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SPINAL SURGERY: VARIATIONS IN HEALTHCARE COSTS AND IMPLICATIONS FOR EPISODE-BASED BUNDLED PAYMENTS.

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ABSTRACT

Study Design: Retrospective, observational.

Objective: To simulate what episodes-of-care in spinal surgery might look like in a bundled payment system and to evaluate the associated costs and characteristics.

Summary of Background Data: Episode-based payment bundling has received considerable attention as a potential method to help curb the rise in healthcare spending and is being

investigated as a new payment model as part of the Affordable Care Act. While earlier studies investigated bundled payments in a number of surgical settings, very few focused on spine surgery specifically.

Methods: We analyzed data from MarketScan. Patients were included in the study if they underwent cervical or lumbar spinal surgery in 2000-2009, had at least 2 years pre-operative and 90 days post-operative follow-up data. Patients were grouped based on their Diagnosis Related Group (DRG) and then tracked in simulated episodes-of-care/payment bundles that lasted for the duration of 30, 60, and 90 days following the discharge from the index-surgical hospitalization. Total costs associated with each episode-of-care duration were measured and characterized.

Results: A total of 196,918 patients met our inclusion criteria. Significant variation existed between DRGs, ranging from $11,180 (30-day bundle, DRG 491) to $107,642 (30-day bundle, DRG). There were significant cost variations within each individual DRG. Post-discharge care accounted for a relatively small portion of overall bundle costs (range 4-8% in 90-day bundles). Total bundle costs remained relatively flat as bundle-length increased (total average cost of 30-day: $33,522 vs. $35,165 for 90-day). Payments to hospitals accounted for the largest portion of bundle costs (76%)

Conclusion: There exists significant variation in total healthcare costs for spinal surgery patients, even within a given DRG. Better characterization of impacts of a bundled payment system in spine surgery is important for understanding the costs of index procedure hospital, physician services and post-operative care on potential future healthcare policy decision making.

Key words: bundled payments, spinal surgery, DRG, episode of care, post-discharge cost.

Level of Evidence: N/A

Mini Abstract

The authors aimed to simulate a bundled payment in cervical and lumbar spinal surgery using 196, 918 patients from MarketScan database. It was found that bundle costs were highly variable even within DRG. The total bundle cost varied very little with the increase of bundle length.

Key points

- In a large retrospective, observational, longitudinal study using claims database, 30-day, 60-day and 90-day bundle costs (including index hospitalization cost and post-discharge cost) was highly variable depending on the type of spinal procedure, comorbidities, complications, and post-discharge hospital re-admission.
- Post-discharge care accounted for a relatively small portion of overall bundle costs and total bundle costs remained insensitive to the bundle-length increase.
- The information needed for the payer pertaining to the goal of lowering cost while improving the quality of care varies by specialty and is vital to the implementation of a successful bundled episode-of-care payment system

INTRODUCTION

The intent of the Affordable Care Act is to improve the quality of care, lower costs, and improve access to care for most Americans[1]. Reforming the healthcare payment model is an integral part of this effort. Currently, the fee-for-service model [2] is primarily utilized and has been strongly associated with cost increases but not improved health outcomes [3]. Within the current system, surgery constitutes a significant portion of healthcare spending and has been identified as a potential area for cost reduction [4]. As a result, the Centers of Medicare and Medicaid Services (CMS) is considering a new payment model: episode-based bundling.

Following the passing of the Affordable Care Act, Congress mandated the commencement of a pilot study to test the effectiveness of episode-based bundling in approximately 10 acute-care conditions. This study began on January 2013 and is being conducted by CMS in collaboration with selected providers. The idea is to provide a single lump payment for hospitals, physicians, and providers of post-surgical care, with the hopes that fixing the total payout will discourage unnecessary testing or procedures [4]. In the CMS pilot study, an episode is described as the period starting three days before surgery and ending 30 days after discharge following the index procedure [1].

