	Median Resource Use
No Comorbidity Adjustment	7,522,067	83.26%	\$1,486.34	\$1,197.93
Comorbidity Adjustment	1,512,902	16.74%	\$1,822.68	\$1,466.23
Total	9,034,969	100.00%	\$1,542.66	\$1,239.91

Additional Approaches to Comorbidity Adjustment



- Comorbidity adjustment currently causes case-mix weight to increase by 0.174.
- Alternative Approach - Set it up just like functional levels
 - Each comorbidity contributes points to a comorbidity score
 - Multiple comorbidity levels (low, medium, high)
 - Medium comorbidity level increases case-mix weight by 0.0193
 - High comorbidity level increases case-mix weight by 0.1217
 - This approach causes the case-mix adjustment to impact weights less than previous approach
 - More 30-day periods receive an adjustment though

Additional Approaches to Comorbidity Adjustment



- Alternative Approach - Set it up just like functional levels
 - Three levels, but low is 80% of 30-day periods, medium is 10% of 30-day periods, and high is 10% of 30-day periods
 - Medium comorbidity level increases case-mix weight by 0.0741
 - High comorbidity level increases case-mix weight by 0.2301

Additional Approaches to Comorbidity Adjustment



- Alternative Approach – Make comorbidity adjustment vary depending on clinical group.

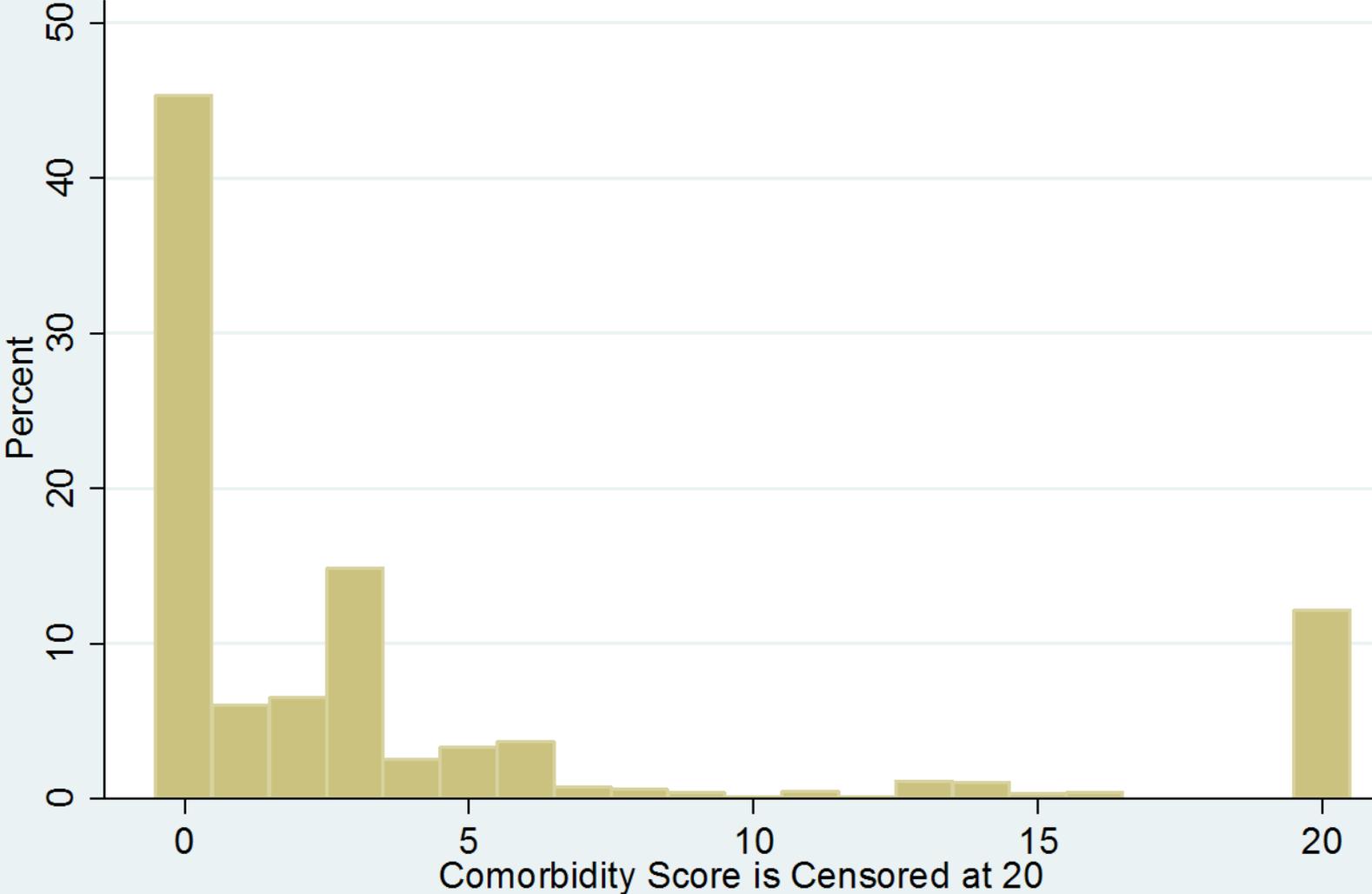
	Option 1		Option 2	
	Medium (33% of Periods)	High (33% of Periods)	Medium (10% of periods)	High (10% of periods)
MMTA	0.0132	0.1023	0.0456	0.2357
Behavioral Health	0.062	0.0582	0.0321	0.0646
Complex	0.0143	0.0779	0.0089	0.2168
MS Rehab	0.0168	0.1113	0.0588	0.1942
Neuro	0.0348	0.2276	0.2613	0.3234
Wound	0.051	0.1838	0.1084	0.2358

Questions



- Is it more desirable to have more 30-day periods receive a smaller comorbidity adjustment or fewer periods receive a larger comorbidity adjustment – and why?
- What is the best approach to adjust for comorbidities?

Histogram of Comorbidity Score



This information has not been publicly disclosed and may be privileged and confidential. It is for discussion purposes only, and must not be disseminated, distributed or copied to persons not authorized to receive the information.

Option 1 - Points needed to be grouped into comorbidity levels



	Low (~33% of 30-day periods)	Medium (~33% of 30-day periods)	High (~33% of 30-day periods)
MMTA	0	1-3	4+
Behavioral Health	0	1	2+
Complex	0	1-3	4+
MS Rehab	0	1-2	3+
Neuro Rehab	0	1-3	4+
Wound	0-2	3-22	23+

Option 2 - Points needed to be grouped into comorbidity levels



	Low (~80% of 30-day periods)	Medium (~10% of 30-day periods)	High (~10% of 30-day periods)
MMTA	0-5	6-16	17+
Behavioral Health	0-3	4-5	6+
Complex	0-6	7-17	18+
MS Rehab	0-3	4-6	7+
Neuro Rehab	0-13	14-17	18+
Wound	0-41	42-45	46+

Admission Source



Admission Source



- **Institutional:** Acute or post-acute (skilled nursing facility, inpatient rehabilitation facility, long term care hospital) care in the 14 days prior to the HH admission
- **Community:** No acute or post-acute care in the 14 days prior to the HH admission

Admission Source	Average Resource Use	Number of Periods	Percent	SD	25th Percentile	Median	75th Percentile
Institutional	\$2,125.21	2,295,678	25.4%	\$1,289.02	\$1,206.72	\$1,875.19	\$2,737.54
Community	\$1,344.22	6,739,291	74.6%	\$1,113.00	\$559.97	\$1,034.91	\$1,792.79
Total	\$1,542.66	9,034,969	100.0%	\$1,209.05	\$660.61	\$1,239.91	\$2,080.72

Admission Source



- Observational stays occur infrequently before a 30-day period of care
 - Roughly 2% of periods
 - Average resource use is very similar to the community admission source
 - Including observational stays with institutional admissions would slightly lessen the impact of institutional admission source

Questions



- How should admission source be controlled for?
- Are there concerns with only accounting for institutional versus community admission source?
- Should a shorter or longer lookback be used?

Episode Length and Timing

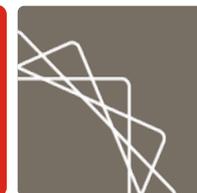


30 Day Periods: Overview and Motivation



- In the HH PPS, HHAs are paid for each (up to) 60 day episode of care
- However, we found significant resource usage differences across 60 day episodes' first and second halves
 - Separately paying each half in accordance with differential resource use better aligns payments with cost
- For the HHGM analysis, we simulate 30 day periods

Mean Visits & Resource Use in each 15 Day Segment of a (Full) and First 60-Day Episode among CY 2016 Episodes; n=856,014



	Days 1-15	Days 16-30	Days 31-45	Days 46-60
Total Visits	8.1	6.4	5.1	4.6
SN Visits	3.9	2.5	2.2	2.3
PT Visits	2.6	2.4	1.7	1.4
OT Visits	0.8	0.8	0.5	0.4
SLP Visits	0.1	0.2	0.1	0.1
Aide Visits	0.5	0.5	0.5	0.4
MSS Visits	0.1	0.1	0.0	0.0
Resource Use	\$328.99	\$233.01	\$184.52	\$171.60

Timing



- In the current payment system, early episodes are first or second in a sequence of episodes
 - When the most recent case-mix refinements went into effect in 2008, late episodes (3rd or later) had higher resource use on average (and therefore higher case-mix weights)
 - In recent years, the relationship is more mixed – sometimes late episodes have lower case-mix weight than a comparable early episode
- In the HHGM, early periods are only the first in a sequence of episodes
 - This was done to simplify the model and best reflect the relationship between episode timing and resource use

Benefits of Transition to 30 Day Periods



1. HHGM fit statistics (e.g., R^2) improve from reduced variation arising from a more constrained time window; in turn this creates more accurate case mix weights
2. Shorter episodes may promote HHAs to more frequently review patients' status and thereby respond more diligently to patient needs

Methodology



- Simulated 30 day periods were constructed using segments of current 60 day episodes
 1. A 30 day period comprised of days 1-30
 2. Where applicable (depending on episode length), a second period comprised of days 31-60
- *Example: a 58 day episode yields two new segments: a initial 30 day period (days 1-30) and a second 28 day period (days 31-58)*
- Home health episodes from the current payment system that are 30 days or less will not yield a second period in the HHGM

Results



- Overall, there were 5,710,726 60-day episodes
 - Of these, 1,513,958 episodes are 30 days or less
 - Those only produce a single 30-day period
 - The remaining 4,196,768 episodes exceed 30 days
 - Each produces two 30-day periods
 - However, we excluded 872,525 periods without visits or that would be considered a LUPA under the HHGM
- $1,513,958 + 2 * 4,196,768 - 872,525 = 9,034,969$ 30-day periods

Regression Results



- Handout contains regression models showing coefficients from a HHGM 30-day period model and a HHGM 60-day episode model
- Results are similar across different models

Questions?



- What time period should episodes cover? What are the trade-offs between having a shorter versus a longer episode?
- How should episode timing be accounted for?
- Other thoughts?

Case-mix Comparisons Between HHGM and Current Payment System

T.J. Christian



Objectives



- Examine the case-mix weights across the HHGM and the current payment system by characteristics of episodes and home health agencies
- Collect feedback from TEP

Case-Mix Weights in Home Health Groupings Model Overview



- The **Home Health Groupings Model (HHGM)** assigns separate payment weights to episodes for patients with similar characteristics and needs
 1. Separate episodes into grouping “buckets”
 - Accounts for clinical grouping, functional level, timing, admission source, and comorbidity adjustment: 144 total “buckets” or buckets
 2. Calculate each group’s **case-mix weight** as the group’s predicted mean cost relative to the overall average
 - A group with higher (lower) than average cost is assigned a case-mix weight above (below) “1.00”
- Eventually, we will use the new case-mix weights to adjust the home health base payment amount
 - Higher resource need episodes are assigned higher case-mix weights and thereby receive more payment

Case-Mix Weights Calculation



- Calculate each group's **case-mix weight** as the group's predicted mean cost relative to the overall average
 - **Resource use** is our measure of episode cost
 - Groups with higher (lower) than average resource use are assigned case-mix weights above (below) "1.00"

Grouping	Group 1	Group 2	Group 3
Predicted Resource Use:	\$600	\$1,800	\$4,800
Relative to Average: [= \$2,400]	$\$600/\$2,400 =$	$\$1,800/\$2,400 =$	$\$4,800/\$2,400 =$
Implied Case-Mix Weight :	0.250	0.750	2.000

Case-Mix Weights Impact on Payment



- Case-mix weights adjust the home health base payment amount
 - Higher case-mix weights → Higher episode payments

Home Health Groupings Model Episode Payment Determination

(Episode Base Payment Amount) x (**Case-Mix Weight**) x (Wage Index)

+

Outlier Payment Amount

=

Home Health Episode Total Episode Payment

Analytic Sample to Compare HHGM Payment Weights



- Medicare home health episodes ending in 2016
 - Exclude Low Utilization Payment Amount episodes (<5 visits) in the current payment system
- To current payment system case-mix weights, we compare HHGM weights (30-day and 60-day weights)
- We average 30-day weights to their originating 60-day episode for comparison

Simulating Case-Mix Weights: Two 30-day Periods



Current Payment System	HHGM (30-Day) System	Case-Mix Weight Comparison
60-day Episode (Case-mix Weight="X")	30-day Period #1 (Case-mix Weight="A")	"X" vs. $[("A"+"B")/2]$
	30-day Period #2 (Case-mix Weight="B")	

Simulating Case-Mix Weights: One 30-day Period



Current Payment System	HHGM (30-Day) System	Case-Mix Weight Comparison
60-day Episode (Case-mix Weight="X")	30-day Period #1 (Case-mix Weight="A")	"X" vs. "A"
	< Missing >	

Results



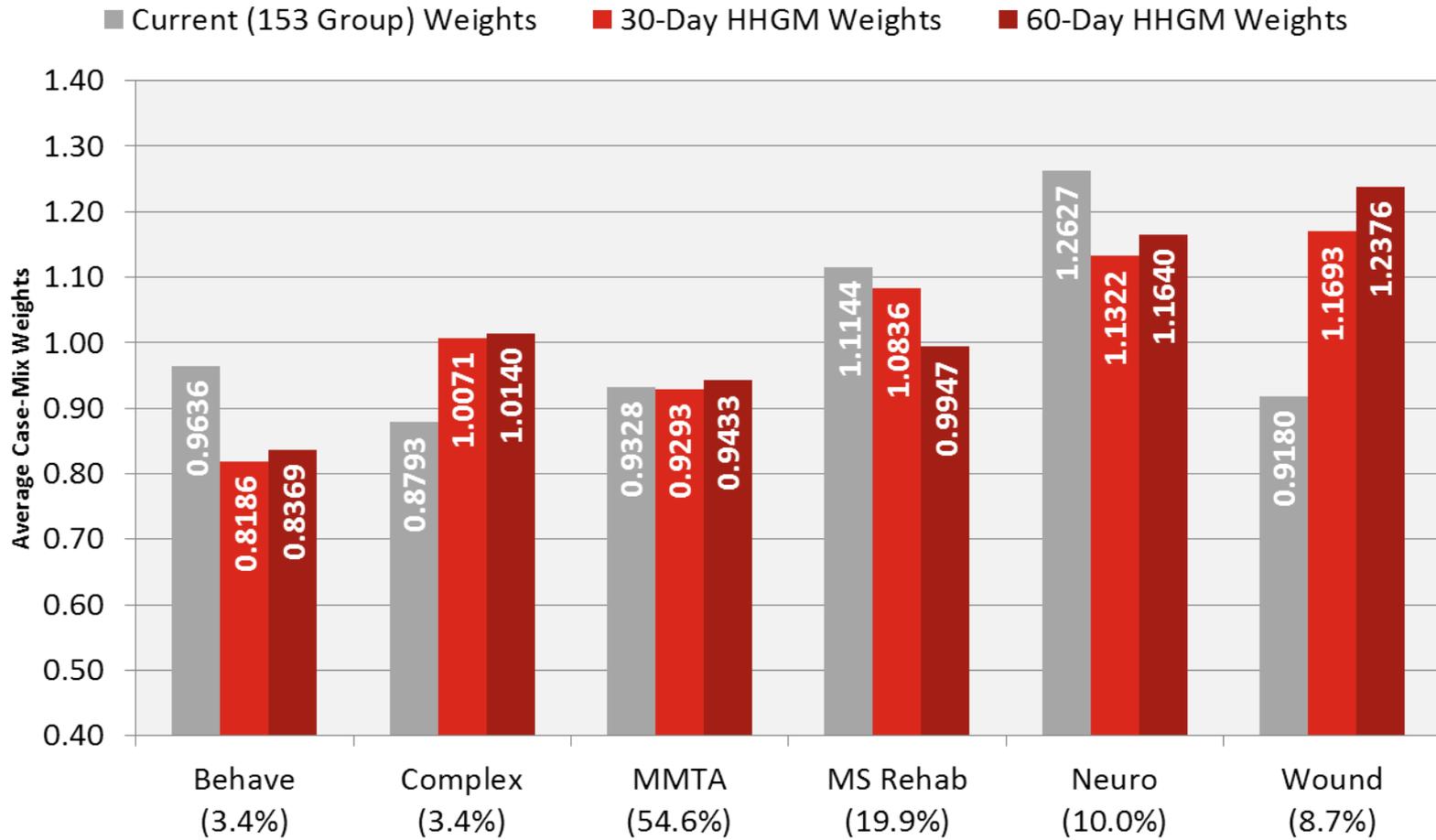
- Three sets of results: Average Case-Mix Weights across...
 1. HHGM episode characteristics
 2. Home health agency characteristics
 3. Clinical characteristics of patients

