Managing Hospital Costs in an Era of Uncertain Reimbursement – A Six Sigma Approach

Prepared by:

WO’L

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As healthcare costs continue to outpace inflation and rise over 6% each year since 2000, hospital reimbursement does not keep up with the increased costs. Most often payments to hospitals are increased at a lower percentage than inflation. Insurance companies are always looking for ways to cut hospital payments either through denials or reduced payments.

The federal government insures our elderly population through the Medicare program which pays for inpatient hospital care using diagnosis related groups (DRGs). The DRG is assigned using ICD-9 diagnosis and procedure codes which are analyzed through a payment grouper and a DRG assignment is made. The payment mechanism is a standardized case rate, adjusted by a wage index based on geographic location and adjusted by a predetermined case weight which reflects the complexity of the individual DRG. Starting in 2007, all hospitals were subject to a new Medicare payment methodology which transitioned the use of hospital charges to hospital costs over a 3 year period and expanded the existing number of DRGs from 538 to 745 DRGs called MS DRGs. The use of the expanded DRG listing meant that some inpatients who were previously assigned to a single DRG would now be assigned to multiple DRGs which separate patients with and without major comorbidities and complications (CCs). The new payment methodology would result in reduced payments for patients without CCs, slightly higher payments for cases with CCs and the highest payment is provided for cases with major CCs. For a Medicare inpatient, payments are out of our control and Century Health is constantly faced with potential payment reductions through proposed regulations. In addition, unless the length of stay is significant enough to put the patient into an outlier status, the payment is the same whether a patient stays for 3 days, 5 days or 10 days. Century Health recognizes that the only way to maintain contribution margin is to manage the costs of the patient’s stay as best as possible. Century Health needs to determine if our Medicare payments cover the cost for services rendered and as payment changes occur, to what extent are we managing our costs and resources in conjunction with these changes.

Goal Statement

Century Health would like to identify where opportunities for improvement exist in managing resources for taking care of Medicare inpatients and the appropriate tool(s) to address these opportunities.

Project Scope

Our initial baseline data identified the top 12 highest volume DRGs for an analysis of the variance between payments and costs. For DRG 127, Heart Failure & Shock, the data reflected that our Division A division had a high length of stay (LOS) and carried the highest variance of $542,059 when total payments were compared to direct costs. Our Division B division, however, reflected a low LOS and the lowest variance of $190,005 when total payments were compared to direct costs. The scope of the project will be limited to reviewing resource utilization for Medicare inpatients for DRG 127 at our Division A and Division B divisions. Our assumption is that there is opportunity to manage resources to ensure that costs are covered and can adjust to future payment reductions. Individuals from the following departments will provide valuable insight into the project: Information Systems, Medical Records, Quality, Case Management and Patient Business Services.
Through an extensive validation of the baseline data, it was determined that detailed charges were missing for some inpatients (see Figure 1, below, for a description of the validation process).

**Figure 1: Resource Utilization Scoping Project Process**

Within our database, it is possible for patients to have a total charge without having accompanying cost detail because our costing methodology utilizes a ratio of cost to charges (RCC) to calculate the actual costs. This indeed turned out to be the case. Investigation of the specific patients revealed that there was a problem with an outside vendor interface from the patient billing system. Approximately 8,000 patients had a total charge amount in their balance record, but no supporting detail in the charge detail table. Information Systems (IS) implemented additional validation procedures to ensure data integrity.

In addition to missing cost detail data, there were a few instances where data that was present was erroneous. An analysis of several patients with high RCCs revealed that a formula in the spreadsheet had been replaced with hard coded numbers causing some of the costing information to be inaccurate. This error was corrected and revised costing for all patients was completed and loaded into the data warehouse.

Due to normal payment timing issues, patients with no payments were manually investigated and updated with the appropriate payment information. All unbilled admissions and patients with zero charges were deleted.
Standard operating procedures were developed for the chart audit and the chart review form used to capture inpatient admission and continued stay criteria was gaged. The gage results identified 93% accuracy and agreement.

A test of equal variances for all costs was performed and since the data was non-normal, the Levene’s test revealed a p-value of .018, which suggested there is a statistically significant difference in variation for costs between Division A and Division B (see Figure 2, below).

Figure 2: Baseline Data Test for Equal Variances (All Costs)

A further evaluation of costs by revenue departments identified three (3) areas where costs differed, Room and Board (R&B), the Emergency Department (ED) and Respiratory Therapy (RT), see Figure 3, below.