This bundled payment model factors in the payment for surgery, hospitalization and post-operative care and is an improvement on the current diagnosis-related group (DRG) payment system. Since its introduction, the bundled payment method has been discussed in the surgical literature in multiple fields including cardiac, orthopedic, spine, and general surgery [3-5]. Birkmeyer et al found that for spine surgery in the Medicare population, hospital payment accounted for the highest percentage of the total payment and varied widely between hospitals

[5]; large variations in the payments for the index hospitalization, outliers, and 30-day re-admission were also demonstrated. Cutler et. al. found that spine surgery ranked 10 among the top 17 episodes that accounted for half of the Medicare spending [6].

While bundled payments in spine surgery have been examined, previous studies grouped multiple spine procedures into one category [4, 5]. The current study examines spine surgeries individually as defined by DRG codes with the goal of simulating potential bundled episodes-of-care for spine surgery. To this end, we designed a study where billing information for spine surgery patients was retrospectively collected from a national database. We then constructed several hypothetical episodes of care mimicking a bundled payment and characterized these bundles in terms of distribution and variations of cost for different DRGs. We analyzed bundled payments for episodes-of-care at 30, 60, and 90 days after surgery to examine the distribution of costs for the index hospitalization and postoperative inpatient and outpatient care. Additionally, we quantified the current average payment for each DRG bundle. We hypothesized that there would be significant cost differences between types of spinal surgeries and the majority of costs would be associated with the index procedure hospitalization.

METHODS

Data source

We used the Thompson's Reuters MarketScan Commercial claims and encounters, Medicare supplemental and Medicaid databases. MarketScan data captures patient-level data on clinical utilization, insurance enrollment, costs linked with detailed patient, provider and facility

information [7, 8]. For the three databases, the paid claims are capitated or non-capitated in MarketScan;, in Commercial and Medicare, they are further classified as fee for service, encounter, Medicare or Medicare encounter [7, 8]. The MarketScan are longitudinal data grouped into files including inpatient and outpatient [7, 8]. Each patient has an encrypted ID which serves as a unique identifier and a linkage variable across different files [7, 8].

Subjects and case extraction

We included all patients over 18 who were hospitalized between 2000 and 2009 with an associated DRG of 453-460, 471-473 or 490- 491 (see Table 1). These DRGs represented the spectrum of cervical and lumbar surgeries most commonly performed in the United States. Patients undergoing the surgeries of interest as a primary procedure were identified in the inpatient files and the procedure records were flagged as the index hospitalization. Inpatient and outpatient files were then used to extract pre- and post-operative hospital and outpatient records for each patient.

Only patients with at least two years of enrollment data prior to the index surgery, no history of a previous spine surgery (laminectomy, fusion or discectomy), and at least 90 days of post-operative follow-up time were included. Pre-operative follow-up time was computed as the difference between the admission date of the index hospitalization and the start date of enrollment. Post-operative follow-up time was the difference between the date of end enrollment and the discharge date of the index hospitalization.

For each DRG cohort and for each patient in that cohort, the index hospitalization was the very first hospitalization in which that particular patient had that DRG.

Definition of bundles and costs calculation

We used three definitions of a bundle for this analysis: 30-day, 60-day and 90-day bundles. The period reflects the length of post-index hospitalization period included in the bundle in addition to the index hospitalization. The first period, 30 days, was chosen based on the definition of an episode of care in the CMS Pilot study [1]. In the Pilot study, an episode of care starts three days before surgery and ends 30 days after the surgery[1]. The period of 60 days was chosen based on Birkmeyer's et al observation that patients' healthcare expenditures dropped to pre-operative baseline levels 4 to 6 weeks after surgery [5]. The definition of 90 days was based on the current payment system, where payment is given for the procedure plus 90 days of postoperative care. For each of the three bundled payment analyses, we examined the cost of the index hospitalization, and the distribution of hospitalization costs and all post-discharge inpatient and outpatient services. Outpatient services with a date which coincided with the admission date or any time during the index hospitalization were excluded. Services occurring at the discharge date were included as part of post-discharge outpatient use whereas hospital stays for which the admission date coincided with the discharge date of the index hospitalization were included as part of post-operative inpatient use.

In MarketScan, financial variables represent costs from the payer's perspective. We adjusted all costs variables to 2009 US dollars using the medical component of the consumer price index [9, 10]. For each patient, we summed the inpatient and outpatient costs over the bundle period, and then averaged across patients and by DRG to get the estimate means.

