ECONOMETRICA, INC.

REPORT

Appendix D – Hospital Groupings

Evaluation and Monitoring of the Bundled Payments for Care Improvement Model 1 Initiative

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Submitted To:

Centers for Medicare & Medicaid Services
Attn.: Arpit Misra
Contracting Officer's Representative
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Submitted By:

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July 9, 2015

ECONOMETRICA, INC.

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Mr. Arpit Misra
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Centers for Medicare & Medicaid Services
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7205 Windsor Boulevard, Mail Stop C3-21-28
Baltimore, MD 21244-1850

Reference: Contract No.: HHSM-500-2011-00015I; Order No.: HHSM-500-T0008; "Evaluation and Monitoring of the Bundled Payments for Care Improvement Model 1 Initiative" (Project No.: 2248-000).

Dear Mr. Misra:

Econometrica is pleased to submit this Appendix D – Hospital Groupings as part of the Annual Report to the Centers for Medicare & Medicaid Services, Center for Medicare & Medicaid Innovation, regarding work being conducted under the above-referenced contract.

Appendixes A, B, C, and E are being submitted as separate files.

If you wish to discuss any aspect of this submission, please feel free to contact me at (301) 395-2281.

Sincerely,

Econometrica, Inc.

Monique Sheppard, Ph.D.
Project Director

cc: Contract File

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Appendix D: Hospital Groupings

To assess the impact(s) of Bundled Payments for Care Improvement (BPCI) Model 1 potentially associated with hospital characteristics, cohorts of BPCI Model 1 hospitals were identified, and two types of cohorts were considered in these analyses:

- *Active*, *Exiting*, and *PHC* Awardees.
- Awardees with *Expansive* or *Targeted* Care Redesigns.

Active and Exiting cohorts are exclusive sets of Awardee hospitals, as are Expansive and Targeted cohorts. The next two sections detail their compositions. The PHC cohort comprises the hospitals that exited and had participated in the PHC demonstration.

D.1. Active and Exiting Awardees

As previously noted, 23 Awardees enrolled in BPCI Model 1 on April 1, 2013, and 1 hospital enrolled on January 1, 2014. As of November 1, 2014, 10 of these Awardees terminated from the program.

Nine of these 10 exiting Awardees were not active in BPCI Model 1 for the duration of the Medicare claims analyses, covering patient stays up to June 30, 2014. These 9 Awardees comprise the BPCI Exiting Cohort, while the remaining 15 comprise the BPCI Active Cohort. It is important to note that the nine exiting hospitals exited at different points in time: six exited in PQ 5 and three exited in PQ 3. Within these nine exits are the six hospitals that participated in the earlier PHC gainsharing program. The three early exiting Awardees were *active* in BPCI Model 1 for 60 percent of the program performance period covered in claim-based analyses of this report.

D.1.1. Expansive and Targeted Care Redesigns

Care redesign Awardees undertake an integral design component of this model. To better understand how they might affect model progress, hospital care redesigns are mapped to expected, measurable outcomes and utilizations by their ability to affect inpatient or post-discharge health care utilization. Awardees pursue two to nine care redesigns under this model, most of which are composed of various care (sub) processes.[1] Further, these care redesigns vary across Awardees, both in measurement of progress and success and even objective. Thus, a systematic classification of Awardee care redesigns was used to group similar care redesigns based on their effects (potential and projected) and scope. This system organized the targeted patient population(s) into two broad classifications:

- *Expansive Care Redesigns* – Awardees in this group included hospitals that, on average, had care redesigns that focused on a larger proportion of a hospital's population and whose care redesigns had high potential to affect model goals.
- *Targeted Care Redesigns* – Awardees in this group included hospitals that, on average, had care redesigns that focused on a smaller proportion of a hospital's population and whose care redesigns may have had high potential to affect model goals.

[1] Section III.A.2 of the 2014 Annual Report provides more detail on the intricacies of care redesigns.

Note that exiting hospitals were included in this classification since the nine exiting Awardees were active in the model for the majority of the analysis period and all expressed the intention to maintain their care redesigns.[2] The care redesigns score process is detailed below.