Average Case-Mix Weights across HHGM Episode Characteristics

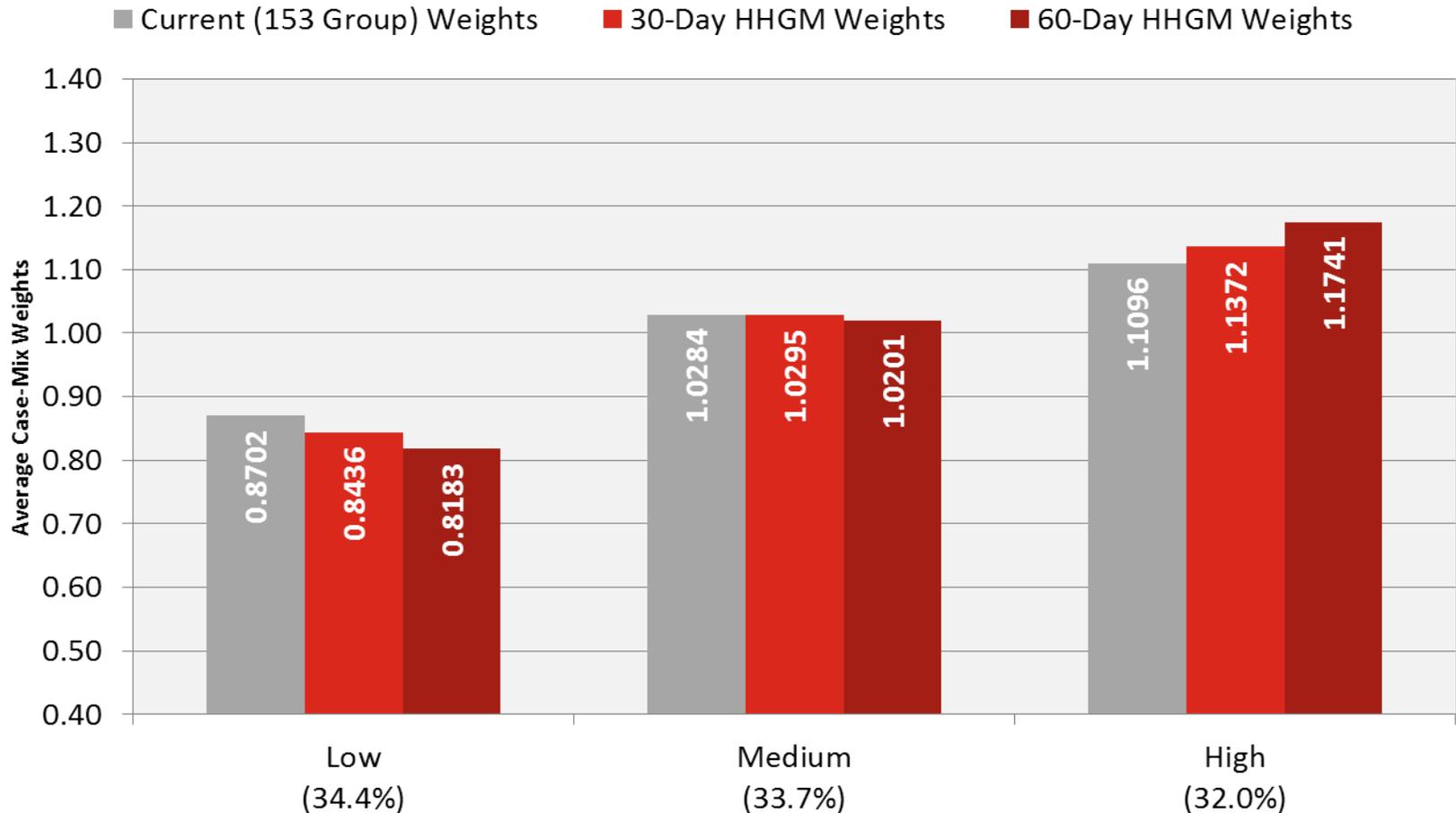


- In this section we examine changes in case-mix weights across the characteristics that determine HHGM buckets/groupings:
 - Clinical grouping
 - Functional level
 - Admission source
 - Timing
 - Comorbidity adjustment

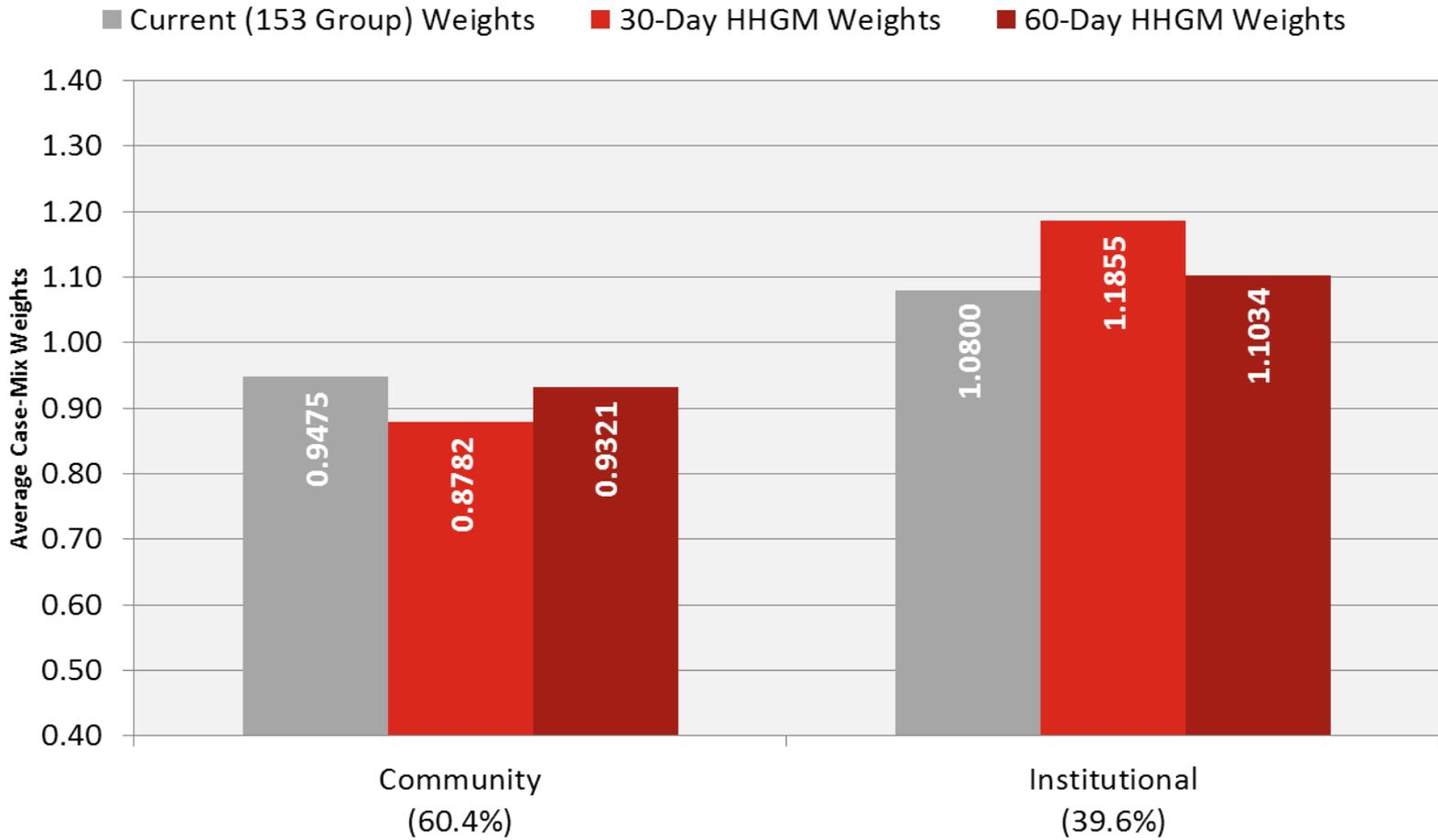
Average Case-Mix Weights, by Clinical Grouping



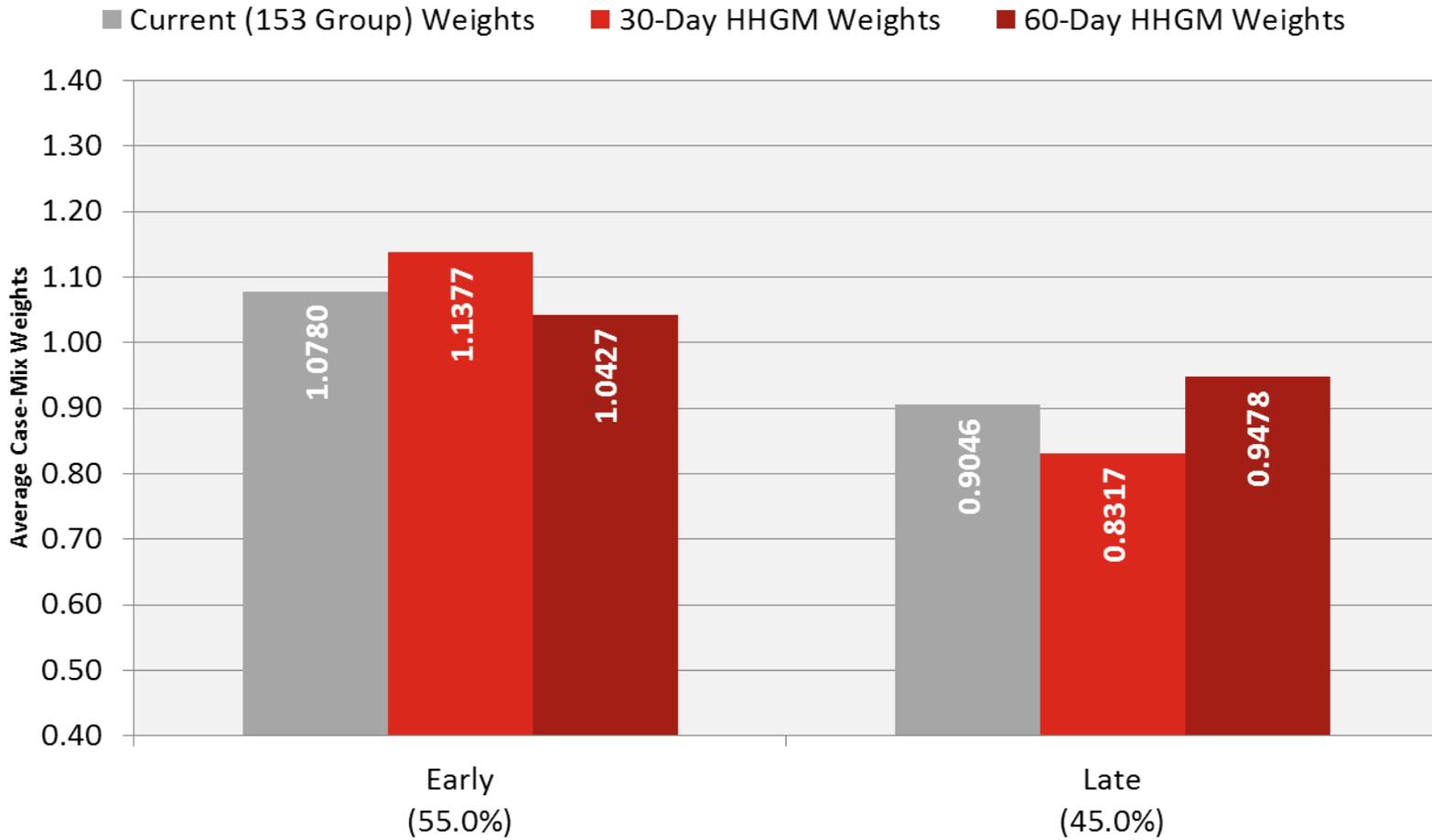
Average Case-Mix Weights, by Level of Functional Limitations



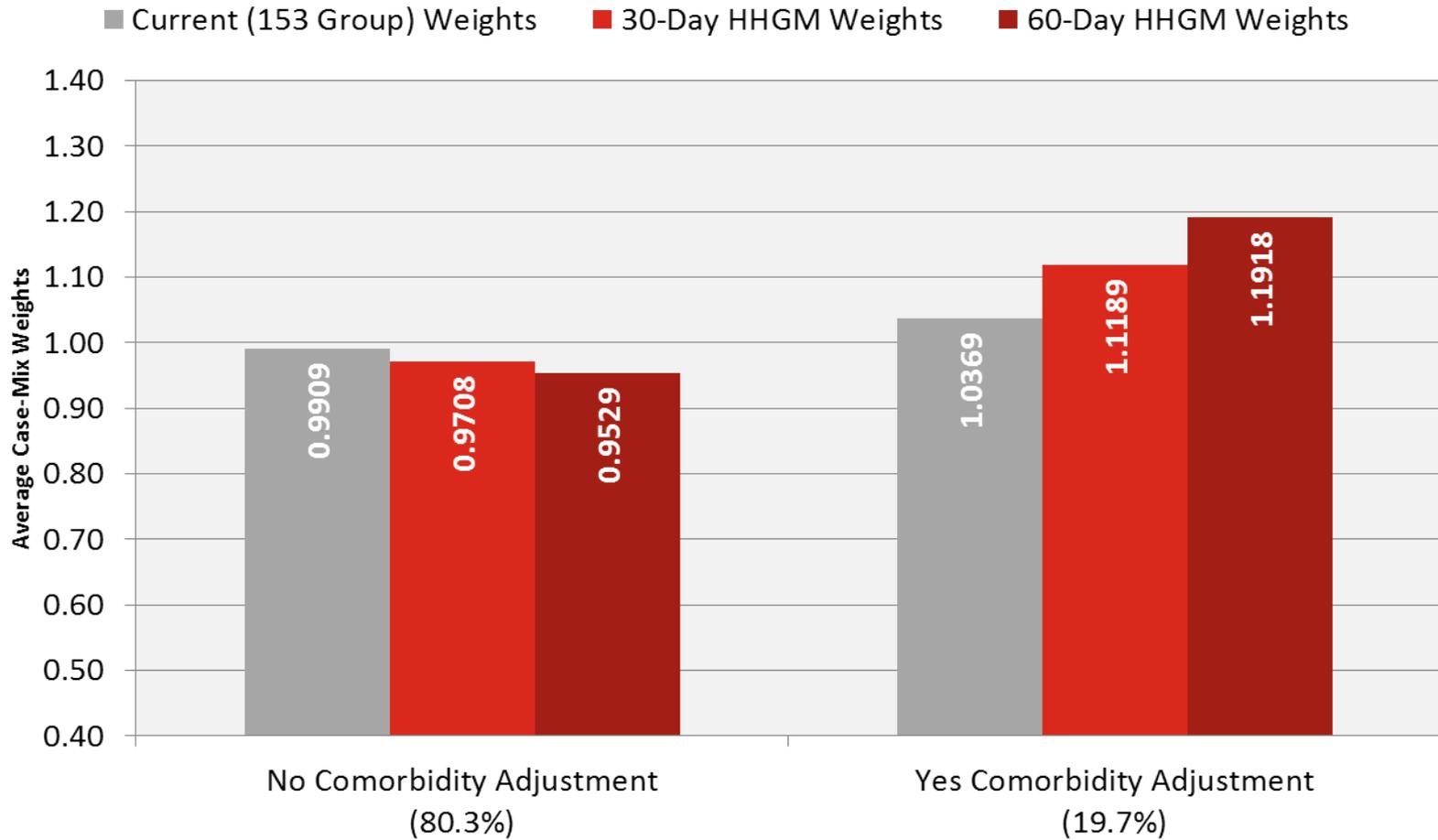
Average Case-Mix Weights, by Admission Source



Average Case-Mix Weights, by Timing



Average Case-Mix Weights, by Comorbidity Adjustment



Average Case-Mix Weights across Home Health Agency Characteristics

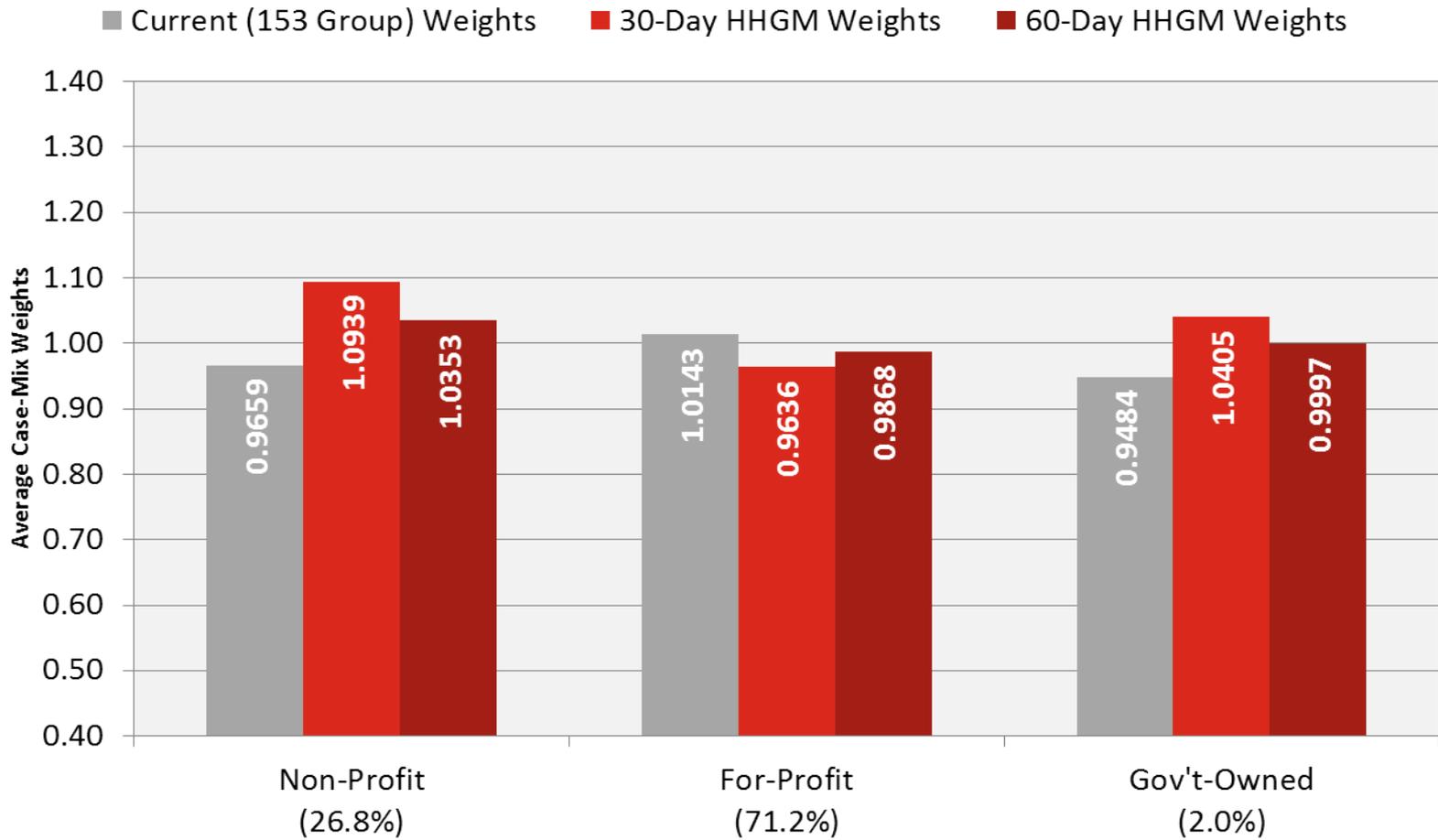


- In this section we examine changes in case-mix weights across characteristics of home health agencies
 - Freestanding vs. facility-based status
 - Ownership type
 - Census region
 - Urban/rural status
 - Agency total nursing/therapy visits ratio
 - Size (# of episodes served)