Analyses performed

For each patient, we obtained the bundle cost by summing the index hospitalization payments with the post-operative hospital admission and outpatient payments. We grouped patients and obtained the average bundle cost for each DRG. Cases with index hospitalization cost below $500 and above the 99th percentile as well as cases with post-discharge inpatient cost or outpatient costs above the 99th percentile for each DRG were excluded.

RESULTS

The analysis dataset consisted of 196,918 cases. The largest group consisted of patients who underwent spinal fusion except cervical without major complication or comorbidity, DRG 460 (n = 70,317). The smallest group was composed of 779 cases that underwent spinal fusion except cervical with spinal curvature/malignancy/infection or 9+ fusions with major complication or comorbidity (DRG 456).

There were significant differences in costs between different DRGs, with the index hospitalization costs ranging from $11,180 for back and neck procedures included in DRG 491 to $107,642 for spinal fusion cases in DRG 456 (see table 2). The 30-day bundle payment ranged from $12,518 for patients within DRG 491 to $116,096 for those within DRG 456 (see table 3). Post-operative care cost constituted between 2% and 5% of the total 30-day bundle (see table 3). The 60-day bundle payment analysis also demonstrated considerable variations with cost varying from $13,188 for DRG 491 to $119,779 for DRG 456 (see table 3). Post-discharge care accounted for 3% to 7% of the 60-day bundle cost (see table 3). The 90-day bundle cost also widely varied from $13,924 for DRG 491 to $123,691 for DRG 456 (see table 3). The portion due to post-acute care ranged from 4% to 8% of the 90-day bundle cost (see table 3).

We also noticed variations within each DRG. The minimum bundle cost represented the average cost for a patient without any post-operative inpatient or outpatient expenditure. The lowest variation for a 30-day bundle was observed in the DRG 491 (see figure 1) with cost varying from a minimum of $566 to a maximum of $160,002, with an average of $19,425 (standard deviation: $7,793). DRG 491 remained the one with the lowest variation with for a 60-day bundle (see figure 2) with a difference of $87,793 between maximum and minimum values (see table 3). For the 90-day bundle, DRG 472 had the lowest variation, with costs ranging from $755 to $208,122 (average: $27,436, standard deviation: $28,176). The highest variation was observed in DRG 456 for the 30-day, 60-day and 90-day bundles (see table 3 and figures 1-3). The minimum bundle cost for DRG 456 was $587 with maximums of $222,514, $253,548 and $254,480 respectively for the 30-day, 60-day and 90-day bundles (see table 3).

An average of 4% of patients was discharged to post-acute care facilities with a low of 0.6% for DRG 473 and a high of 28% for DRG 456 (see table 4).

Readmission rates for the 30-day bundle ranged from 1% for DRG 455, DRG472 and DRG 473 to 7% for DRG 456 (average: 2%). At 60-days, the average re-admission rate remained 2% (see table 4). For the 90-day bundle, readmission rates ranges from 2% to 8%, with an average of 3% for all procedures (see table 4).

DISCUSSION

Spine surgery constitutes a large portion of healthcare expenditure and the cost of spine surgery is continuing to increase, likely due to the rapid rise in the frequency of complex fusion procedures [11]. It is therefore important to identify the sources of high costs in an attempt to control unnecessary spending. In this study, we have demonstrated 30-day, 60-day and 90-day

bundle costs (including index hospitalization cost and post-discharge cost) to be highly variable depending on the type of spinal procedure, comorbidities, complications, and post-discharge hospital re-admission. On average, the cost of the index hospitalization was $32,467, varying from $11,880 to $107,642. The largest portion (76%) is paid to the hospital for the index procedure, with physician services accounting for 14% of the costs. The 30-day bundle cost is on average $33,522 and increases to $34,306 for 60 days and $35,165 for 90 days. In spine surgery, the post-acute care accounts for approximately 3% of the 30-day bundle, 5% of the 60-day bundle, and 6% of the 90-day bundle. Approximately 4% of the patients are discharged to a post-acute care facility.