D.1.1.1. Calculation of Average Care Redesign Effect and Average Care Redesign Scope Variables

A team of experts, including health researchers, medical professionals, and physicians, worked with a modified Delphi process[3] to create the variables "average care redesign effect" and "average care redesign scope." The variables were developed from the information provided to the Centers for Medicare & Medicaid Services (CMS) by Awardees in their Implementation Protocols (IPs) submitted prior to enrolling in the model. In their IPs, each hospital described several care redesign strategies (five on average) that they would implement as Awardees in this model. This description included each care redesign's name, method of implementation, targeted population(s), and mechanism(s) for affecting model goals.

D.1.1.2. Average Care Redesign Effect

To construct the variable "average care redesign effect," two scores were created for each of the proposed care redesigns at each hospital:

1. Care redesign type score.
2. Care redesign intensity score.

The care redesign type score took into account the care redesign's *potential* effect on model goals; the care redesign intensity score was based on a projection of the care redesign's *actual* effect on these goals. This process allowed us to balance the care redesign's potential impact on achieving BPCI cost savings and quality improvements with the intensity or significance of the actual proposed care redesigns on the outcomes of interest.

To develop the care redesign type score, the first score used to calculate average care redesign effect, each care redesign was categorized by the type of activity and/or leverage point that the care redesign intended to target. Leverage points are the areas, processes, or precise decision points that hospitals/providers target to achieve cost savings and/or improve care coordination and the quality of care they provide. The care redesign type categorizations were aligned with potential organizational responses under this model that include the following:

- Care coordination.
- Material management.
- Business operations.
- Standardized orders/protocols.

[2] One-third were active for at least 60 percent of the analysis timeframe; most were active up through the end of the analysis timeframe in PQ 5.

[3] Each team member who participated in this exercise independently scored the interventions at each hospital based on predetermined type scores (Table D.1). Once the interventions were independently scored, the team convened to share their scores for each intervention at each hospital. The "agreement rate" among scorers was quite high, which meant that the team gave the same score for a large majority of the interventions. Any discrepancies were discussed at the time of comparison and a consensus score was determined. Deviating from a "pure" Delphi decision-making process (e.g., the process was not monitored by a facilitator but by consensus) allowed the needs of the activity to be met while preserving the integrity of the process.

- Quality improvement initiative.
- Education/training.

Each of the care redesign types was independently scored on its potential to reduce cost and improve quality on a scale of 1 to 5, where 1 indicated the least potential effect on BPCI outcomes and 5 indicated the greatest potential effect. When calculating these scores, three factors were considered: (1) published peer-reviewed literature, (2) impacts of previous gainsharing demonstrations, and (3) the remaining potential of commonly used care redesign categories to reduce costs and/or improve quality. The experts engaged in an iterative consensus process, inherent to the Delphi method, to come up with a single score for each of the care redesign types listed above. These scores are referred to as the *care redesign type score*.

To illustrate, researchers have found that education and training activities frequently have a limited impact on the actual quality and cost outcomes experienced by patients, as these activities have a significant degree of separation from the clinical care being provided on a daily basis. As such, care redesigns categorized as education/training were determined to have a care redesign type score of 2. Comparatively, literature indicates that care coordination activities tend to have a broader impact on quality and cost outcomes, since such activities directly affect the way medical professionals provide care. Consequently, it was determined that the care coordination category should receive a care redesign type score of 4. Table D.1 presents the care redesign categories and each care redesign's care redesign type score.

Table D.1: Care Redesign Categories and Care Redesign Type Score

Care Redesign Type	Example	Care Redesign Type Score
Care coordination	Management of transition of care services	4
Material management	Standardization of hardware or other materials	4
Business operations	Internal process or throughput protocol	3
Standardized orders/protocols	Evidence-based checklist	4
Quality improvement initiative	Fall prevention program	3
Education/training	Education on Crimson use	2

To develop the care redesign *intensity* score, the second score used to calculate average care redesign effect, each of the hospital's proposed care redesigns was scored based on the level of intensity. When calculating the care redesign intensity score, three elements were considered: (1) the care redesign's capacity to affect costs and/or quality, (2) the scale of the care redesign (e.g., one departmental unit versus hospital-wide or implementation of a care redesign versus planning a care redesign), and (3) the compliance and adherence policies associated with the care redesign (e.g., physicians must meet certain requirements or thresholds to receive gainsharing).