Figure 3: Baseline Data Percent of Cost Distribution by Revenue Grouping
A test of equal variances for LOS was performed and the Levene’s test identified a p-value of .001 which suggested a statistically significant difference in variation with LOS between Division A and Division B. See Figure 4, below. Additionally, a look at historical information from 2003 through 2006 revealed that Division A’s LOS was between 6.1 and 7.2 patient days when Division B’s LOS had been between 4.7 and 4.9 patient days.
**ANALYZE**

**Room and Board (R&B)**

The R&B category includes the cost of nursing care which is a large component of the Division A-Division B cost variance. Average cost per day for nursing care at each facility was impacting the cost variance. Century Health utilizes a standard for direct patient care hours per patient day for each nursing unit. We found that the Division A division was over the standard on the nursing units (hours per patient day, HPPD), whereas the Division B division complied with the established standards of care. The number of premium pay hours, such as agency hours and overtime hours as a percentage of total hours were higher at Division A than Division B and were also contributing to the cost variances. See summary Table below.
<table>
<thead>
<tr>
<th>Patient Care Area</th>
<th>Division A</th>
<th>Division B</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPPD</td>
<td>9.9</td>
<td>8.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Progressive Care Unit (PCU)</td>
<td>14.5</td>
<td>14.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Intensive Care Unit (ICU)</td>
<td>5%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Premium Pay Hours - Agency (% of total hours)</td>
<td>11%</td>
<td>10%</td>
<td></td>
</tr>
</tbody>
</table>

The amount of non-productive time was also analyzed and ruled out as a driver of the cost variance. All of these variables are constantly monitored by our Nursing Directors as they are critical metrics for them.

Emergency Department

The ED analysis failed to reveal any statistical differences in the Level of Care (LOC) of patients being seen at the Division A division versus the patients at the Division B division. A comparison of average cost per case between the Division B and Division A divisions did not show a significant difference aside from one aberrant observation. Again, HPPD were evaluated for each division and although Division A was higher than Division B, their numbers were declining over time. A recommendation was made to share the information gathered with the ED practice group in order to support continued performance improvement on the metrics being monitored.
Respiratory Therapy

Finally, a detailed cost analysis of the Respiratory department revealed that the number of respiratory units per CHF patient were 21.8 at Division A and 6.8 at Division B. The difference was identified as the number of units per patient for hand-held nebulizer treatments at each division. Where Division B indicated less than 1 unit/patient of nebulized medication, Division A recorded 8.2 units/patient of nebulized medication. Further investigation revealed differences in who provides the treatment between divisions. At Division A, respiratory therapists provided the treatment resulting in a detailed charge to each patient and at Division B, the treatments were provided by nursing staff, where no charges were entered for the treatment. Since this discrepancy accounted for 54% of the cost variance, no further investigation was warranted because the remaining cost variance was immaterial. A recommendation was made to share the information gathered during our project with another team who was anticipating a future project specifically related to RT.

As mentioned in the Measure section above, the test of equal variance for LOS revealed a statistically significant difference in the variation with LOS between Division A and Division B. A regression analysis (R-Sq=81.2% for Baseline and R-Sq=89.7% for Interim (pre-implementation)) supported our theory that LOS was the primary driver of the cost variance at Division A. For this reason, we began to analyze possible X’s that may be driving the LOS variance. The average excess LOS of 1.2 days at Division A accounted for over $258,000 in additional costs. The average nursing cost variance of $130 per day, accounted for another $200,000 in costs.

The following possible X’s were analyzed for LOS using box plots and individual graphical summaries to determine whether there were any differences requiring further evaluation (see Figure 5, below). None of the variables identified below warranted additional investigation.

- Cardio versus non Cardio physicians
- Patient Age
- Additional procedures and Type of procedures
- Physician Specialty
However, the two (2) possible X’s which did reveal statistically significant variances driving LOS were discharge disposition and severity. Discharge disposition refers to the place where the patient was discharged to after they leave the hospital. The typical discharge disposition codes are as follows:

01 – Discharge to home

02 – Transfer to another acute care institution

03 – Discharge/transfer to a skilled nursing facility (SNF)

05 – Discharge/transfer to a rehab facility

06 – Discharge/transfer to home health

Both Division A and Division B’s p value of 0.00 using a Mood’s median test showed that there is a statistically significant difference between LOS with disposition levels 3 and 6 as compared to disposition levels 1 and 2. Further analysis using a chi square test showed there was a statistically significant difference (p-value < .05) with LOS for patients with disposition 3 (discharge/transfer to a SNF) between divisions, with Division A’s observed counts worse than expected counts. When we looked at severity, the chi square indicated a statistically significant difference in LOS between the
divisions with severity scores of 2 and 3. From the pareto charts (see Figure 6, below), you can see that Division B’s non defect counts are higher than Division A’s. Division B is doing better than expected for both severity levels and Division A is doing worse than expected for both severity levels.

*Figure 6: Pareto of Patient Severity Levels (Division B & Division A)*

Using the Medicare geometric mean LOS of 4.0 days as our guide, we performed a chart audit on the patients with discharge dispositions of 3 and 6. Since severity scores of 2 and 3 also seemed to impact LOS, we would anticipate that patients not ready for discharge on day 4 would have CCs to support their extended stay. The inter-qual criteria were utilized to determine if the acute stay was appropriate.¹ Two sources of data were utilized to review the patient stay, Canopy data and when that data was not available, we pulled the actual patient chart to review physician progress notes, nurse’s notes, case management and home care notes and lab results.² The following table provides the results of our review.