Bundled payments have been analyzed for a number of surgical procedures including total joint arthroplasty, cardiac surgery, gastrointestinal and urological procedures [3-5]. Our results of index hospital total payments averaging $32,467 are consistent with a previous study by Birkmeyer [5] which cited a figure of $26,515 using 2005 Medicare data. Unlike total joint arthroplasty [12] where post-discharge costs accounted for 36% of the 30-day bundle, our results show that only 3% of the bundle cost is attributable to post-discharge care. This highlights the unique differences in the nature of postoperative care, health condition, type of surgical approach, and frequency of follow-up among surgical fields.

The bundled payment model is designed to control health care costs while improving patient outcomes and is a part of the effort to shifts the focus from quantity of services to quality of care. It provides a fixed fee to all providers around an episode of care with an intention to incentivize collaboration, promote cost reduction, avoid unnecessary duplicate services, and reduce preventable re-admissions and complications. However, this episode-of-care technique comes

with potentially undesirable effects, such as withholding expensive but necessary care, multiplication of episodes where only minimum care is provided to get a patient through one episode and into the next, or avoiding caring for the very sick patients altogether selecting healthier patients who will accumulate low cost for the bundle instead. For example, in our study, the average 30-day bundle cost for a spinal fusion with complications or comorbidities (DRG 459) was $65,124 vs. $43,363 for a patient without complications or comorbidities (DRG 460). If a bundled payment system were to set reimbursement at the average bundle cost for a given DRG, the providers could be disincentivized to care for a patient with significant comorbidities if the expected extra costs exceeded $22,000.

The bundle payment method may also lead to a clinically inappropriate shift toward procedures with less costly DRGs. For example, providers may choose to treat a patient with cervical arthroplasty (30-day bundle cost: $19,425) instead of a cervical discectomy and fusion (30-day bundle cost: $26,095). Furthermore, a minor shift in the number of patients with comorbidities or complications may significantly increase costs and impact long-term sustainability of a provider under a bundled payment agreement.

The implementation of a bundled payment model will be inherently challenging and require robust quality monitoring. Current costs will be used to inform the feasibility and the starting values of the bundled payment system, with the necessary adjustment for “outliers” to cover the total spectrum of patients and avoid potential loss of the willingness to treat complex cases. Additionally, defining the length of the bundle will be an important part of the successful implantation of bundled payments

Currently, the bundling length has been primarily based on the lower extremity joint replacements and hip fractures [13]. In this setting, it was demonstrated that of 90-day post-discharge care cost, a 30-day bundle covers approximately 50% of re-admissions and 70% of post-acute care costs; the numbers increase to 80% and 90%, respectively for a 60-day bundle [13]. Sood et al [13] suggested that an increased bundle length would capture more cost and hospitalizations without jeopardizing providers. Our analysis suggests that a 30-day bundle captures 95% of the 90-day expenditure and may be sufficient to achieve the goal of cost saving.

Total savings associated with the bundled payment model depend on numerous factors including regional differences and hospital/provider variations. Cutler et al [6] has previously shown that episode-based bundling would lead to savings across low and high cost regions, if the condition is associated with high-spending.

Although this study has examined bundled payments in a wide variety of spinal procedures in a national cohort, it has several limitations. First, the study is retrospective and therefore does not include a random sample of patients. Nonetheless, as MarketScan is comprehensive and comprises data from the entire United States and three payer types (Commercial, Medicare and Medicaid), this study represents the majority of practices of spine surgery in the United States. Second, we limited our study to bundled payments defined as index hospitalization cost plus post-discharge care. We did not include pre-index costs or services in the outpatient data table in the peri-operative period. Third, we limited our results to non-extreme cases. Extreme "outlier" cases will inevitably have to be part of a bundled payment program. We believe that bundled payments will be formed using current actual values. As we presented averages, we excluded extreme values which are not necessary representative of the majority of situations. We

recognize that bundled payments will have to address the issue of outliers, either as a side agreement with providers or as a built-in method. Finally, from our dataset, we could not evaluate patient functional status, long-term health outcomes and satisfaction with care.