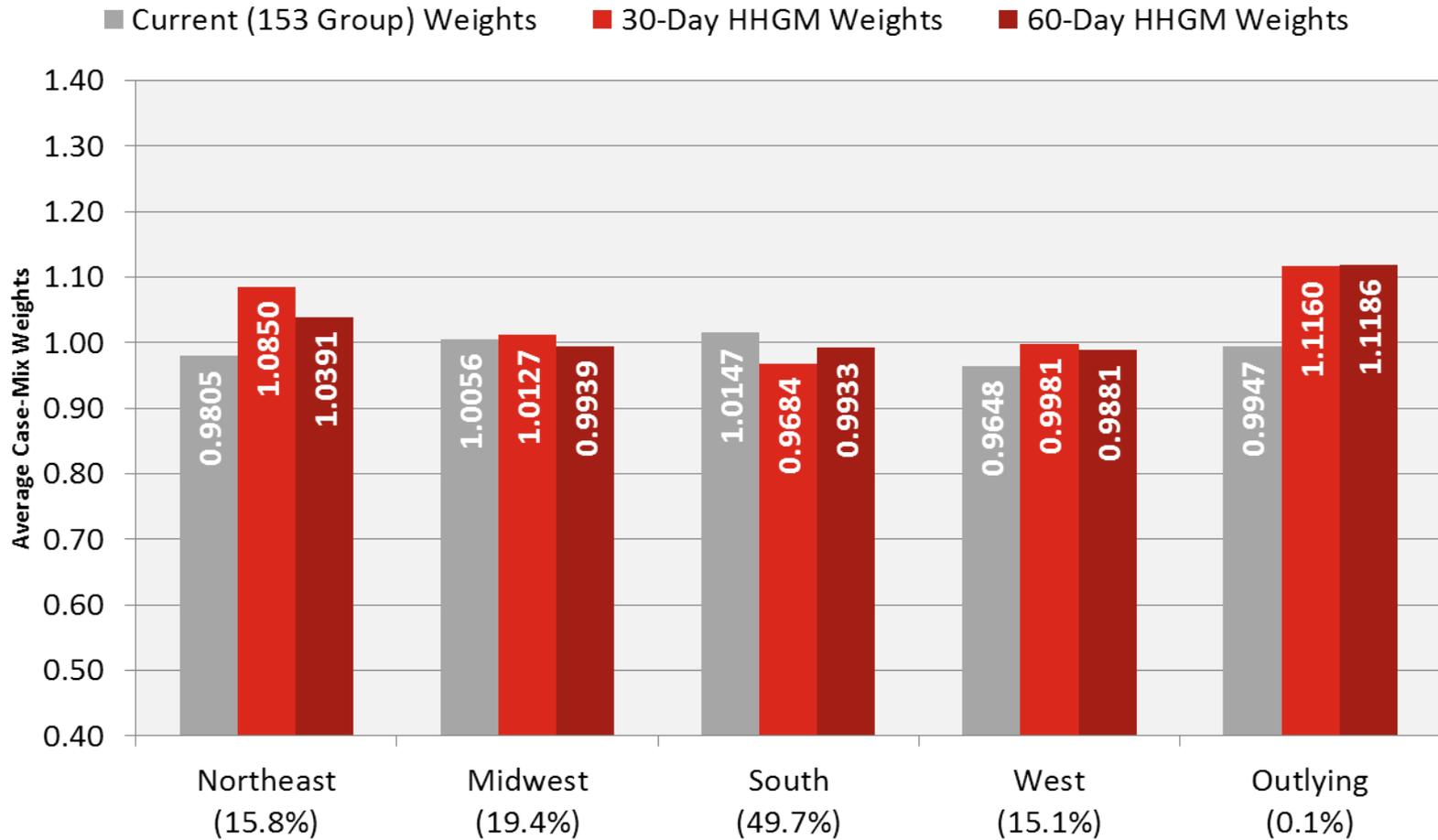
Average Case-Mix Weights, by Facility Type



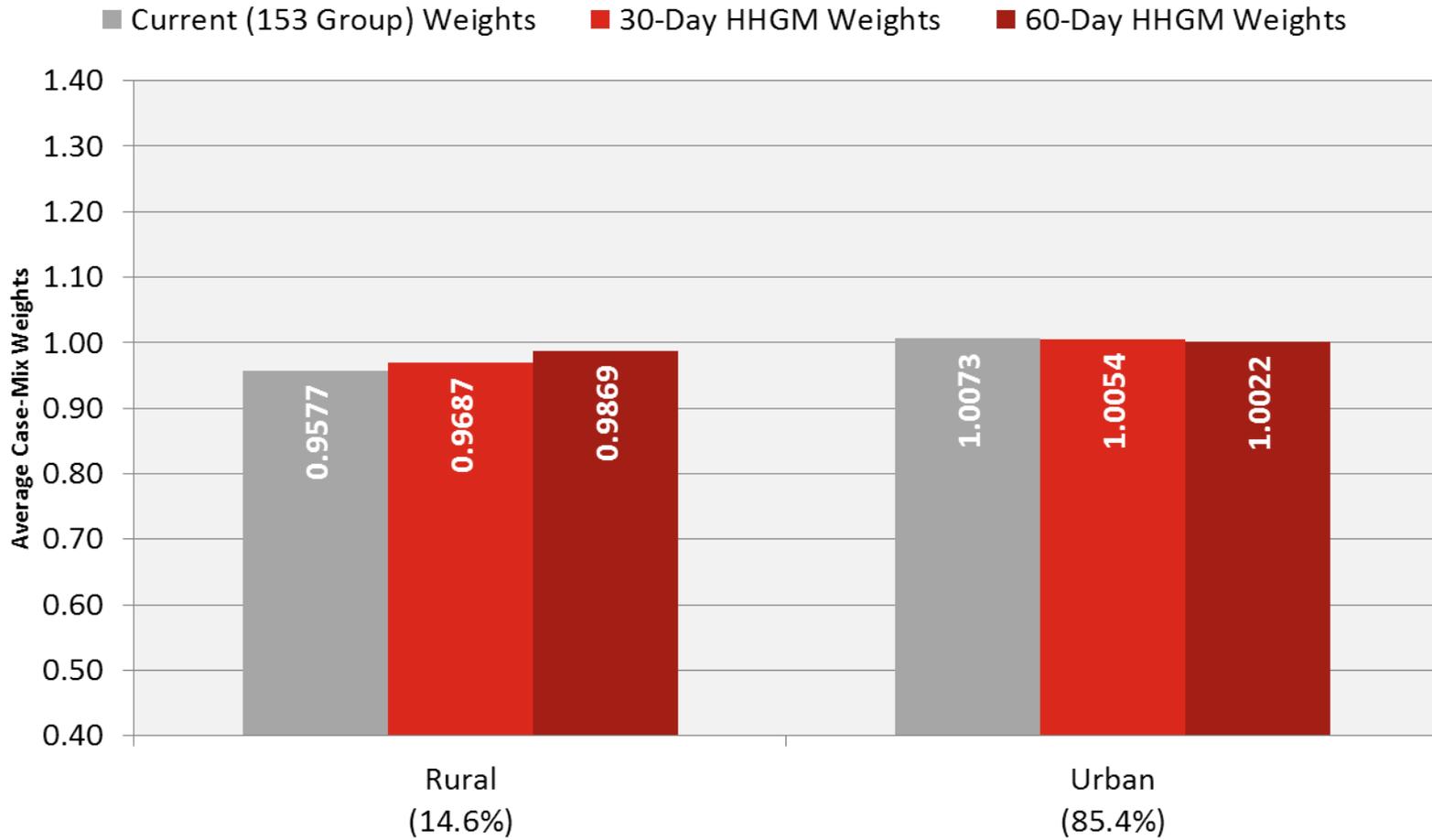
Average Case-Mix Weights, by Ownership Type



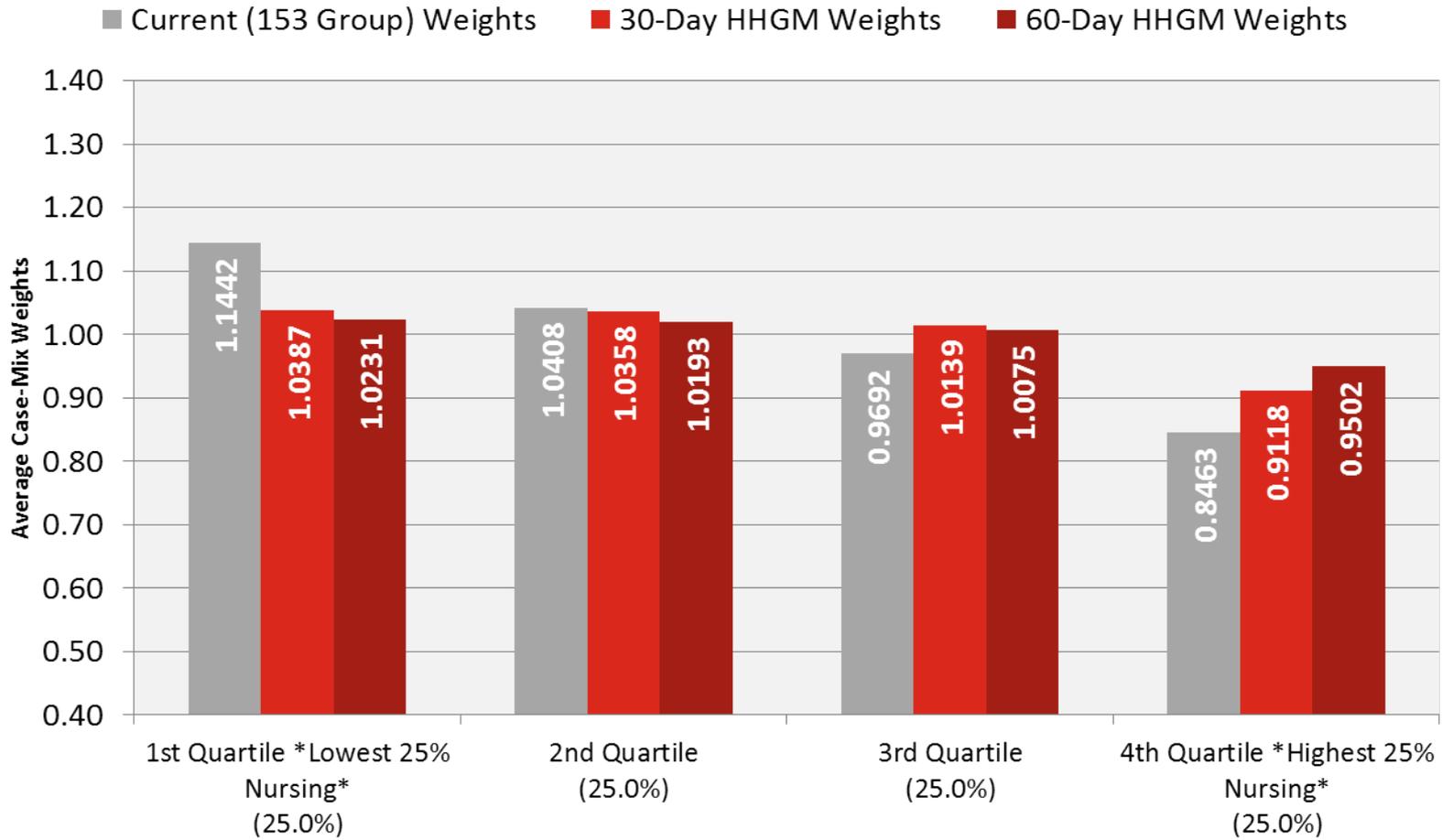
Average Case-Mix Weights, by Region



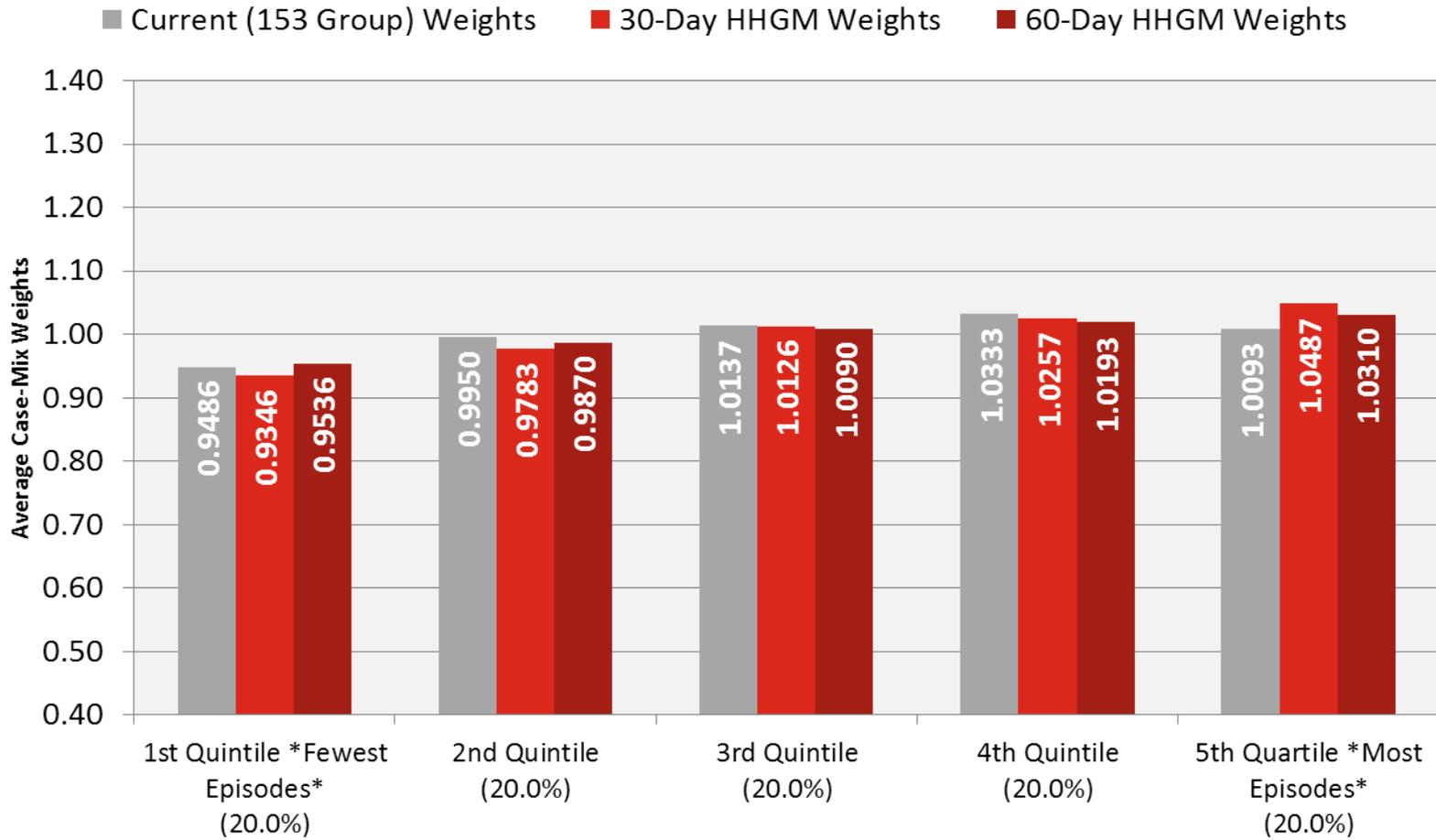
HHGM Case-Mix Changes, by Urban/Rural Status



HHGM Case-Mix Changes, by Total Nursing to Therapy Visits Ratio



Average Case-Mix Weights, by Facility Size (in Episodes)