As with the care redesign *type* score, *intensity* scores ranged from 1 to 5, with 1 indicating the least projected effect on BPCI outcomes and 5 indicating the greatest projected effect. After several iterations of the consensus processes, all differences were reconciled to come up with one *care redesign intensity score* for each of the care redesigns pursued under the model.

A unified *care redesign effect score* was created by multiplying the care redesign *type* score by the care redesign *intensity* score; Care Redesign Effect Step 1 below presents this equation. When constructing the mathematical model, the care redesign type score—a potential score[4]—was viewed as being the maximum possible score, while the intensity score—a projected score—was viewed as a limiting factor.

Consider the following example of a care redesign that implements standardized order sets that are designed to reduce postoperative infection rates. The care redesign *type* score of 4 was given on its ability to impact model goals (e.g., promote efficiency of care and ultimately reduce costs). But if the stated goal of the order set was only to maintain the current performance of the hospital's infection rates, then a limited impact related to the outcomes of interest can be expected, and thus would give it a low care redesign *intensity* score. As such, it was determined that the relationship of these variables was best represented by following a multiplicative approach.

Care Redesign Effect Step 1:

$$\text{Care Redesign 1 Type Score} \times \text{Care Redesign 1 Intensity Score} = \text{Care Redesign 1 Effect Score}$$

A single score was created for each Awardee to easily understand the combined impact of the multiple care redesigns planned under this model. Specifically, the care redesign effect scores were averaged as depicted in Care Redesign Effect Step 2. The resulting values correspond to the average care redesign effect variable used in the *Overall Care Redesign Effect* score.

Care Redesign Effect Step 2:

$$\frac{\text{Care Redesign 1 Effect Score} + \text{Care Redesign 2 Effect Score} + \ldots}{\text{\# of Care Redesigns}} = \text{Average Care Redesign Effect}$$

Next, the *Average Care Redesign Scope* score was computed, the final component of the care redesign scoring.

D.1.1.3. Average Care Redesign Scope

Unlike the average care redesign *effect* variable, the average care redesign *scope* variable takes into account the fact that care redesigns that target specific patient populations (e.g., specialties or particular clinical conditions) may only affect outcomes in those areas. For example, if a hospital implements standardized order sets for their cardiology patients, only improvements in measures associated with standardized orders for cardiology patients can be expected.

Two scores were used to construct the *average care redesign scope* for each hospital. Both scores were generated for each care redesign for a given Awardee.

1. Care redesign effect score (calculated as part of the average care redesign effect variable).
2. Care redesign target area score.

[4] Expected from literature searches (see Care Redesign Type Score section).

To calculate the care redesign target area score, it was first determined whether a given care redesign targeted a specific patient population.[5] Next, patient populations targeted by the care redesigns were broadly categorized, and it was determined that hospitals targeted seven distinct populations across care redesigns:

1. Cardiology.
2. Orthopedic.
3. Neurology.
4. Pulmonary.
5. Surgery.
6. Intravenous immunoglobulin.
7. Sepsis patients.

These populations were based on the broadest categorization of the patient population deemed reasonable upon consultation with physicians and public health experts. For example, if a hospital specified the targeted population as heart failure, it was categorized as being relevant to all cardiology patients. When in doubt of a patient population, the most inclusive population was chosen. This was done in an effort to capture cases in which the care redesigns might have spillover effects into related patient populations and to account for potential variation in coding practices.

Using claims data from the CMS Public Use File (PUF), the fraction of each Awardee's Medicare claims in 2012 was calculated for each area/population indicated above, using the Major Diagnostic Category (MDC) designation included as part of the CMS PUF file, or the relevant diagnosis-related group (DRG) designations. This fraction represents the fraction of patients potentially affected by the given care redesign (i.e., that care redesign's target area). For example, suppose a care redesign targeted orthopedic DRGs and claims data showed one-third of that Awardee's patient population had the corresponding MDC code (MDC=8 for orthopedics), then that care redesign would receive a target area score of 0.33. If a care redesign was expected to apply for all patients (e.g., overall improved discharge coordination), then that care redesign's target area score was given a value of 1.0.