Conclusion: We simulated potential bundled payment episode of care package in spinal surgery patients and found that episode-of-care cost varies with the type of spine surgery, complications, comorbidities and post-discharge cost. Post-discharge cost constituted an average of 3%, 5% and 6% respectively for 30-, 60- and 90-day bundles. Re-admission rates were 2%, 2% and 3% for 30-, 60- and 90-days respectively. These results contribute to the understanding the current distribution of cost across the episode-of-care in spine surgery. There is significant variation between the cost involved with types of spinal surgeries, based on the complexity and extent of the surgical procedure as well as within a given DRG. From the perspective of a healthcare system that is paying for a "surgical product", the goal of the bundled payment model is lowering the cost variation within a given procedure to lower overall healthcare costs, while improving the quality of care. This information will vary by specialty and is vital to the implementation of a successful bundled episode-of-care payment system.

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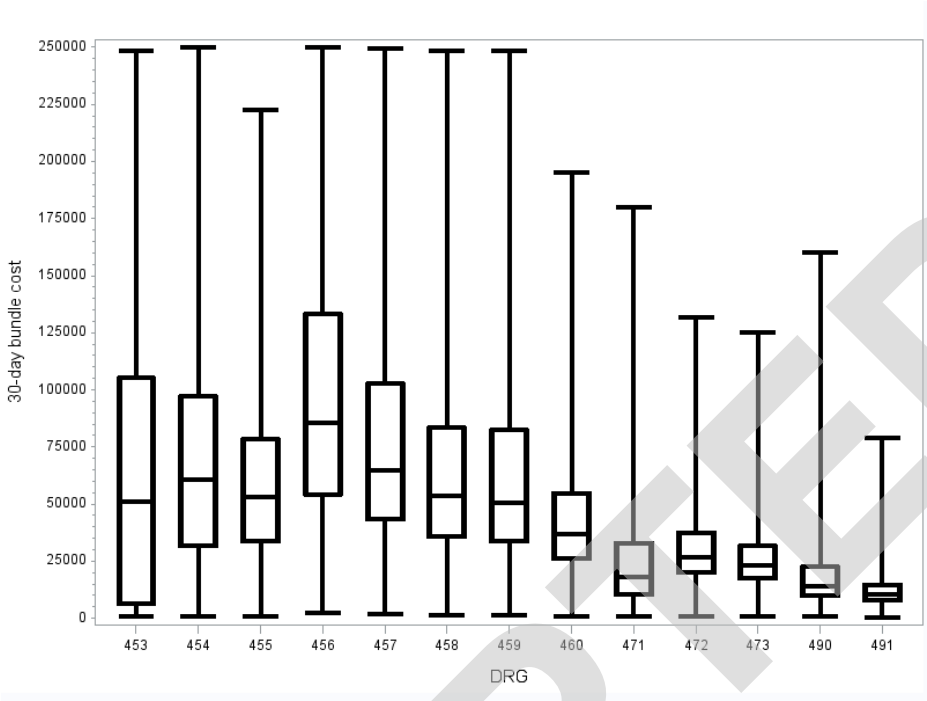

Figure 1: the interquartile range, maximums and minimums of 30-day bundle-pay by DRG.