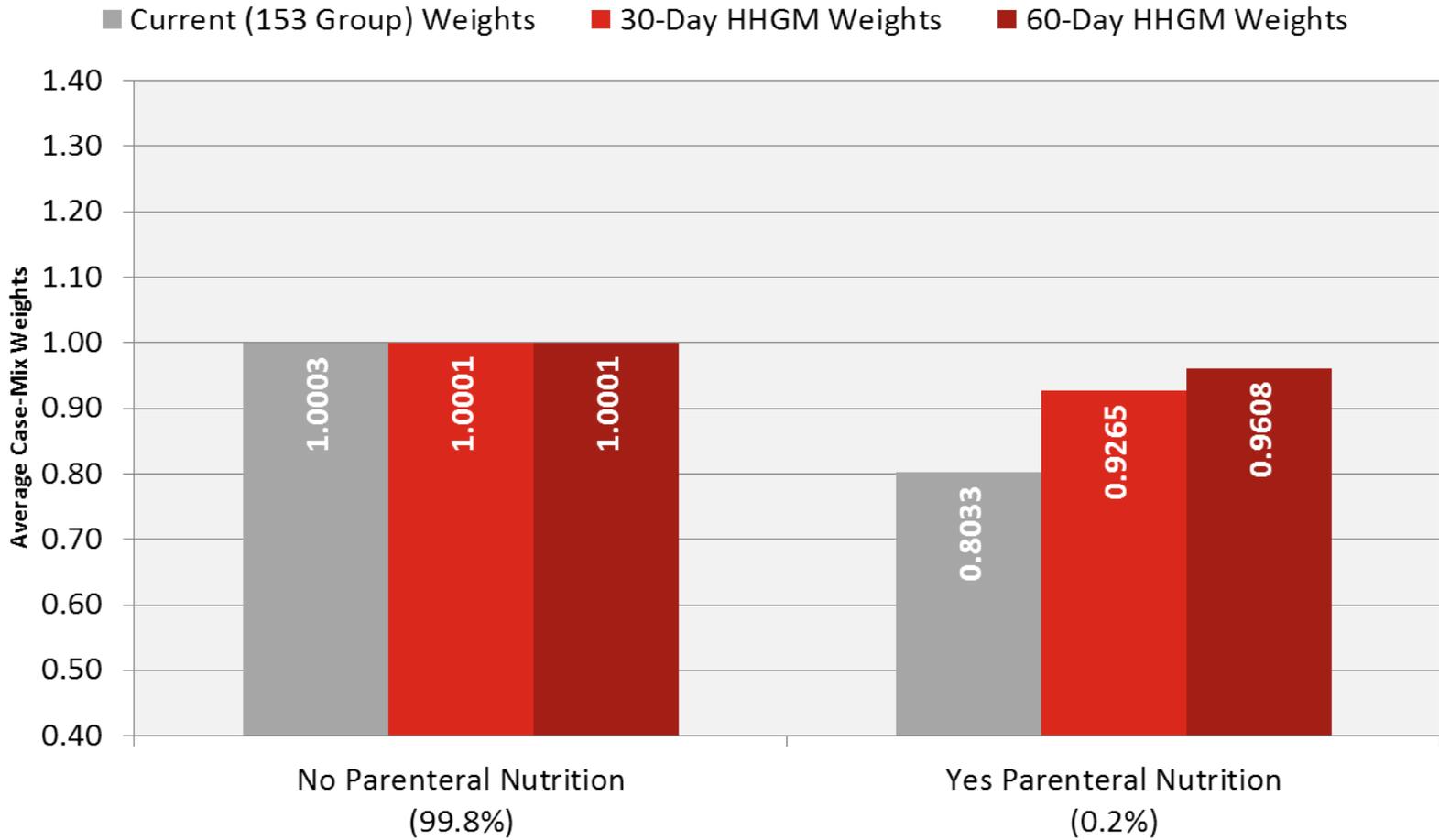


Average Case-Mix Weights across Patient Characteristics

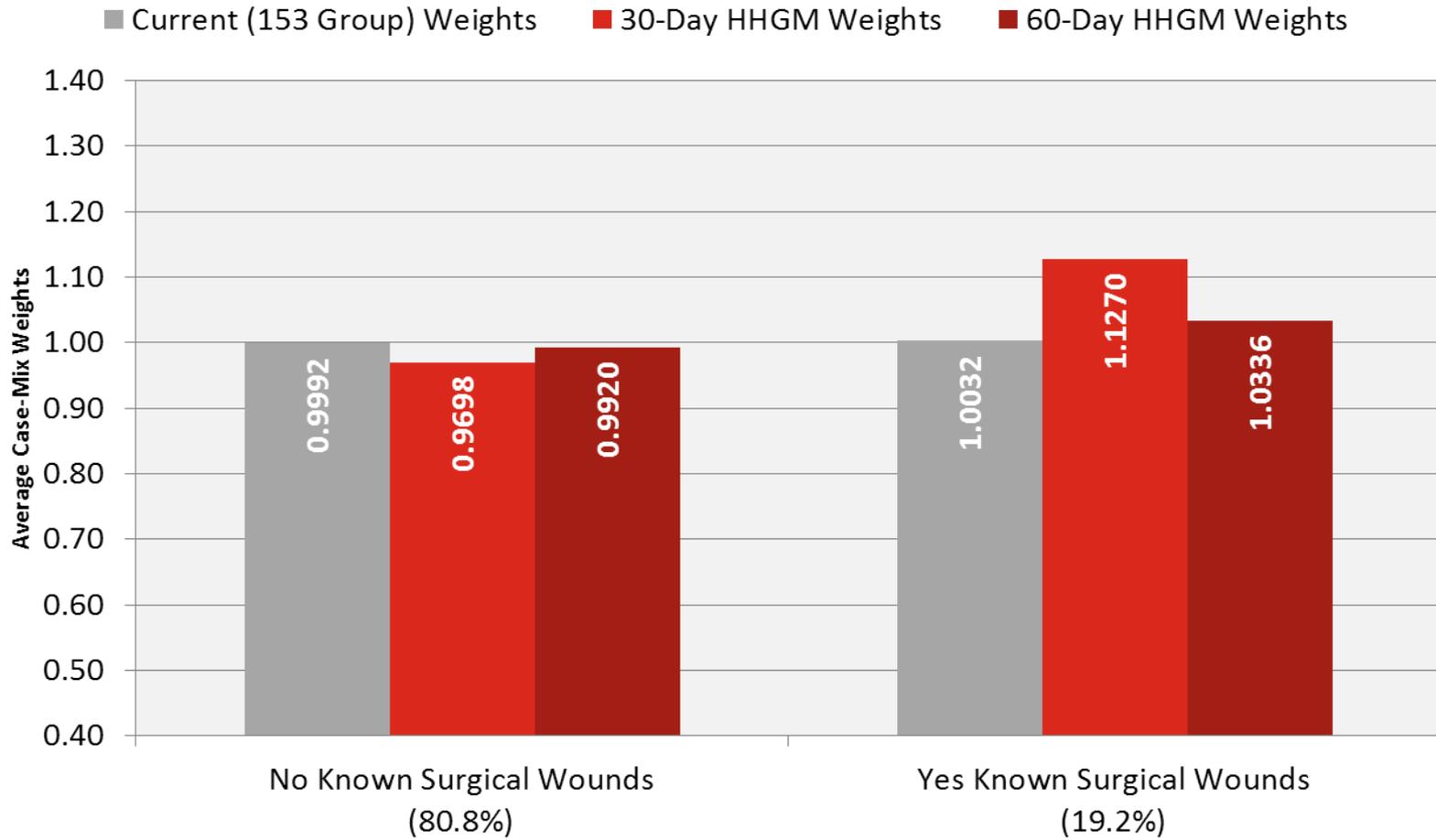


- In this section we examine HHGM case-mix weight changes across clinical characteristics of the patient:
 - Parenteral nutrition
 - Surgical wounds
 - Ulcers
 - Bathing independence
 - Poorly-controlled cardiac dysrhythmia, diabetes, peripheral vascular disease, or pulmonary disorder
 - Open wound/lesion
 - Temporary or fragile/serious health risk
 - Grooming
 - Risk of hospitalization
 - Cognitive functioning

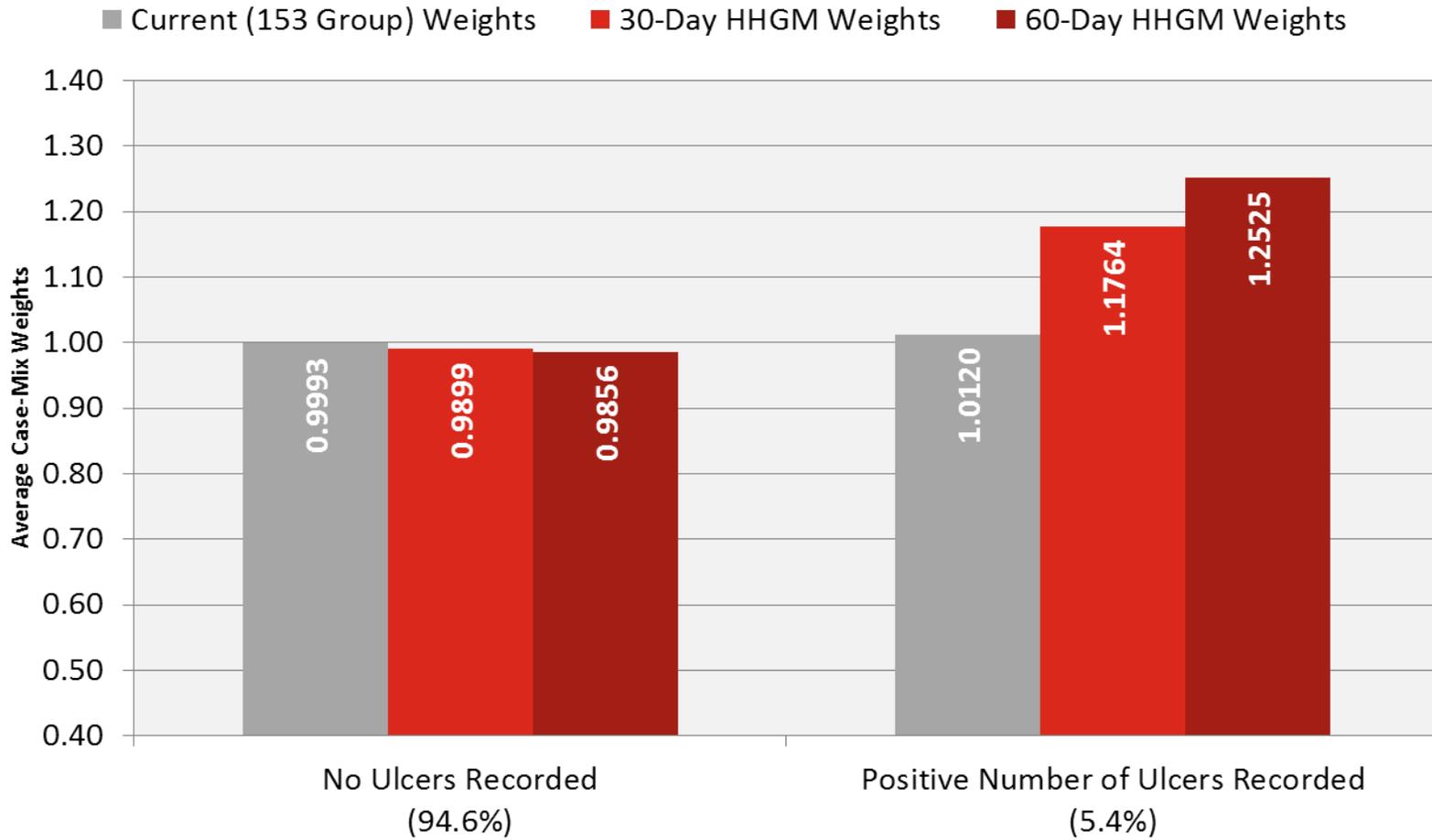
Average Case-Mix Weights, by Parenteral Nutrition



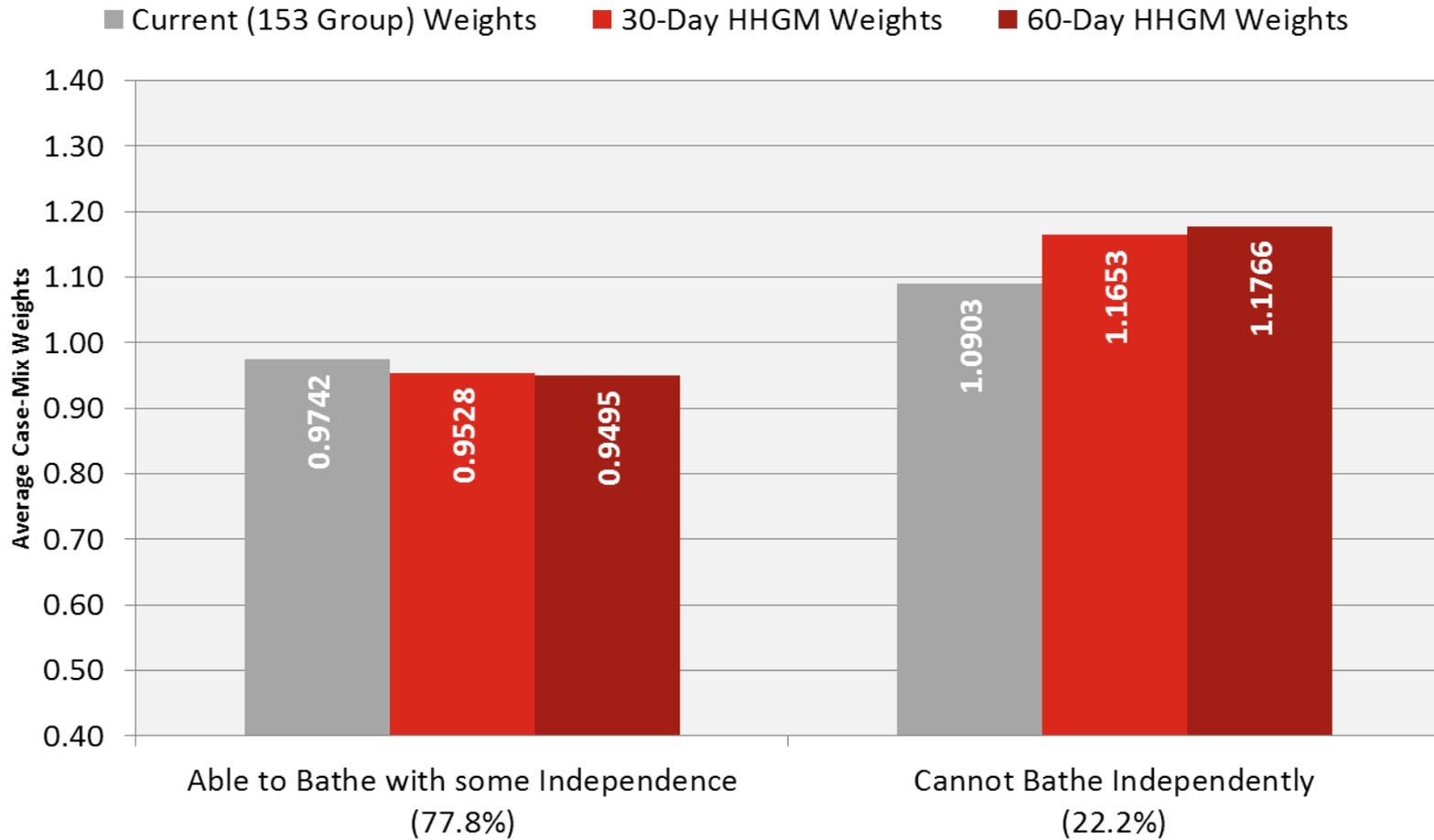
Average Case-Mix Weights, by Surgical Wounds