To construct one score for each care redesign (i.e., care redesign scope variable), the care redesign effect score was multiplied (calculated in Care Redesign Effect Step 1 as part of the average care redesign effect variable) by the target area score, as depicted in Care Redesign Scope Step 1.

Care Redesign Scope Step 1:

$$\text{Care Redesign 1 Effect Score} \times \text{Care Redesign 1 Target Area Score} = \text{Care Redesign 1 Scope Score}$$

To construct one variable for each hospital, the hospital's care redesign scope scores were added across all care redesigns and the sum was divided by the number of care redesigns proposed at the hospital. This number is the average care redesign scope variable used in the hospital clustering analysis.

[5] Typically, targeted populations were indicated or implied by care redesign descriptions in a BPCI Model 1 Awardee's IP.

Care Redesign Scope Step 2:

$$\frac{\text{Care Redesign 1 Scope Score} + \text{Care Redesign 2 Scope Score} + \ldots}{\text{\# of Care Redesigns}} = \text{Average Care Redesign Scope}$$

D.1.2. Determining Cohort Conclusion

As previously noted, the goal was to create a taxonomy of these varied care redesigns by their potential effect on goals. Specifically, care redesigns were scored over two primary mechanisms: (1) the potential effect of an Awardee's care redesigns and (2) the populations over which that effect may occur. The Average Care Redesign Scope score provides information on the average *reach* of care redesigns and does not necessarily account for any spillover effects (e.g., information technology implementation that would also have benefits across non-targeted departments). The Average Care Redesign Effect score provides an average potential effect of the care redesigns, not limited by targeted patient populations.

The maximum of the two scores was considered for the initial care redesign cohort classification,[6] and as these scores were computed early in the implementation of the model, they will be updated as more information on the effect of care redesigns is known. For example, some Awardees opted to target specific patient populations that they considered more costly than others (e.g., where cost savings may be most evident) but ultimately expected to expand the redesign to a hospital-wide endeavor. The top one-third of the maximum of either computed score was used for classification into the Expansive Care Redesign cohort in this report.[7] Table D.2 identifies care redesign cohort designation.

Table D.2: Care Redesign Cohort Classification and Care Redesign Scores*

Hospital Code	Expansive Care Redesigns	Targeted Care Redesigns	Average Care Redesign Effect (1)	Average Care Redesign Scope (2)	Maximum of (1) and (2)
Capital Health Medical Center – Regional		✓	10	7	10
Capital Health Medical Center – Hopewell		✓	10	8	10
CentraState Medical Center		✓	8	4	8
Cooper Hospital / University Medical Center		✓	14	8	14
Deborah Heart and Lung Center		✓	7	6	7
Hunterdon Medical Center		✓	5	4	5

[6] Note: These scores were finalized after Kansas Surgery and Recovery Center's enrollment. A combined average was considered, which did not change the grouping.

[7] Overlook Medical Center's max score ranked in the top one-third; however, it was kept from the Expansive cohort due to it being one of the earliest exits and having only two care redesigns.

Hospital Code	Expansive Care Redesigns	Targeted Care Redesigns	Average Care Redesign Effect (1)	Average Care Redesign Scope (2)	Maximum of (1) and (2)
Jersey Shore University Medical Center		✓	8	8	8
JFK Medical Center		✓	8	8	8
Morristown Medical Center		✓	7	6	7
Overlook Medical Center		✓	6	3	6
Robert Wood Johnson University Hospital		✓	4	3	4
Robert Wood Johnson University Hospital – Hamilton		✓	9	9	9
Robert Wood Johnson University Hospital – Rahway	✓		12	10	12
St. Joseph's Regional Medical Center		✓	9	6	9
Saint Clare's Hospital (Denville, Dover)		✓	9	7	9
Saint Michael's Medical Center		✓	6	6	6
Saint Peter's University Hospital	✓		13	9	13
Inspira Medical Center – Elmer	✓		14	9	14
Inspira Medical Center – Vineland	✓		14	11	14
Inspira Medical Center – Woodbury	✓		16	6	16
St. Mary's Hospital Passaic	✓		15	11	15
The Valley Hospital		✓	7	4	7
University Medical Center of Princeton at Plainsboro	✓		10	10	10
Kansas Surgery and Recovery	✓		12	12	12

*Scores are rounded to the nearest whole number.