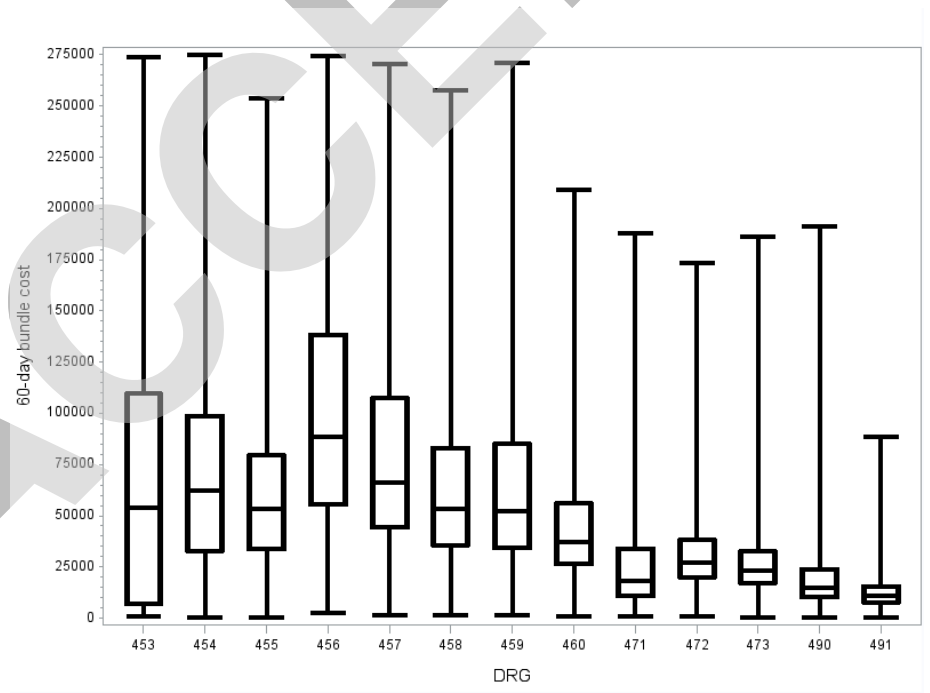

Figure 2: the interquartile range, maximums and minimums of 60-day bundle-pay by DRG.

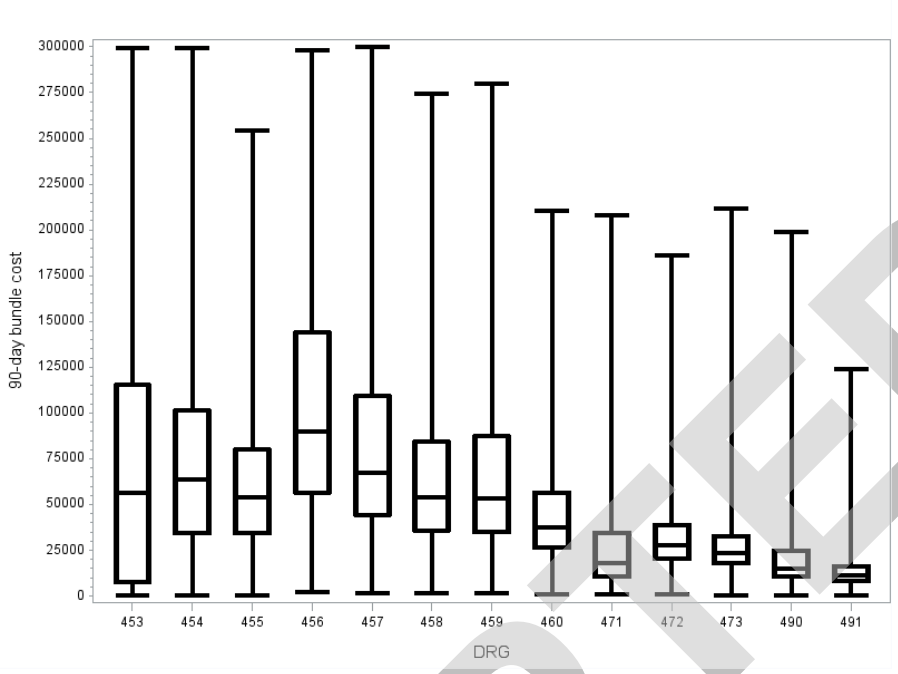

Figure 3: the interquartile range, maximums and minimums of 90-day bundle-pay by DRG.

Table 1: Number of procedures by DRG

DRG	Description	Number of cases	percentage
453	Combined anterior/posterior spinal fusion with major complication or comorbidity	2272	1.15%
454	Combined anterior/posterior spinal fusion with complication or comorbidity	5376	2.73%
455	Combined anterior/posterior spinal fusion without complication or comorbidity or major complication or comorbidity	6015	3.05%
456	Spinal fusion except cervical with spinal curvature/malignancy/infection or 9+ fusions with major complication or comorbidity	779	0.40%
457	Spinal fusion except cervical with spinal curvature/malignancy/infection or 9+ fusions with complication or comorbidity	1760	0.89%
458	Spinal fusion except cervical with spinal curvature/malignancy/infection or 9+ fusions without complication or comorbidity or major complication or comorbidity	1036	0.53%
459	Spinal fusion except cervical with major complication or comorbidity	3919	1.99%

460	Spinal fusion except cervical without major complication or comorbidity	70317	35.71%
471	Cervical spinal fusion with major complication or comorbidity	4820	2.45%
472	Cervical spinal fusion with complication or comorbidity	9298	4.72%
473	Cervical spinal fusion without complication or comorbidity or major complication or comorbidity	26992	13.71%
490	Back and neck procedures except spinal fusion with complication or comorbidity or major complication or comorbidity or disc device/neurostimulator	17503	8.89%
491	Back and neck procedures except spinal fusion without complication or comorbidity or major complication or comorbidity	46831	23.78%
Total		196918	100%