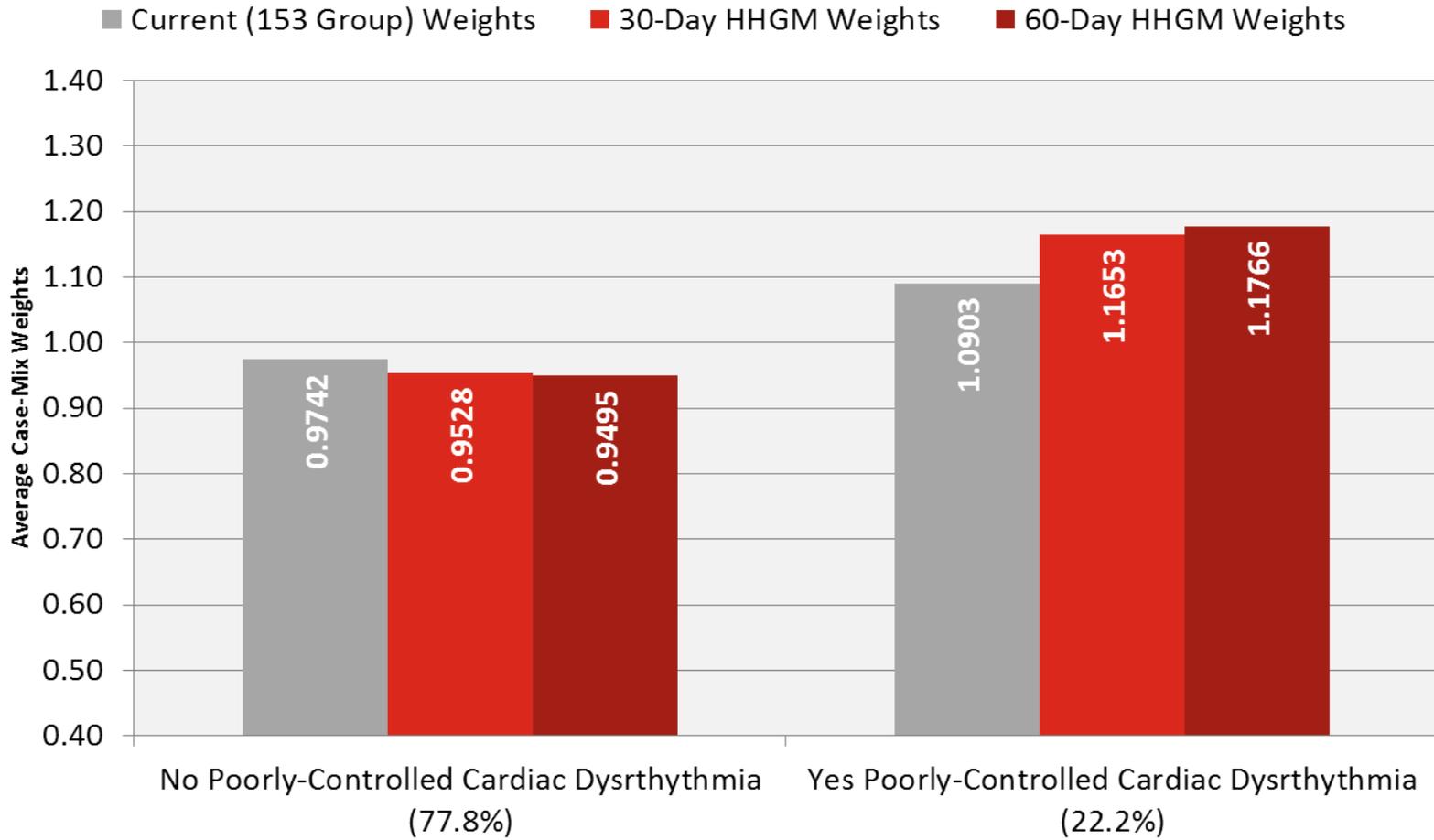
Average Case-Mix Weights, by Ulcers



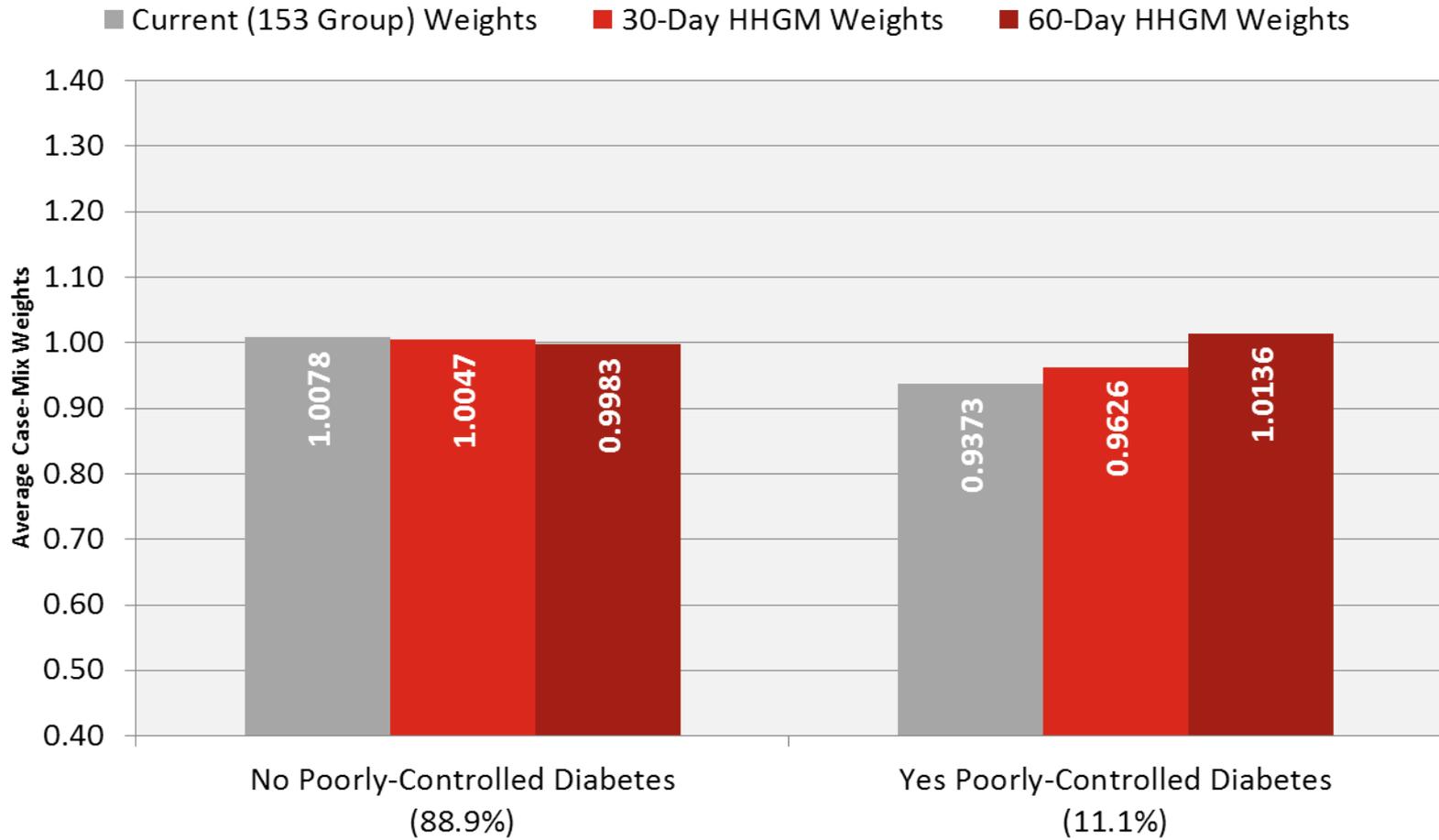
Average Case-Mix Weights, by Bathing



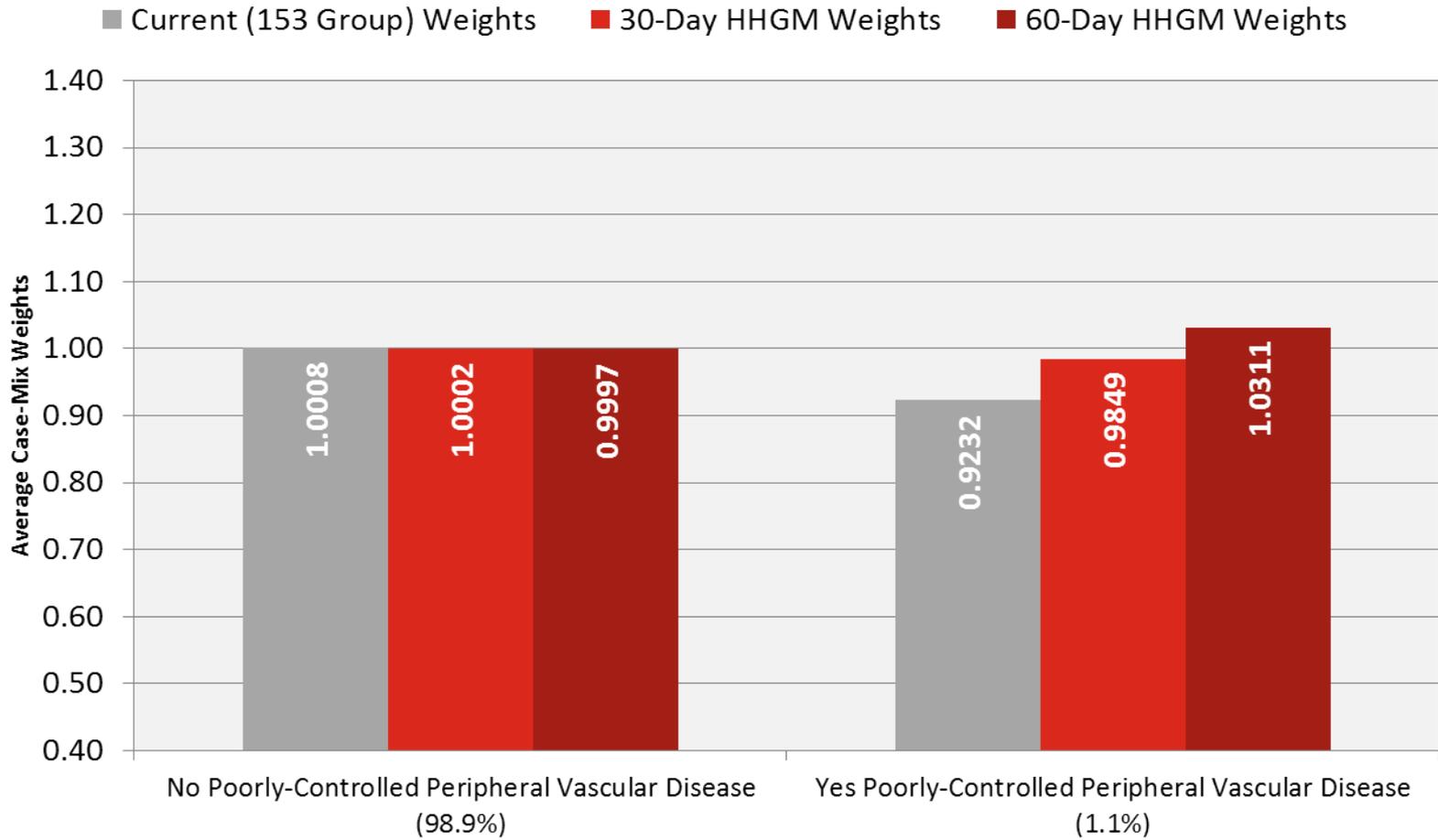
Average Case-Mix Weights, by Cardiac Dysrhythmia



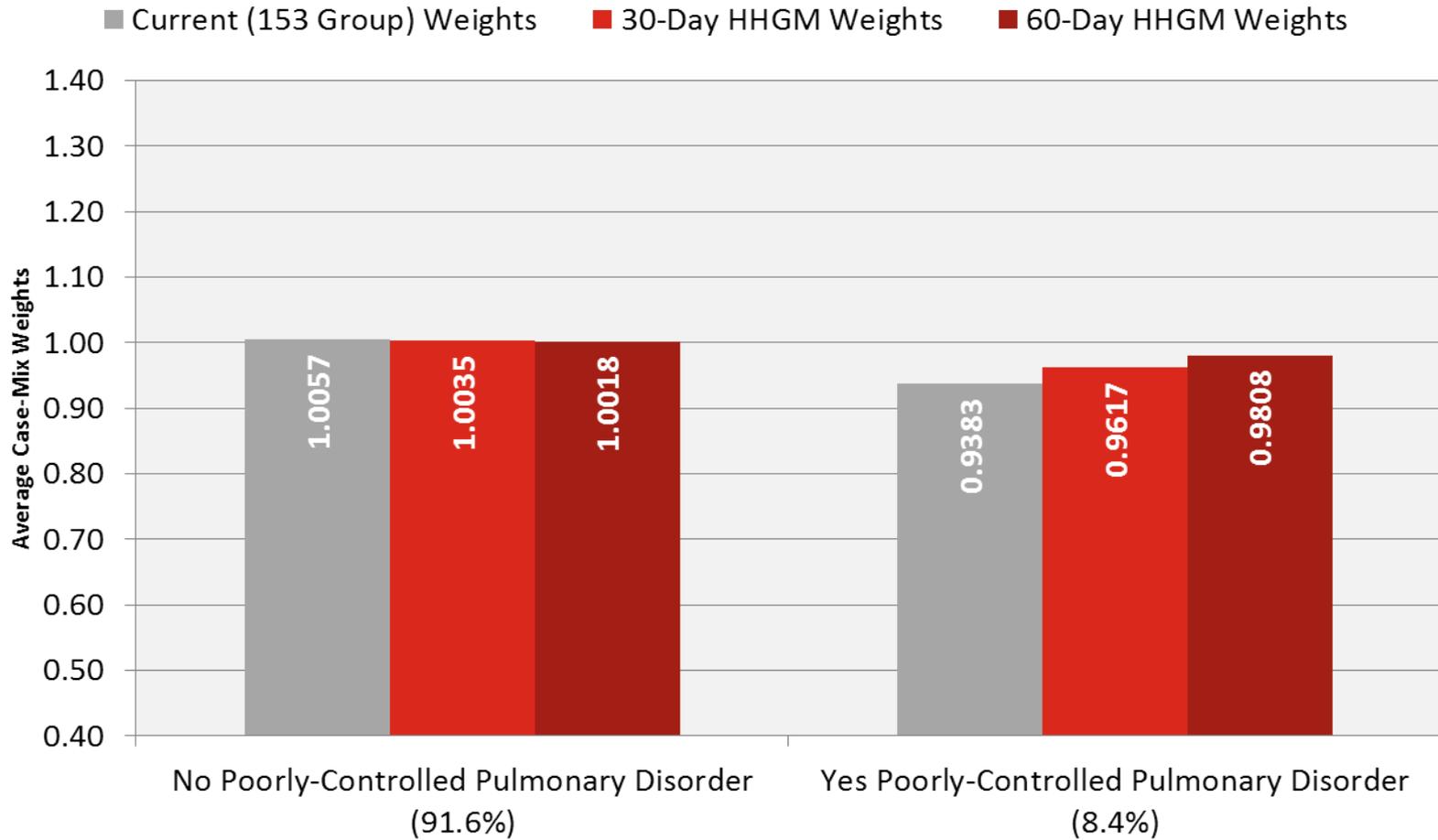
Average Case-Mix Weights, by Diabetes



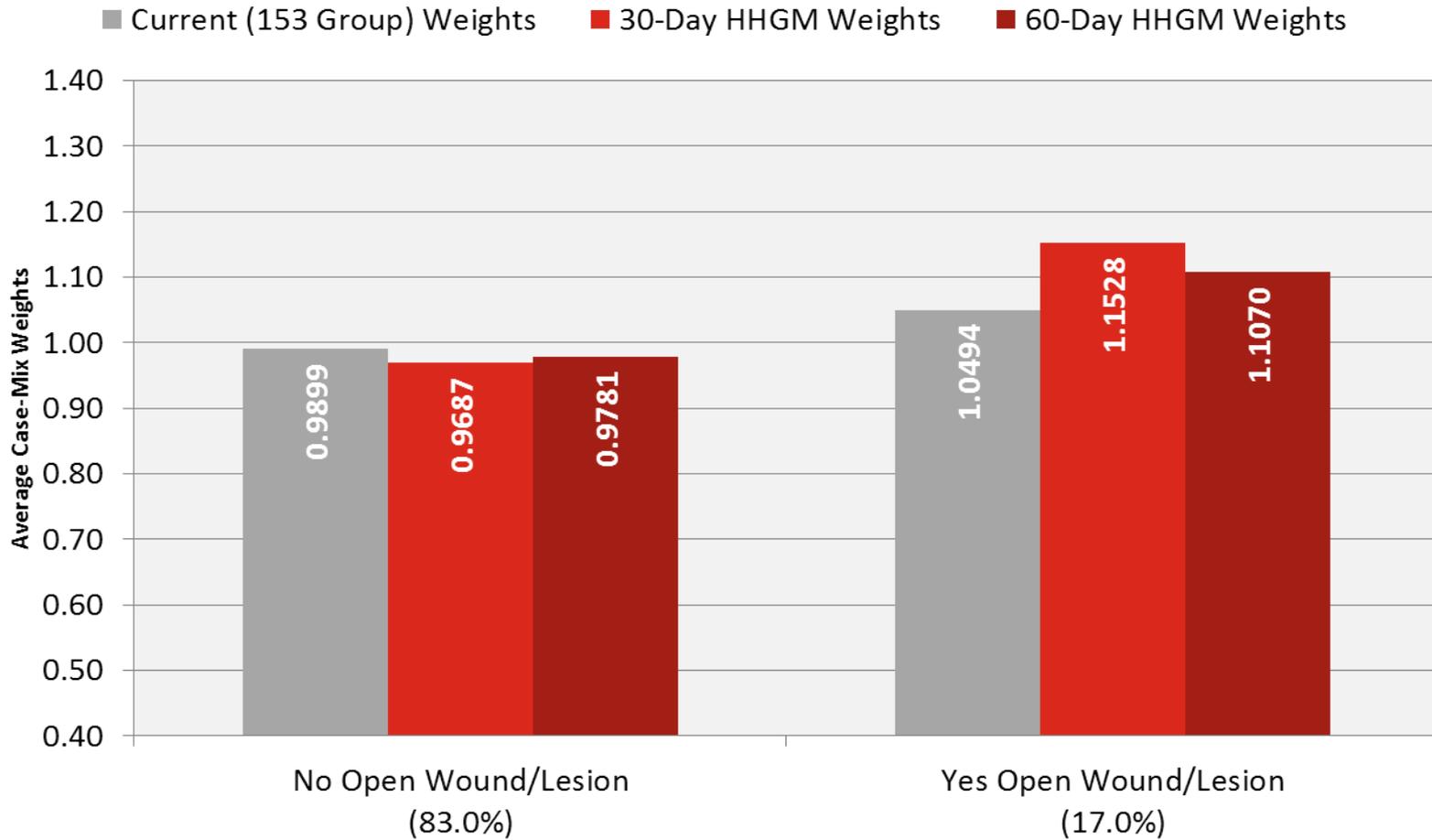
Average Case-Mix Weights, by Peripheral Vascular Disease



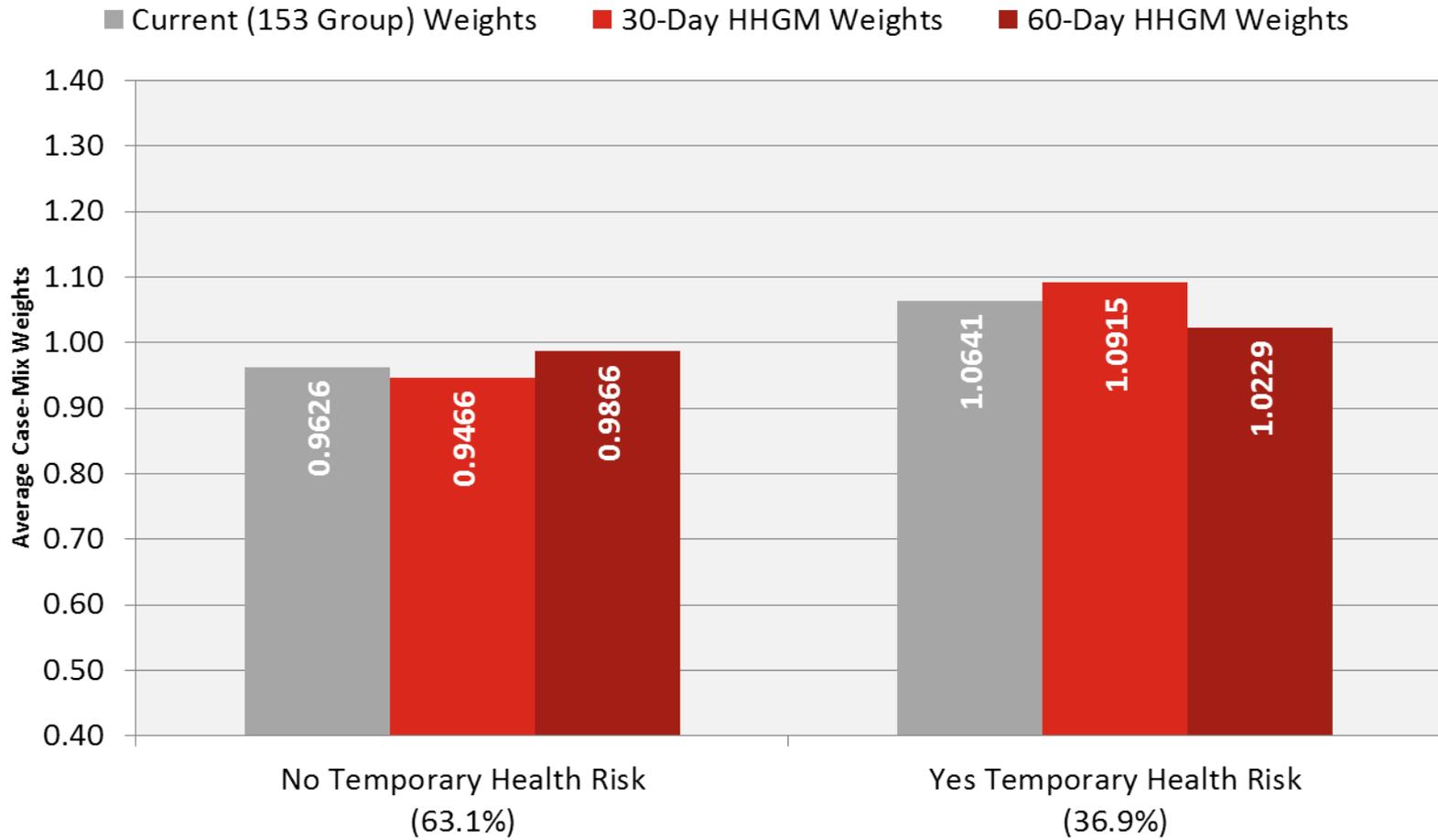
Average Case-Mix Weights, by Pulmonary Disorder



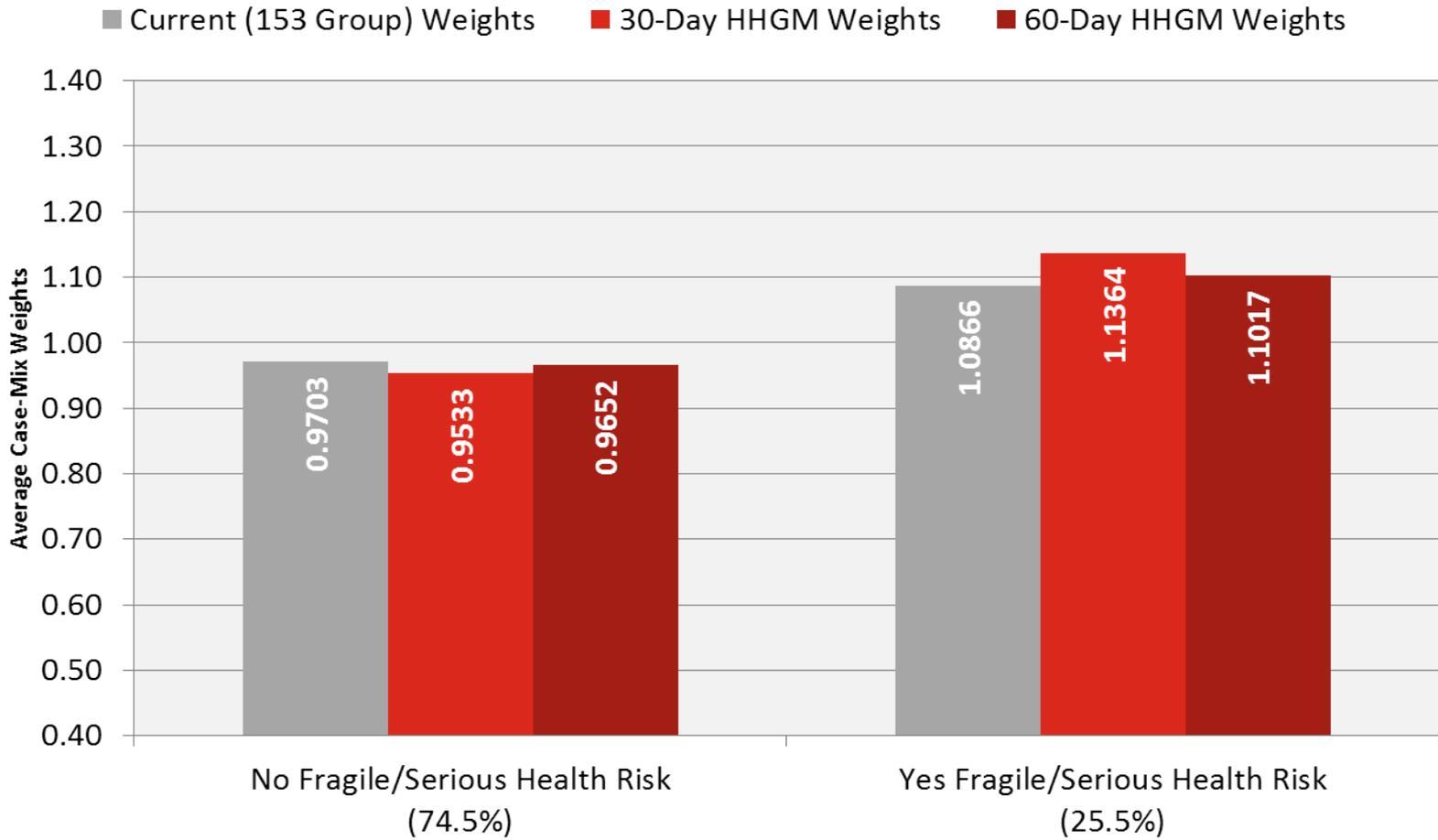
Average Case-Mix Weights, by Open Wound Presence



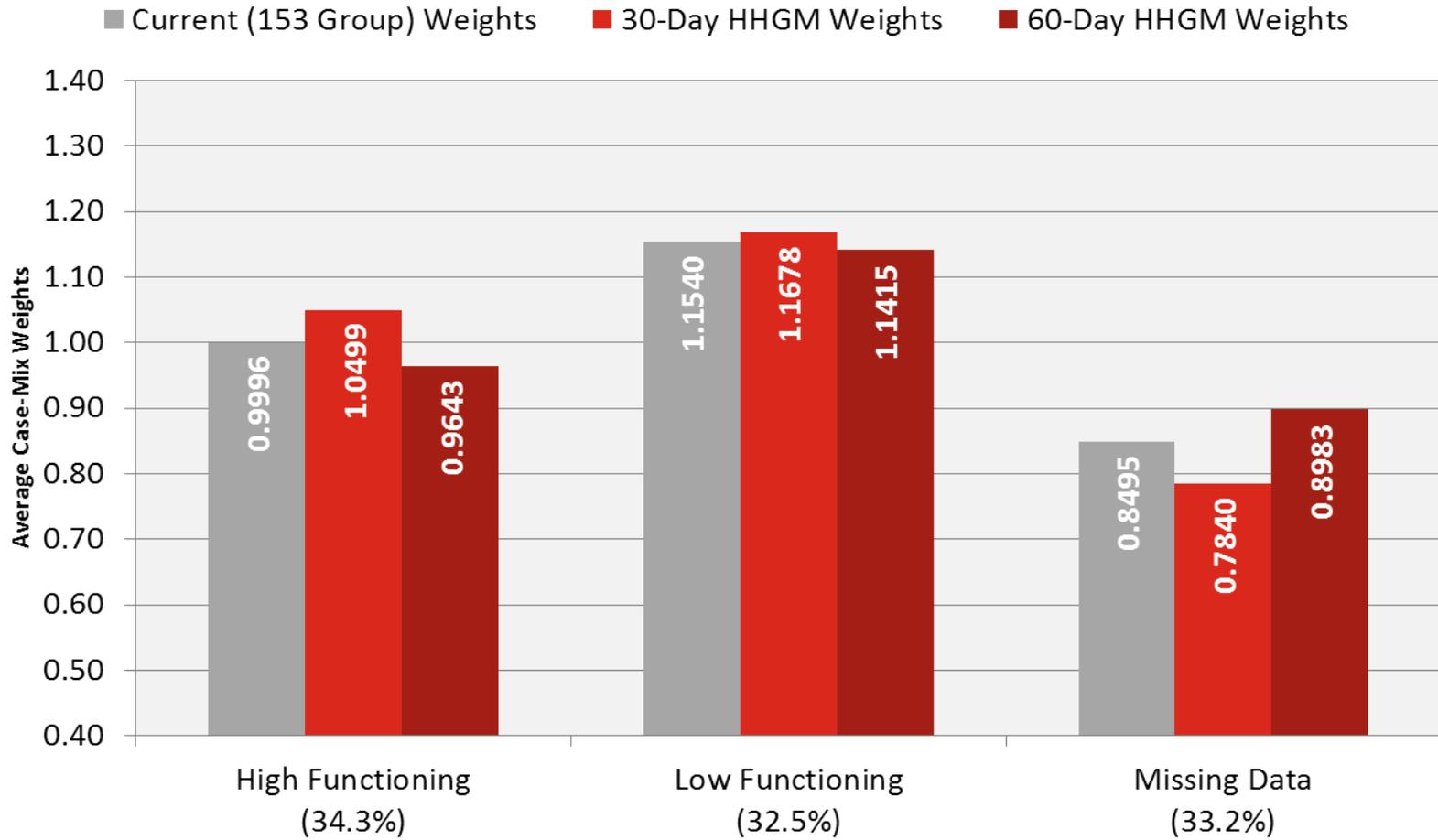
Average Case-Mix Weights, by Temporary Health Risk Status



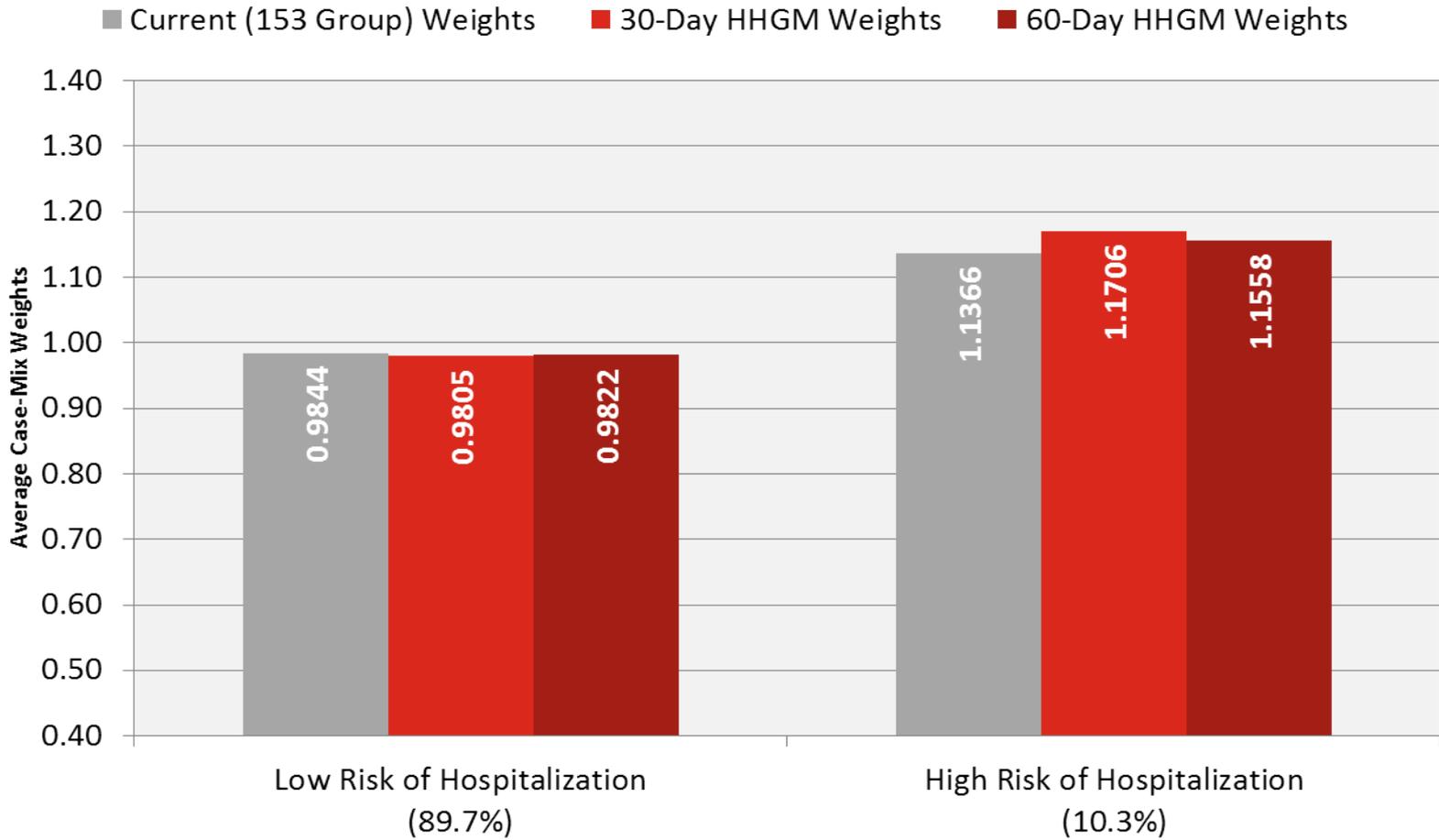
Average Case-Mix Weights, by Serious Health Risk Status



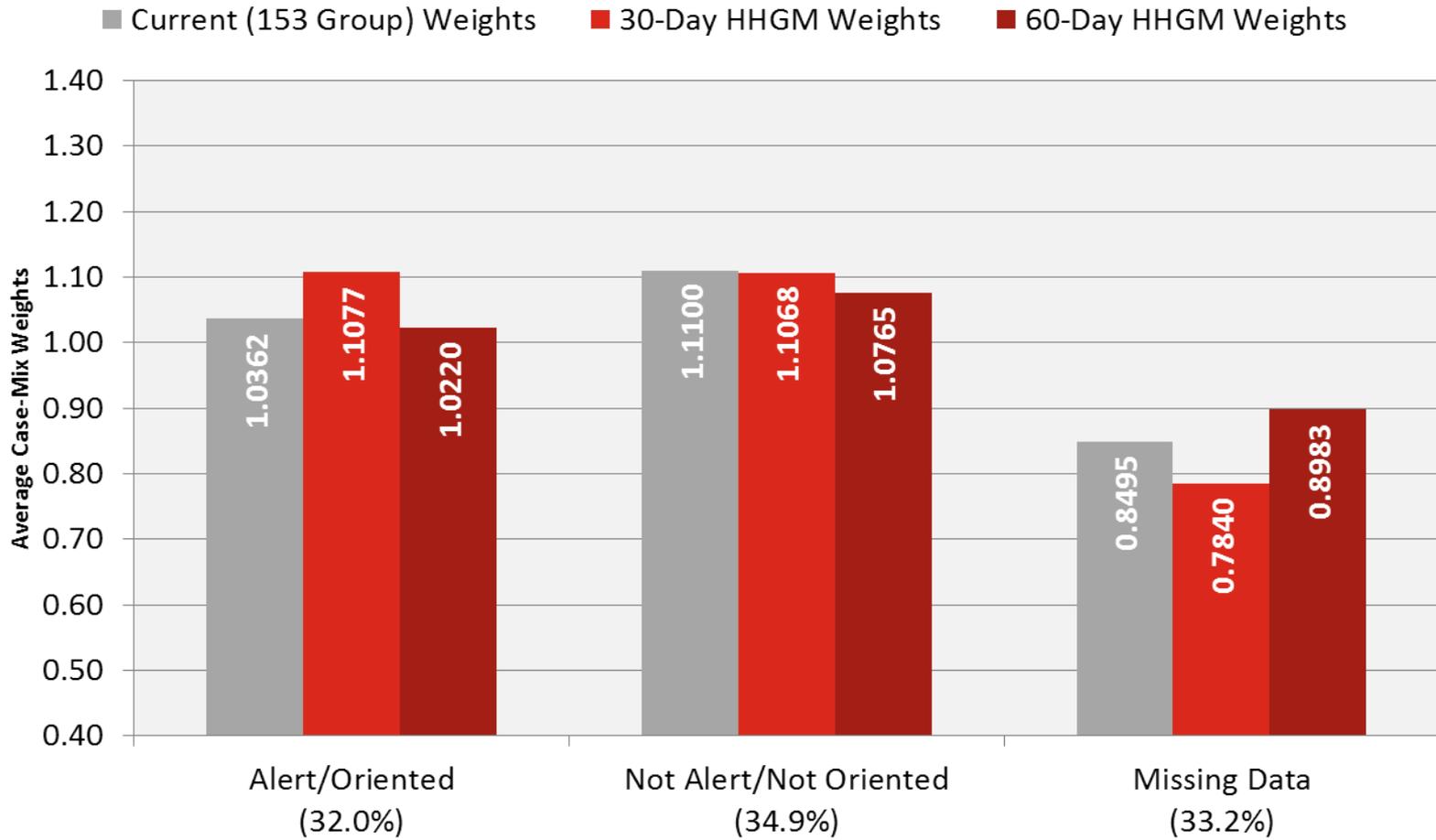
Average Case-Mix Weights, by Grooming



Average Case-Mix Weights, by Hospitalization Risk



Average Case-Mix Weights, by Cognitive Functioning



Summary of Findings



- Wound and complex episodes have higher payment weight, behavioral health, MS rehab and neuro rehab have lower; higher weights also with other indicators or higher severity
- Episodes treated by non-profits and those in the Northeast are simulated to have higher weights, agencies with a higher ratio of nursing will also have an average higher weight

Case-Mix Discussion



- Thoughts or comments?

Free Response



Alternative Approaches to Case-Mix Adjustment



- Tie payments to outcomes?
 - Beyond CMS's statutory authority
 - CMS is supposed to tie payments to costs. Case-mix adjustment is supposed to reflect variation in the cost of providing service
 - Difficult to pay claims timely
 - CMS will not know outcomes until well after the episode

Other topics?



- What other topics have we not discussed in relation to the case-mix model?
- How can the HHGM be improved?

Conclusions



Questions?



Please contact Erica Granor
(Erica_Granor@abtassoc.com) and
Michael Plotzke
(Michael_Plotzke@abtassoc.com)
regarding any questions you have

Thank you!

The regression results shown on pages 2–17 show the payment regression from the Home Health Groupings Model (HHGM). The payment regression estimates the relationship between resource use and the independent variables that make up the HHGM. Many different variations of the payment regression are shown.

- Pages 2–5 show regressions using the HHGM estimated using 30-day periods and where the Low Utilization Payment Adjustment (LUPA) threshold is set so that all 30-day periods with 2 or fewer visits are considered LUPAs.
- Pages 6–9 show regressions using the HHGM estimated using 30-day periods and where the LUPA threshold for each payment group is set using the 10th percentile value of visits to create a payment group specific LUPA threshold with a minimum threshold of at least 2 visits for each group.
- Pages 10–13 show regressions using the HHGM estimated using 60-day episodes and where the LUPA threshold is set so that all 60-day episodes with 4 or fewer visits are considered LUPAs.
- Pages 14–17 show regressions using the HHGM estimated using 60-day episodes and where the LUPA threshold for each payment group is set using the 10th percentile value of visits to create a payment group specific LUPA threshold with a minimum threshold of at least 4 visits for each group.

LUPAs are not included in the estimation of these models. Within each set of regressions, there are also many variations including estimates of the model:

- Using the Bureau of Labor Statistics (BLS) approach to construct resource use and using the Cost Per Minute + Non-Routine Supplies (CPM + NRS) approach to construct resource use
- With different sets of independent variables
- With and without the fixed effects term

The comorbidity regression on pages 18–22 show regression coefficients of the comorbidity model used to assign the comorbidity adjustment to the HHGM. The dependent variable in this model is resource use (calculated using CPM+NRS) and the HHGM adjustors besides comorbidity (timing, clinical level, functional level, and admission source) are included as independent variables. The highlighted variables and coefficients indicate those variables that have a coefficient above the median (where the median is calculated only looking at the positive coefficients). These highlighted variables are the comorbidity groups that trigger the comorbidity adjustment under this estimate of the HHGM model.

Pages 23–27 describe each comorbidity group that is included in the estimate of the comorbidity adjustment model.

30-Day Periods

All Periods with 2 or Fewer Visits are LUPAs

Variable	Model 1		Model 2		Model 3	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	\$66.96	0.1699	\$275.58	0.1736		
MMTA - High Functional	\$113.48	0.2879	\$483.29	0.3045		
Behavioral Health - Low Functional	-\$19.21	-0.0487	-\$157.64	-0.0993		
Behavioral Health - Medium Functional	\$61.15	0.1551	\$141.50	0.0892		
Behavioral Health - High Functional	\$100.68	0.2554	\$322.10	0.2029		
Complex - Low Functional	-\$33.23	-0.0843	\$29.62	0.0187		
Complex - Medium Functional	\$60.27	0.1529	\$438.30	0.2761		
Complex - High Functional	\$108.27	0.2747	\$607.23	0.3826		
MS Rehab - Low Functional	\$59.84	0.1518	\$202.26	0.1274		
MS Rehab - Medium Functional	\$111.20	0.2821	\$424.76	0.2676		
MS Rehab - High Functional	\$163.22	0.4141	\$645.72	0.4068		
Neuro - Low Functional	\$106.73	0.2708	\$309.92	0.1953		
Neuro - Medium Functional	\$180.00	0.4567	\$605.08	0.3812		
Neuro - High Functional	\$204.94	0.5200	\$745.16	0.4695		
Wound - Low Functional	\$32.43	0.0823	\$319.26	0.2011		
Wound - Medium Functional	\$101.61	0.2578	\$591.17	0.3724		
Wound - High Functional	\$121.40	0.3080	\$739.80	0.4661		
Community - Late	-\$137.71	-0.3494			-\$497.48	-0.3134
Institutional - Early	\$70.64	0.1792			\$234.62	0.1478
Institutional - Late	\$16.08	0.0408			\$140.52	0.0885
Comorbidity Adjustment	\$43.38	0.1101				
Constant	\$372.21	0.9444	\$1,251.22	0.7883	\$1,823.81	1.1490
Avg Resource Use	\$394.13		\$1,587.25		\$1,587.25	
N	8,754,919		8,754,919		8,754,919	
Adj R-Squared	0.2503		0.1959		0.2248	
BLS or CPM+NRS?	BLS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		Yes		Yes	

Variable	Model 4		Model 5		Model 6	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			\$246.79	0.1555	\$270.63	0.1705
MMTA - High Functional			\$448.14	0.2823	\$463.19	0.2918
Behavioral Health - Low Functional			-\$112.92	-0.0711	-\$147.13	-0.0927
Behavioral Health - Medium Functional			\$161.20	0.1016	\$149.58	0.0942
Behavioral Health - High Functional			\$326.04	0.2054	\$321.69	0.2027
Complex - Low Functional			\$16.22	0.0102	\$34.43	0.0217
Complex - Medium Functional			\$384.58	0.2423	\$431.44	0.2718
Complex - High Functional			\$591.86	0.3729	\$557.63	0.3513
MS Rehab - Low Functional			\$118.05	0.0744	\$211.70	0.1334
MS Rehab - Medium Functional			\$307.22	0.1936	\$431.32	0.2717
MS Rehab - High Functional			\$550.65	0.3469	\$639.34	0.4028
Neuro - Low Functional			\$308.67	0.1945	\$298.46	0.1880
Neuro - Medium Functional			\$589.64	0.3715	\$585.38	0.3688
Neuro - High Functional			\$753.41	0.4747	\$703.77	0.4434
Wound - Low Functional			\$402.12	0.2533	\$252.14	0.1589
Wound - Medium Functional			\$644.80	0.4062	\$517.62	0.3261
Wound - High Functional			\$827.83	0.5215	\$642.41	0.4047
Community - Late			-\$501.34	-0.3159		
Institutional - Early			\$251.74	0.1586		
Institutional - Late			\$107.10	0.0675		
Comorbidity Adjustment	\$294.26	0.7466			\$210.43	0.1326
Constant	\$1,537.19	3.9002	\$1,512.26	0.9528	\$1,229.33	0.7745
Avg Resource Use	\$1,587.25		\$1,587.25		\$1,587.25	
N	8,754,919		8,754,919		8,754,919	
Adj R-Squared	0.1719		0.2572		0.1998	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		Yes		Yes	