Table 2: Index hospitalization cost by DRG

DRG	**Mean and STD* for index hospitalization pay (physician)**	**Mean and STD * for index hospitalization pay (hospital)**	**Mean and STD * for index hospitalization other pay**	**Mean and STD * for index hospitalization total pay**
453	8003 (13927)	59862 (69822)	7095 (13531)	74960 (82229)
454	8969 (12788)	55690 (47929)	6628 (10568)	71287 (55828)
455	7732 (9253)	46489 (33531)	5299 (7759)	59520 (38557)
456	10551 (17438)	88145 (70352)	8947 (12123)	107642 (78969)
457	8624 (11722)	63228 (48363)	5874 (8646)	77727 (53854)
458	6964 (7407)	52013 (40724)	4111 (5980)	63088 (43327)
459	6818 (8713)	50451 (42491)	4983 (5751)	62252 (46589)
460	6041 (6333)	32828 (23682)	3472 (5056)	42342 (26242)
471	3105 (4627)	19518 (21834)	2115 (3044)	24739 (24759)
472	5756 (6326)	21633 (15458)	3228 (4549)	30617 (18295)
473	5030 (5483)	18180 (12782)	2634 (3934)	25843 (15043)
490	2169 (3450)	14025 (13376)	1894 (2594)	18088 (14964)
491	1915 (2497)	8600 (6238)	1365 (1723)	11880 (7303)
Total	4707 (6436)	24828 (26696)	2932 (4972)	32467 (31009)

*STD: standard deviation

Table 3: 30-day bundle cost by DRG

DRG	Bundle length	Mean (STD*) for post-discharge inpatient pay	Mean (STD*) for post-discharge outpatient pay	Mean (STD*) for post-discharge total pay	Mean (STD*) for Bundle** pay	Post-discharge as % of total bundle pay
453	30-day	954 (6485)	2646 (11609)	3600 (14330)	78560 (84617)	5% (16%)
	60-day	1336 (9150)	4915 (20776)	6251 (24369)	81211 (86885)	7% (19%)
	90-day	1508 (10022)	6952 (28429)	8460 (32410)	83420 (89689)	8% (21%)
454	30-day	366 (3045)	1217 (5599)	1583 (6780)	72870 (56322)	3% (10%)
	60-day	474 (3757)	2099 (8644)	2573 (10151)	73860 (56706)	4% (13%)
	90-day	564 (4138)	3079 (11874)	3643 (13464)	74930 (57312)	5% (15%)
455	30-day	156 (1608)	670 (2961)	826 (3522)	60346 (38679)	2% (7%)
	60-day	211 (2055)	1269 (4838)	1480 (5494)	61000 (38931)	3% (10%)
	90-day	298 (2681)	1867 (6423)	2164 (7348)	61684 (39163)	4% (11%)
456	30-day	1939 (10938)	6515 (28478)	8454 (31272)	116096 (85499)	5% (15%)
	60-day	2367 (12239)	9770 (38389)	12136 (42366)	119779 (89666)	7% (18%)
	90-day	2511 (12498)	13538 (51313)	16049 (55810)	123691 (96115)	8% (20%)
457	30-day	781 (5536)	3242 (14349)	4023 (16212)	81750 (55854)	4% (13%)
	60-day	1177 (8694)	6182 (26662)	7359 (29739)	85085 (60913)	5% (16%)
	90-day	1480 (10350)	8726 (37548)	10206 (41953)	87933 (67338)	6% (18%)
458	30-day	479 (4437)	1300 (6203)	1779 (8186)	64867 (43876)	3% (10%)
	60-day	533 (4749)	1796 (7468)	2329 (9615)	65417 (44251)	3% (11%)
	90-day	576 (4938)	2518 (9397)	3094 (11678)	66182 (44622)	4% (13%)