Variable	Model 7		Model 8		Model 9	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			\$189.29	0.1193	\$240.55	0.1516
MMTA - High Functional			\$334.03	0.2104	\$423.92	0.2671
Behavioral Health - Low Functional			-\$136.31	-0.0859	-\$99.98	-0.0630
Behavioral Health - Medium Functional			\$133.38	0.0840	\$170.68	0.1075
Behavioral Health - High Functional			\$270.40	0.1704	\$325.18	0.2049
Complex - Low Functional			\$44.12	0.0278	\$22.35	0.0141
Complex - Medium Functional			\$342.58	0.2158	\$376.46	0.2372
Complex - High Functional			\$473.62	0.2984	\$533.25	0.3360
MS Rehab - Low Functional			\$171.53	0.1081	\$127.52	0.0803
MS Rehab - Medium Functional			\$309.63	0.1951	\$312.85	0.1971
MS Rehab - High Functional			\$478.34	0.3014	\$541.37	0.3411
Neuro - Low Functional			\$306.55	0.1931	\$294.35	0.1854
Neuro - Medium Functional			\$535.31	0.3373	\$565.26	0.3561
Neuro - High Functional			\$675.02	0.4253	\$703.54	0.4432
Wound - Low Functional			\$350.57	0.2209	\$322.23	0.2030
Wound - Medium Functional			\$529.80	0.3338	\$556.92	0.3509
Wound - High Functional			\$685.30	0.4318	\$712.09	0.4486
Community - Late	-\$522.51	-1.3257	-\$588.35	-0.3707	-\$515.11	-0.3245
Institutional - Early	\$240.14	0.6093	\$250.28	0.1577	\$250.30	0.1577
Institutional - Late	\$112.26	0.2848	\$58.22	0.0367	\$91.85	0.0579
Comorbidity Adjustment	\$359.98	0.9133	\$262.21	0.1652	\$254.30	0.1602
Constant	\$1,778.16	4.5115	\$1,571.02	0.9898	\$1,495.54	0.9422
Avg Resource Use	\$1,587.25		\$1,587.25		\$1,587.25	
N	8,754,919		8,754,919		8,754,919	
Adj R-Squared	0.237		0.1288		0.2628	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		No		Yes	

30-Day Periods

LUPA Thresholds Vary by Payment Group (10th Percentile of Visits)

Variable	Model 1		Model 2		Model 3	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	\$66.84	0.1746	\$281.21	0.1823		
MMTA - High Functional	\$112.57	0.2940	\$489.06	0.3170		
Behavioral Health - Low Functional	-\$21.91	-0.0572	-\$173.00	-0.1121		
Behavioral Health - Medium Functional	\$61.60	0.1609	\$145.69	0.0944		
Behavioral Health - High Functional	\$100.05	0.2613	\$325.50	0.2110		
Complex - Low Functional	-\$38.54	-0.1007	-\$5.07	-0.0033		
Complex - Medium Functional	\$56.73	0.1482	\$421.11	0.2730		
Complex - High Functional	\$99.39	0.2596	\$563.57	0.3653		
MS Rehab - Low Functional	\$61.23	0.1599	\$223.82	0.1451		
MS Rehab - Medium Functional	\$116.48	0.3042	\$464.09	0.3008		
MS Rehab - High Functional	\$169.28	0.4421	\$687.78	0.4458		
Neuro - Low Functional	\$105.84	0.2764	\$313.86	0.2035		
Neuro - Medium Functional	\$184.78	0.4826	\$633.46	0.4106		
Neuro - High Functional	\$208.69	0.5451	\$767.16	0.4973		
Wound - Low Functional	\$41.72	0.1090	\$355.65	0.2305		
Wound - Medium Functional	\$117.17	0.3060	\$666.25	0.4319		
Wound - High Functional	\$135.36	0.3535	\$806.45	0.5228		
Community - Late	-\$167.19	-0.4367			-\$622.28	-0.4034
Institutional - Early	\$75.60	0.1975			\$249.57	0.1618
Institutional - Late	\$7.43	0.0194			\$102.35	0.0663
Comorbidity Adjustment	\$47.33	0.1236				
Constant	\$381.82	0.9972	\$1,196.54	0.7756	\$1,871.76	1.2133
Avg Resource Use	383		1,543		1,543	
N	9,034,969		9,034,969		9,034,969	
Adj. R-Squared	0.276		0.1925		0.2418	
BLS or CPM+NRS?	BLS		CPM+NRS		CPM+NRS	

Variable	Model 4		Model 5		Model 6	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			\$247.44	0.1604	\$275.80	0.1788
MMTA - High Functional			\$447.22	0.2899	\$467.69	0.3032
Behavioral Health - Low Functional			-\$122.35	-0.0793	-\$162.07	-0.1051
Behavioral Health - Medium Functional			\$165.43	0.1072	\$153.78	0.0997
Behavioral Health - High Functional			\$326.31	0.2115	\$324.73	0.2105
Complex - Low Functional			-\$13.99	-0.0091	-\$0.26	-0.0002
Complex - Medium Functional			\$366.89	0.2378	\$413.41	0.2680
Complex - High Functional			\$557.44	0.3614	\$510.39	0.3309
MS Rehab - Low Functional			\$126.69	0.0821	\$233.33	0.1512
MS Rehab - Medium Functional			\$331.19	0.2147	\$470.39	0.3049
MS Rehab - High Functional			\$576.37	0.3736	\$681.35	0.4417
Neuro - Low Functional			\$310.12	0.2010	\$301.85	0.1957
Neuro - Medium Functional			\$611.59	0.3965	\$614.07	0.3981
Neuro - High Functional			\$772.33	0.5006	\$725.72	0.4704
Wound - Low Functional			\$442.04	0.2865	\$286.50	0.1857
Wound - Medium Functional			\$716.12	0.4642	\$588.62	0.3816
Wound - High Functional			\$894.64	0.5799	\$703.73	0.4562
Community - Late			-\$620.59	-0.4023		
Institutional - Early			\$270.54	0.1754		
Institutional - Late			\$73.01	0.0473		
Comorbidity Adjustment	\$313.09	0.8177			\$220.95	0.1432
Constant	\$1,490.23	3.8922	\$1,550.78	1.0053	\$1,173.90	0.7610
Avg Resource Use	1,543		1,543		1,543	
N	9,034,969		9,034,969		9,034,969	
Adj. R-Squared	0.1656		0.2774		0.1966	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	

Variable	Model 7		Model 8	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			\$240.61	0.1560
MMTA - High Functional			\$421.30	0.2731
Behavioral Health - Low Functional			-\$108.81	-0.0705
Behavioral Health - Medium Functional			\$175.00	0.1134
Behavioral Health - High Functional			\$325.04	0.2107
Complex - Low Functional			-\$7.74	-0.0050
Complex - Medium Functional			\$357.77	0.2319
Complex - High Functional			\$494.16	0.3203
MS Rehab - Low Functional			\$136.43	0.0884
MS Rehab - Medium Functional			\$336.73	0.2183
MS Rehab - High Functional			\$567.05	0.3676
Neuro - Low Functional			\$295.07	0.1913
Neuro - Medium Functional			\$587.45	0.3808
Neuro - High Functional			\$722.05	0.4681
Wound - Low Functional			\$359.03	0.2327
Wound - Medium Functional			\$622.55	0.4036
Wound - High Functional			\$771.46	0.5001
Community - Late	-\$645.91	-1.6870	-\$633.78	-0.4108
Institutional - Early	\$255.26	0.6667	\$269.23	0.1745
Institutional - Late	\$72.89	0.1904	\$57.37	0.0372
Comorbidity Adjustment	\$382.93	1.0001	\$268.57	0.1741
Constant	\$1,823.05	4.7614	\$1,532.92	0.9937
Avg Resource Use	1,543		1,543	
N	9,034,969		9,034,969	
Adj. R-Squared	0.2554		0.2835	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS	

60-Day Episodes

All Periods with 4 or Fewer Visits are LUPAs

	Model 1		Model 2		Model 3	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	\$116.40	0.1639	\$451.21	0.1583		
MMTA - High Functional	\$205.56	0.2894	\$860.19	0.3018		
Behavioral Health - Low Functional	-\$13.20	-0.0186	-\$181.53	-0.0637		
Behavioral Health - Medium Functional	\$115.77	0.1630	\$262.24	0.0920		
Behavioral Health - High Functional	\$175.91	0.2476	\$542.02	0.1902		
Complex - Low Functional	-\$43.73	-0.0616	\$115.61	0.0406		
Complex - Medium Functional	\$116.75	0.1643	\$787.27	0.2763		
Complex - High Functional	\$227.13	0.3197	\$1,269.98	0.4456		
MS Rehab - Low Functional	\$47.65	0.0671	-\$3.11	-0.0011		
MS Rehab - Medium Functional	\$129.09	0.1817	\$328.68	0.1153		
MS Rehab - High Functional	\$244.36	0.3440	\$857.21	0.3008		
Neuro - Low Functional	\$168.41	0.2371	\$444.72	0.1561		
Neuro - Medium Functional	\$300.51	0.4230	\$976.19	0.3426		
Neuro - High Functional	\$371.78	0.5233	\$1,359.90	0.4772		
Wound - Low Functional	\$51.48	0.0725	\$667.48	0.2342		
Wound - Medium Functional	\$179.00	0.2520	\$1,141.95	0.4007		
Wound - High Functional	\$228.64	0.3219	\$1,537.68	0.5396		
Community - Late	-\$33.28	-0.0468			\$41.52	0.0146
Institutional - Early	\$57.65	0.0812			\$170.34	0.0598
Institutional - Late	\$114.94	0.1618			\$647.74	0.2273
Comorbidity Adjustment	\$85.03	0.1197				
Constant	\$538.30	0.7578	\$2,305.32	0.8090	\$2,725.29	0.9563
Avg Resource Use	\$710.38		\$2,849.75		\$2,849.75	
N	4,643,196		4,643,196		4,643,196	
Adj R-Squared	0.1605		0.1744		0.14	
BLS or CPM+NRS?	BLS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		Yes		Yes	

	Model 4		Model 5		Model 6	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			\$428.72	0.1504	\$441.46	0.1549
MMTA - High Functional			\$815.42	0.2861	\$818.00	0.2870
Behavioral Health - Low Functional			-\$142.44	-0.0500	-\$153.92	-0.0540
Behavioral Health - Medium Functional			\$295.62	0.1037	\$287.65	0.1009
Behavioral Health - High Functional			\$559.07	0.1962	\$549.74	0.1929
Complex - Low Functional			\$87.19	0.0306	\$132.74	0.0466
Complex - Medium Functional			\$723.92	0.2540	\$779.43	0.2735
Complex - High Functional			\$1,188.04	0.4169	\$1,175.85	0.4126
MS Rehab - Low Functional			-\$7.45	-0.0026	\$17.60	0.0062
MS Rehab - Medium Functional			\$303.37	0.1065	\$344.44	0.1209
MS Rehab - High Functional			\$820.32	0.2879	\$843.62	0.2960
Neuro - Low Functional			\$461.63	0.1620	\$417.53	0.1465
Neuro - Medium Functional			\$977.49	0.3430	\$934.23	0.3278
Neuro - High Functional			\$1,356.54	0.4760	\$1,274.29	0.4472
Wound - Low Functional			\$704.19	0.2471	\$517.45	0.1816
Wound - Medium Functional			\$1,153.85	0.4049	\$979.20	0.3436
Wound - High Functional			\$1,545.28	0.5423	\$1,324.98	0.4649
Community - Late			\$12.72	0.0045		
Institutional - Early			\$208.53	0.0732		
Institutional - Late			\$542.02	0.1902		
Comorbidity Adjustment	\$649.14	0.9138			\$466.05	0.1635
Constant	\$2,721.29	3.8308	\$2,200.17	0.7721	\$2,242.10	0.7868
Avg Resource Use	\$2,849.75		\$2,849.75		\$2,849.75	
N	4,643,196		4,643,196		4,643,196	
Adj R-Squared	0.1497		0.1798		0.1822	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		Yes		Yes	

	Model 7		Model 8		Model 9	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	\$299.28	0.4213			\$417.79	0.1466
MMTA - High Functional	\$580.25	0.8168			\$773.37	0.2714
Behavioral Health - Low Functional	-\$170.90	-0.2406			-\$115.06	-0.0404
Behavioral Health - Medium Functional	\$213.23	0.3002			\$319.02	0.1119
Behavioral Health - High Functional	\$418.05	0.5885			\$565.11	0.1983
Complex - Low Functional	\$50.24	0.0707			\$104.28	0.0366
Complex - Medium Functional	\$578.41	0.8142			\$715.93	0.2512
Complex - High Functional	\$905.84	1.2752			\$1,097.92	0.3853
MS Rehab - Low Functional	\$40.50	0.0570			\$8.28	0.0029
MS Rehab - Medium Functional	\$233.65	0.3289			\$312.61	0.1097
MS Rehab - High Functional	\$628.17	0.8843			\$801.49	0.2812
Neuro - Low Functional	\$403.02	0.5673			\$433.09	0.1520
Neuro - Medium Functional	\$813.92	1.1458			\$933.18	0.3275
Neuro - High Functional	\$1,149.22	1.6178			\$1,270.95	0.4460
Wound - Low Functional	\$497.50	0.7003			\$558.86	0.1961
Wound - Medium Functional	\$842.93	1.1866			\$994.77	0.3491
Wound - High Functional	\$1,186.43	1.6701			\$1,340.32	0.4703
Community - Late	-\$23.14	-0.0326	-\$25.38	-0.0089	-\$24.57	-0.0086
Institutional - Early	\$124.69	0.1755	\$177.10	0.0621	\$204.04	0.0716
Institutional - Late	\$465.54	0.6553	\$580.85	0.2038	\$502.31	0.1763
Comorbidity Adjustment	\$458.25	0.6451	\$648.67	0.2276	\$464.90	0.1631
Constant	\$2,285.66	3.2175	\$2,621.24	0.9198	\$2,154.89	0.7562
Avg Resource Use	\$2,849.75		\$2,849.75		\$2,849.75	
N	4,643,196		4,643,196		4,643,196	
Adj R-Squared	0.0472		0.1562		0.1876	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	
Fixed Effects	No		Yes		Yes	

60-Day Episodes

LUPA Thresholds Vary by Payment Group (10th Percentile of Visits)

Variable	Model 1		Model 2		Model 3	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	\$127.35	0.1943	\$525.57	0.1992		
MMTA - High Functional	\$214.36	0.3270	\$933.99	0.3540		
Behavioral Health - Low Functional	-\$44.30	-0.0676	-\$299.47	-0.1135		
Behavioral Health - Medium Functional	\$120.13	0.1833	\$314.36	0.1191		
Behavioral Health - High Functional	\$184.85	0.2820	\$615.85	0.2334		
Complex - Low Functional	-\$46.74	-0.0713	\$90.43	0.0343		
Complex - Medium Functional	\$112.21	0.1712	\$771.69	0.2925		
Complex - High Functional	\$230.14	0.3511	\$1,307.13	0.4954		
MS Rehab - Low Functional	\$73.30	0.1118	\$153.66	0.0582		
MS Rehab - Medium Functional	\$173.14	0.2642	\$577.24	0.2188		
MS Rehab - High Functional	\$288.89	0.4408	\$1,111.08	0.4211		
Neuro - Low Functional	\$181.66	0.2772	\$531.68	0.2015		
Neuro - Medium Functional	\$333.63	0.5090	\$1,151.05	0.4362		
Neuro - High Functional	\$388.49	0.5927	\$1,463.03	0.5545		
Wound - Low Functional	\$86.20	0.1315	\$773.65	0.2932		
Wound - Medium Functional	\$219.19	0.3344	\$1,298.51	0.4921		
Wound - High Functional	\$257.21	0.3924	\$1,624.53	0.6157		
Community - Late	-\$94.08	-0.1435			-\$253.85	-0.0962
Institutional - Early	\$60.57	0.0924			\$177.50	0.0673
Institutional - Late	\$108.09	0.1649			\$603.94	0.2289
Comorbidity Adjustment	\$84.75	0.1293				
Constant	\$500.23	0.7632	\$2,023.22	0.7668	\$2,633.11	0.9979
Avg Resource Use	655.4387		2638.562		2638.562	
N	5,247,601		5,247,601		5,247,601	
Adj R-Squared	0.1836		0.1804		0.1452	
BLS or CPM+NRS?	BLS		CPM+NRS		CPM+NRS	

Variable	Model 4		Model 5		Model 6	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			\$481.71	0.1826	\$515.14	0.1952
MMTA - High Functional			\$862.53	0.3269	\$892.48	0.3382
Behavioral Health - Low Functional			-\$243.92	-0.0924	-\$275.66	-0.1045
Behavioral Health - Medium Functional			\$334.33	0.1267	\$334.31	0.1267
Behavioral Health - High Functional			\$612.32	0.2321	\$619.50	0.2348
Complex - Low Functional			\$53.12	0.0201	\$106.26	0.0403
Complex - Medium Functional			\$693.67	0.2629	\$766.11	0.2904
Complex - High Functional			\$1,204.75	0.4566	\$1,217.18	0.4613
MS Rehab - Low Functional			\$111.68	0.0423	\$170.69	0.0647
MS Rehab - Medium Functional			\$491.19	0.1862	\$589.29	0.2233
MS Rehab - High Functional			\$1,011.41	0.3833	\$1,095.92	0.4153
Neuro - Low Functional			\$535.55	0.2030	\$507.08	0.1922
Neuro - Medium Functional			\$1,121.89	0.4252	\$1,113.64	0.4221
Neuro - High Functional			\$1,442.15	0.5466	\$1,384.49	0.5247
Wound - Low Functional			\$833.72	0.3160	\$630.84	0.2391
Wound - Medium Functional			\$1,318.09	0.4996	\$1,144.44	0.4337
Wound - High Functional			\$1,660.56	0.6293	\$1,423.52	0.5395
Community - Late			-\$238.91	-0.0905		
Institutional - Early			\$215.65	0.0817		
Institutional - Late			\$511.70	0.1939		
Comorbidity Adjustment	\$624.09	0.9522			\$433.71	0.1644
Constant	\$2,516.41	3.8393	\$2,041.30	0.7736	\$1,965.61	0.7450
Avg Resource Use	2638.562		2638.562		2638.562	
N	5,247,601		5,247,601		5,247,601	
Adj R-Squared	0.1469		0.1921		0.1873	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	