459	30-day	672 (4421)	2201 (8743)	2872 (10467)	65124 (47571)	4% (12%)
	60-day	806 (5288)	3578 (13030)	4384 (15036)	66636 (48548)	6% (15%)
	90-day	988 (6434)	4777 (16423)	5765 (19079)	68017 (49826)	7% (16%)
460	30-day	209 (2077)	812 (3327)	1020 (4088)	43363 (26483)	2% (8%)
	60-day	263 (2433)	1434 (5047)	1697 (5891)	44039 (26791)	4% (10%)
	90-day	321 (2799)	2156 (7125)	2476 (8028)	44819 (27295)	5% (12%)
471	30-day	260 (2616)	1097 (5365)	1356 (6243)	26095 (26069)	3% (11%)
	60-day	302 (2806)	1720 (7404)	2021 (8424)	26760 (26911)	4% (14%)
	90-day	413 (3697)	2284 (9518)	2698 (11058)	27436 (28176)	5% (15%)
472	30-day	181 (1869)	598 (2844)	779 (3528)	31396 (18613)	2% (8%)
	60-day	222 (2150)	1121 (4323)	1343 (5046)	31959 (18958)	3% (10%)
	90-day	287 (2528)	1781 (6419)	2069 (7240)	32685 (19602)	5% (13%)
473	30-day	216 (2193)	541 (2796)	758 (3698)	26601 (15481)	2% (9%)
	60-day	268 (2585)	1119 (4753)	1388 (5661)	27231 (16061)	4% (11%)
	90-day	360 (3319)	1828 (7278)	2188 (8373)	28031 (17191)	5% (14%)
490	30-day	371 (3061)	967 (4925)	1337 (6087)	19425 (16302)	4% (13%)
	60-day	505 (4161)	1950 (8146)	2455 (9728)	20543 (17984)	7% (17%)
	90-day	653 (4890)	2897 (11298)	3550 (13112)	21638 (20052)	8% (20%)
491	30-day	201 (1585)	437 (2009)	638 (2704)	12518 (7793)	4% (11%)
	60-day	253 (1958)	1054 (3879)	1307 (4559)	13188 (8619)	6% (16%)
	90-day	331 (2431)	1713 (5815)	2044 (6664)	13924 (9904)	8% (19%)
Total	30-day	256 (2459)	798 (4357)	1055 (5261)	33522 (31731)	3% (10%)
	60-day	327 (3059)	1512 (6947)	1839 (8053)	34306 (32387)	5% (13%)
	90-day	412 (3592)	2286 (9676)	2698 (10986)	35165 (33299)	6% (16%)

*STD=standard deviation; **bundle pay=index hospitalization total pay + post-discharge total pay

Table 4: Discharge disposition and readmission rates by DRG

	Discharge disposition				Readmission rates, n (%)		
DRG (n)	Inpatient rehabilitation facility	Skilled nursing facility	Long-term care hospital	Percent of patients discharged to a post-acute facility	30-day	60-day	90-day
453 (n=2272)	227	160	16	18%	94 (4%)	113 (5%)	121 (5%)
454 (n=5376)	283	239	3	10%	133 (2%)	156 (3%)	182 (3%)
455 (n=6015)	91	88	2	3%	85 (1%)	104 (1%)	128 (2%)
456 (n=779)	137	78	7	28%	55 (7%)	59 (2%)	63 (8%)
457 (n=1760)	195	114	3	18%	70 (4%)	78 (8%)	95 (5%)
458 (n=1036)	29	45	0	7%	20 (2%)	22 (4%)	24 (2%)
459 (n=3919)	378	320	20	18%	151 (4%)	169 (2%)	187 (5%)
460 (n=70317)	1404	1634	9	4%	1077 (2%)	1284 (4%)	1526 (2%)
471 (n=4820)	218	434	12	14%	87 (2%)	101 (2%)	120 (2%)
472 (n=9298)	167	109	1	3%	121 (1%)	143 (2%)	180 (2%)
473 (n=26992)	72	97	0	0.6%	358 (1%)	419 (2%)	518 (2%)
490 (n=17503)	621	660	21	7%	407 (2%)	474 (3%)	581 (3%)
491 (n=46831)	226	541	2	2%	941 (2%)	1077 (2%)	1299 (3%)
Total (n=196918)	4048	4519	96	4%	3599 (2%)	4199 (2%)	5024 (3%)