Variable	Model 7		Model 8	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			\$83.80	0.0318
MMTA - High Functional			\$134.78	0.0511
Behavioral Health - Low Functional			-\$25.77	-0.0098
Behavioral Health - Medium Functional			\$86.43	0.0328
Behavioral Health - High Functional			\$130.03	0.0493
Complex - Low Functional			-\$38.93	-0.0148
Complex - Medium Functional			\$68.21	0.0258
Complex - High Functional			\$137.20	0.0520
MS Rehab - Low Functional			\$83.02	0.0315
MS Rehab - Medium Functional			\$151.75	0.0575
MS Rehab - High Functional			\$208.70	0.0791
Neuro - Low Functional			\$131.40	0.0498
Neuro - Medium Functional			\$225.54	0.0855
Neuro - High Functional			\$244.74	0.0928
Wound - Low Functional			\$39.86	0.0151
Wound - Medium Functional			\$126.28	0.0479
Wound - High Functional			\$140.28	0.0532
Community - Late	-\$313.28	-0.4780	-\$118.45	-0.0449
Institutional - Early	\$185.44	0.2829	\$74.22	0.0281
Institutional - Late	\$537.80	0.8205	\$57.93	0.0220
Comorbidity Adjustment	\$655.80	1.0006	\$41.13	0.0156
Constant	\$2,529.49	3.8592	\$359.21	0.1361
Avg Resource Use	2638.562		450.4626	
N	5,247,601		5,247,601	
Adj R-Squared	0.1619		0.2745	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS	

Comorbidity Regression

Regression of Resource Use on Comorbidity Groups and other HHGM Adjustment Variables (Other Adjustment variables not shown)

30-Day Periods - CPM + NRS

Description	Coefficient	P-Value	% of 30-Day Periods	Points
Behavioral 11: Intellectual Disabilities	-\$170.44	0	0.1%	0
Infectious 2: HIV	-\$133.49	0	0.1%	0
Renal 4: Pyelonephritis and other disorders of the kidney and ureter	-\$129.13	0	0.1%	0
Infectious 4: Viral Hepatitis	-\$121.30	0	0.3%	0
Neoplasm 4: Malignant neoplasms of pancreas	-\$97.10	0	0.1%	0
Resp 2: Whooping cough	-\$96.00	0	1.0%	0
Behavioral 3: Delusional and Non-mood Disorders	-\$92.13	0	0.0%	0
Cerebral 1: Occlusion/Stenosis of Pre-cerebral/Cerebral Arteries w/o Cerebral Infarction	-\$85.99	0	0.1%	0
Behavioral 1: Schizophrenia and Schizoaffective Disorders	-\$72.29	0	0.7%	0
Neuro 3: Dementia in diseases classified elsewhere	-\$69.31	0	10.5%	0
Heart 9: Valve Disorders	-\$67.91	0	0.9%	0
GI 4: Alcoholic Liver Disease, Chronic Hepatitis, Fibrosis and Cirrhosis of the Liver	-\$66.43	0	0.6%	0
Heart 4: Angina Pectoris	-\$64.61	0	0.2%	0
Neuro 8: Epilepsy	-\$63.02	0	1.5%	0
Neoplasm 6: Malignant neoplasms of trachea, bronchus, lung, and mediastinum	-\$61.64	0	0.8%	0
Heart 5: Atherosclerotic Heart Disease with Angina	-\$60.02	0	1.2%	0
Neoplasm 17: Secondary neoplasms of respiratory and GI systems.	-\$58.35	0	0.4%	0
Endocrine 1: Hypothyroidism	-\$55.60	0	3.0%	0
Renal 1: Chronic kidney disease and ESRD	-\$50.78	0	10.1%	0
Behavioral 5: Phobias, Other Anxiety and Obsessive Compulsive Disorders	-\$48.74	0	5.8%	0
GI 5: Hepatic Failure and Other Inflammatory Liver Disorders	-\$47.56	0	0.1%	0
Neuro 2: Delirium due to known physiological conditions	-\$45.63	0.004	0.0%	0
Heart 7: Chronic Ischemic Heart Disease	-\$42.78	0	0.8%	0
Resp 5: COPD and asthma	-\$41.32	0	5.1%	0
Resp 4: Bronchitis and emphysema	-\$40.19	0	0.5%	0
Resp 1: Obstructive sleep apnea	-\$39.84	0	0.7%	0
Circulatory 1: Nutritional, Enzymatic, and Other Heredity Anemias	-\$35.29	0	2.1%	0
MS 5: Osteoporosis	-\$32.67	0	2.7%	0
Behavioral 4: Psychotic, Major Depressive, and Dissociative Disorders	-\$32.40	0	0.2%	0
Neoplasm 9: Malignant neoplasm of breast	-\$30.96	0	0.4%	0
Heart 12: Other Heart Diseases	-\$30.84	0	15.2%	0

Description	Coefficient	P-Value	% of 30-Day Periods	Points
Behavioral 6: Schizotypal, Persistent Mood, and Adult Personality Disorders	-\$30.76	0	0.2%	0
Neoplasm 11: Malignant neoplasms of female genital organs and prostate	-\$30.59	0	0.6%	0
Resp 9: Respiratory Failure	-\$28.05	0	1.1%	0
Neuro 1: Vascular Dementia and Delirium due to known physiological conditions	-\$28.03	0	0.7%	0
Heart 8: Other Pulmonary Heart Diseases	-\$25.95	0	0.9%	0
Neoplasm 22: Follicular and other non-Hodgkin's lymphoma, and leukemia	-\$24.22	0	0.7%	0
Neuro 4: Alzheimer's disease and related dementias	-\$23.06	0	2.9%	0
Behavioral 2: Mood Disorders	-\$22.82	0	2.9%	0
Circulatory 2: Hemolytic, Aplastic, and Other Anemias	-\$22.51	0	5.1%	0
Renal 5: Neuromuscular dysfunction of bladder, urinary tract infection, and benign prostatic hyperplasia	-\$21.96	0	3.2%	0
Circulatory 7: Atherosclerosis	-\$21.61	0	0.3%	0
Endocrine 5: Obesity, and Disorders of Metabolism and Fluid Balance	-\$15.07	0	2.5%	0
Neoplasms 1: Malignant neoplasms of lip, oral cavity and pharynx	-\$13.36	0.249	0.1%	0
Renal 2: Unspecified renal failure	-\$11.55	0.383	0.1%	0
Resp 6: Bronchiectasis	-\$11.47	0	10.6%	0
Neuro 11: Diabetic retinopathy and macular edema	-\$8.07	0.028	0.8%	0
Behavioral 10: Major Depression, single episode	-\$5.43	0	8.6%	0
Neoplasm 2: Malignant neoplasms of digestive organs	-\$3.11	0.502	0.6%	0
MS 1: Lupus	-\$1.57	0.813	0.3%	0
Resp 8: Pulmonary fibrosis	-\$1.41	0.81	0.3%	0
Circulatory 12: Hypotension	-\$1.25	0.743	0.8%	0
Endocrine 3: Type 1, Type 2, and Other Specified Diabetes	-\$0.86	0.301	23.0%	0
Neoplasm 5: Malignant neoplasms of peritoneum and retroperitoneum	\$0.00			0
Behavioral 7: Mental and Behavioral Disorders Due to Psychoactive Substance Abuse	\$0.00			0
Behavioral 8: Eating Disorders	\$0.00			0
Behavioral 9: Personality and Behavioral Disorders due to known Physiological Condition	\$0.00			0
Cerebral 2: Transient Ischemic Attacks and Vascular Syndromes in Cerebrovascular Diseases	\$0.00			0
Cerebral 3: Other Cerebrovascular Diseases	\$0.00			0
Circulatory 3: Coagulation Defects	\$0.00			0
GI 2: Intestinal Obstruction and Ileus	\$0.00			0
GI 3: Constipation	\$0.00			0
GI 6: Other Disorders of the Liver	\$0.00			0
GI 7: Cholelithiasis and Cholecystitis	\$0.00			0

Description	Coefficient	P-Value	% of 30-Day Periods	Points
GI 8: Pancreatitis	\$0.00			0
GI 9: Celiac Disease	\$0.00			0
Heart 3: Unstable Angina, Acute Coronary Thrombosis, and Acute Ischemic Heart Disease	\$0.00			0
Heart 6: Aneurysm of Heart/Coronary Artery	\$0.00			0
Infectious 3: Herpes Zoster	\$0.00			0
Neoplasm 10: Kaposi's sarcoma	\$0.00			0
Neoplasm 12: Malignant neoplasms of urinary tract	\$0.00			0
Neoplasm 13: Malignant neoplasms of brain	\$0.00			0
Neoplasm 14: Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system	\$0.00			0
Neoplasm 15: Malignant neoplasm of adrenal gland, endocrine glands and related structures	\$0.00			0
Neoplasm 16: Secondary neoplasm of lymph nodes	\$0.00			0
Neoplasm 19: Secondary neoplasms of other specified sites	\$0.00			0
Neoplasm 20: Non-Hodgkin's Lymphoma	\$0.00			0
Neoplasm 21: Hodgkin's Lymphoma	\$0.00			0
Neoplasm 23: Merkel cell and neuroendocrine carcinoma	\$0.00			0
Neoplasm 24: Secondary carcinoid and neuroendocrine carcinoma	\$0.00			0
Neoplasm 3: Malignant neoplasms of liver and intrahepatic bile ducts	\$0.00			0
Neoplasm 7: Malignant neoplasms of bone and articular cartilage	\$0.00			0
Neoplasm 8: Malignant neoplasms of peripheral nerves, autonomic nervous system, and other Connective Tissue	\$0.00			0
Neuro 6: Demyelinating diseases of the central nervous system	\$0.00			0
Neuro 9: Encephalopathy	\$0.00			0
Renal 3: Diabetes Insipidus	\$0.00			0
Resp 3: Influenza and pneumonia	\$0.00			0
Resp 7: Pneumonitis and chronic pulmonary edema	\$0.00		0.1%	0
Skin 5: Non-pressure chronic ulcers	\$0.00			0
GI 1: Crohn's, Ulcerative Colitis, and other Functional Intestinal Disorders	\$1.30	0.844	0.3%	0
MS 4: Lumbar Spinal Stenosis	\$1.89	0.519	1.2%	0
Endocrine 4: Other Combined Immunodeficiencies and Malnutrition	\$4.05	0.32	0.8%	0
Circulatory 8: Aneurysms and Peripheral Vascular Disease	\$7.11	0	3.4%	1
MS 3: Joint Pain	\$7.52	0	2.5%	1
Circulatory 5: Hypertensive Heart and Chronic Kidney Disease w/o Heart Failure	\$7.98	0.02	1.2%	1
Infectious 1: C-diff, MRSA, E-coli	\$16.60	0	1.0%	2
Circulatory 4: Hypertensive Chronic Kidney Disease	\$17.27	0	11.3%	2
MS 2: Rheumatoid Arthritis	\$19.30	0	2.2%	2
Heart 11: Heart Failure	\$25.38	0	14.6%	3

Description	Coefficient	P-Value	% of 30-Day Periods	Points
Heart 10: Dysrhythmias	\$27.47	0	13.6%	3
Circulatory 6: Pulmonary Embolism	\$28.01	0	0.3%	3
Neuro 10: Diabetes with neuropathy	\$32.92	0	5.0%	3
Heart 1: Hypertensive Heart Disease with Heart Failure	\$33.64	0	1.7%	3
Neoplasm 18: Secondary neoplasms of urinary and reproductive systems, skin, brain, and bone	\$44.01	0	0.5%	4
Endocrine 6: Graft vs. Host Disease	\$59.15	0.265	0.0%	0
Endocrine 2: Diabetes due to a Known Underlying Condition	\$60.51	0	0.2%	6
Circulatory 9: Other Venous Embolism and Thrombosis	\$72.49	0	0.6%	7
Skin 1: Cutaneous abscess, cellulitis, and lymphangitis	\$104.79	0	1.3%	10
Neuro 5: Parkinson's Disease	\$133.65	0	2.0%	13
Skin 2: Stage One and unspecified stage pressure ulcers by site	\$140.00	0	0.8%	14
Neuro 7: Hemiplegia, paraplegia, and quadriplegia	\$147.92	0	1.2%	15
Cerebral 4: Sequelae of Cerebrovascular Diseases	\$174.83	0	4.9%	17
Circulatory 10: Varicose Veins of Lower Extremities with Ulceration	\$193.98	0	0.2%	19
Circulatory 11: Lymphedema	\$278.94	0	0.7%	28
Skin 3: Diseases of arteries, arterioles and capillaries with ulceration and non-pressure chronic ulcers	\$364.29	0	3.6%	36
Skin 4: Stages Two-Four and unstageable pressure ulcers by site	\$411.06	0	3.0%	41

Comorbidity Subgroup Descriptions for February, 2018 TEP:

Behavioral 1: Schizophrenia and Schizoaffective Disorders

Behavioral 2: Mood Disorders

Behavioral 3: Delusional and Non-mood Disorders

Behavioral 4: Psychotic, Major Depressive, and Dissociative Disorders

Behavioral 5: Phobias, Other Anxiety and Obsessive Compulsive Disorders

Behavioral 6: Schizotypal, Persistent Mood, and Adult Personality Disorders

Behavioral 7: Mental and Behavioral Disorders Due to Psychoactive Substance Abuse

Behavioral 8: Eating Disorders

Behavioral 9: Personality and Behavioral Disorders due to known Physiological Condition

Behavioral 10: Major Depression, single episode

Cerebral 1: Occlusion/Stenosis of Pre-cerebral/Cerebral Arteries w/o Cerebral Infarction

Cerebral 2: Transient Ischemic Attacks and Vascular Syndromes in Cerebrovascular Diseases

Cerebral 3: Other Cerebrovascular Diseases

Cerebral 4: Sequelae of Cerebrovascular Diseases

Circulatory 1: Nutritional, Enzymatic, and Other Heredity Anemias

Circulatory 2: Hemolytic, Aplastic, and Other Anemias

Circulatory 3: Coagulation Defects

Circulatory 4: Hypertensive Chronic Kidney Disease

Circulatory 5: Hypertensive Heart and Chronic Kidney Disease w/o Heart Failure

Circulatory 6: Pulmonary Embolism

Circulatory 7: Atherosclerosis

Circulatory 8: Aneurysms and Peripheral Vascular Disease

Circulatory 9: Other Venous Embolism and Thrombosis

Circulatory 10: Varicose Veins of Lower Extremities with Ulceration

Circulatory 11: Lymphedema

Circulatory 12: Hypotension

Endocrine 1: Hypothyroidism

Endocrine 2: Diabetes due to a Known Underlying Condition

Endocrine 3: Type 1, Type 2, and Other Specified Diabetes

Endocrine 4: Other Combined Immunodeficiencies and Malnutrition

Endocrine 5: Obesity, and Disorders of Metabolism and Fluid Balance

Endocrine 6: Graft vs. Host Disease

GI 1: Crohn's, Ulcerative Colitis, and other Functional Intestinal Disorders

GI 2: Intestinal Obstruction and Ileus

GI 3: Constipation

GI 4: Alcoholic Liver Disease, Chronic Hepatitis, Fibrosis and Cirrhosis of the Liver

GI 5: Hepatic Failure and Other Inflammatory Liver Disorders

GI 6: Other Disorders of the Liver

GI 7: Cholelithiasis and Cholecystitis

GI 8: Pancreatitis

GI 9: Celiac Disease

Heart 1: Hypertensive Heart Disease with Heart Failure

Heart 2: None (these are now part of Circulatory 5)

Heart 3: Unstable Angina, Acute Coronary Thrombosis, and Acute Ischemic Heart Disease

Heart 4: Angina Pectoris

Heart 5: Atherosclerotic Heart Disease with Angina

Heart 6: Aneurysm of Heart/Coronary Artery

Heart 7: Chronic Ischemic Heart Disease

Heart 8: Other Pulmonary Heart Diseases

Heart 9: Valve Disorders

Heart 10: Dysrhythmias

Heart 11: Heart Failure

Heart 12: Other Heart Diseases

Infectious 1: C-diff, MRSA, E-coli

Infectious 2: HIV

Infectious 3: Herpes Zoster

Infectious 4: Viral Hepatitis

MS 1: Lupus

MS 2: Rheumatoid Arthritis

MS 3: Joint Pain

MS 4: Lumbar Spinal Stenosis

MS 5: Osteoporosis

Neoplasms 1: Malignant neoplasms of lip, oral cavity and pharynx

Neoplasm 2: Malignant neoplasms of digestive organs

Neoplasm 3: Malignant neoplasms of liver and intrahepatic bile ducts

Neoplasm 4: Malignant neoplasms of pancreas

Neoplasm 5: Malignant neoplasms of peritoneum and retroperitoneum

Neoplasm 6: Malignant neoplasms of trachea, bronchus, lung, and mediastinum

Neoplasm 7: Malignant neoplasms of bone and articular cartilage

Neoplasm 8: Malignant neoplasms of peripheral nerves, autonomic nervous system, and other Connective Tissue

Neoplasm 9: Malignant neoplasm of breast

Neoplasm 10: Kaposi's sarcoma

Neoplasm 11: Malignant neoplasms of female genital organs and prostate

Neoplasm 12: Malignant neoplasms of urinary tract

Neoplasm 13: Malignant neoplasms of brain

Neoplasm 14: Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system

Neoplasm 15: Malignant neoplasm of adrenal gland, endocrine glands and related structures

Neoplasm 16: Secondary neoplasm of lymph nodes

Neoplasm 17: Secondary neoplasms of respiratory and GI systems.

Neoplasm 18: Secondary neoplasms of urinary and reproductive systems, skin, brain, and bone

Neoplasm 19: Secondary neoplasms of other specified sites

Neoplasm 20: Non-Hodgkin's Lymphoma

Neoplasm 21: Hodgkin's Lymphoma

Neoplasm 22: Follicular and other non-Hodgkin's lymphoma, and leukemia

Neoplasm 23: Merkel cell and neuroendocrine carcinoma

Neoplasm 24: Secondary carcinoid and neuroendocrine carcinoma

Neuro 1: Vascular Dementia and Delirium due to known physiological conditions

Neuro 2: Delirium due to known physiological conditions

Neuro 3: Dementia in diseases classified elsewhere

Neuro 4: Alzheimer's disease and related dementias

Neuro 5: Parkinson's Disease

Neuro 6: Demyelinating diseases of the central nervous system

Neuro 7: Hemiplegia, paraplegia, and quadriplegia

Neuro 8: Epilepsy

Neuro 9: Encephalopathy

Neuro 10: Diabetes with neuropathy

Neuro 11: Diabetic retinopathy and macular edema

Renal 1: Chronic kidney disease and ESRD

Renal 2: Unspecified renal failure

Renal 3: Diabetes Insipidus

Renal 4: Pyelonephritis and other disorders of the kidney and ureter

Renal 5: Neuromuscular dysfunction of bladder, urinary tract infection, and benign prostatic hyperplasia

Resp 1: Obstructive sleep apnea

Resp 2: Whooping cough

Resp 3: Influenza and pneumonia

Resp 4: Bronchitis and emphysema

Resp 5: COPD and asthma

Resp 6: Bronchiectasis

Resp 7: Pneumonitis and chronic pulmonary edema

Resp 8: Pulmonary fibrosis

Resp 9: Respiratory Failure

Skin 1: Cutaneous abscess, cellulitis, and lymphangitis

Skin 2: Stage One and unspecified stage pressure ulcers by site

Skin 3: Diseases of arteries, arterioles and capillaries with ulceration and non-pressure chronic ulcers

Skin 4: Stages Two-Four and unstageable pressure ulcers by site

Skin 5: Non-pressure chronic ulcers