<table>
<thead>
<tr>
<th></th>
<th>Division A</th>
<th>Division B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comorbidities/Complications</td>
<td>23%</td>
<td>54%</td>
</tr>
<tr>
<td>Placement Delays</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>No Documentation</td>
<td>62%</td>
<td>32%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

¹ Inter-qual refers to the inpatient admission criteria utilized to deem medical necessity.
² Canopy refers to the internal case management documentation system utilized by Century Health.
As the table indicates, the acute stay was appropriate in 23% of the cases at Division A and 54% of the cases at Division B. For both divisions, 15% of the days beyond the criteria were related to placement delays mostly due to family issues. In 62% of the Division A cases and 32% of the Division B cases, we were unable to determine the reason for the extended stay. At the very least, there is an opportunity for better physician documentation in the patient chart for extended patient stays. In spite of the missing documentation, it was noted that every case was paid by Medicare, therefore, there was no evidence of lost or reduced payments to the hospitals.

Our final analysis of possible X’s included several physician analyses (See Exhibit A). The physicians were stratified into groups with small patient volumes (between 11 and 20) and large patient volumes (>20). The analysis of physician groups using a Mood’s median test revealed that there was a statistically significant difference with LOS between physician groups at Division A. Further testing also indicated that there was a statistically significant difference for LOS between small volume groups at both Division A and Division B. A chi square test indicated that there was a statistically significant difference with LOS compared against the geometric mean for large volume physician practices between divisions with Division B performing better than Division A. Another cut of the data compared hospitalists to other physicians. Our Division B division utilizes hospitalists, whereas, the same model is not employed at our Division A division. For the Division B division, we tested whether the use of the Hospitalist model had an impact on the LOS at Division B. The LOS for the hospitalists was not statistically significant as compared with the large volume physician groups, the small volume physician groups or all physician groups at Division B. This result indicated to us that the physician practice patterns for treating CHF patients were consistent among the hospitalists and independent physician practices. This result also indicated that there was an opportunity to share best practices with Division A’s large volume physician groups in order to reduce LOS.

Our ability to affect physician practice patterns is difficult at best, since the majorities of our physicians are independent and are not employed by Century Health. There is no incentive for physicians to reduce LOS because they, unlike the hospital, receive their payments based on the number of days they see their patients in the hospital. However, our findings were shared with the senior management teams at both divisions and they were not surprised by our initial report. At the Division A division, the Medical Director could name the physician outliers even before we provided the supporting data for his review. Their reaction was immediate and they embraced the data in order to begin steps towards improving the LOS at the Division A division.

**Improve**

The Medical Management Committee, comprised of the Medical Directors from each of our hospital divisions and Medical Affairs and the following other members; VP Physician Relations, Case Management Physician Advisor, Medical Director – Division B Hospitalists, Chief Medical Information Officer, AVP Case Management and Directors, AVP Patient Business Services, AVP Internal Audit and a representative from our Operations Improvement department, was formed at Century Health in 2007. Among other responsibilities, the Committee is chartered to address LOS issues across the system. DRG 127 (Heart Failure & Shock) has been a focus at Century Health. The committee’s initial approach to
physicians was through verbal communication to individual physician outliers and physician group outliers. This approach did not bear any fruit, according to the Medical Director at the Division A division. The Committee then implemented an alternative approach by sending letters to physicians addressing ALOS and denial issues (see Exhibit B). While the Medical Directors cannot force a physician to change their behaviors and decisions, the physicians cannot claim they were not aware of the issues. This documentation becomes a part of the physician’s evaluation as a member of the Medical Staff and could possibly be utilized for future sanctions on the physician. The Medical Management Committee has also developed a standard operating procedure for LOS, utilization and severity issues.

It was clearly demonstrated as the project was being completed that our focus needed to be directed at our physicians since they drive the patient LOS. In order to impact physician behavior, the following interventions were discussed, developed and implemented:

- Elimination of a physician’s inpatient hospital practice who was a chronic abuser of inappropriate and unnecessary inpatient days
- Focused outreach efforts to Emergency Department physician leaders and physician staff to address the proper classification of patients as either an inpatient admission or an observation case through the Case Management Physician Advisor
- Physician rounding by Division A’s Medical Director and Chief Operating Officer to address LOS issues, with more intense rounding being done with known physician outliers
- Reached an agreement with 2 physicians for another physician practice to take care of their patients on the weekends in order to get them discharged earlier, when appropriate.

**CONTROL**

As a result of their efforts, the Division A division has decreased their ALOS for DRG 127 by 0.6 patient day from the interim (pre-implementation) time frame to the full implementation time frame. The length of stay reduction has resulted in an average cost per case decrease of $346. Additionally, the average variance between payments and costs has been reduced by $34. For the post implementation time frame, compared to the full implementation time frame, the LOS has been reduced even further by another 0.8 patient day with an average cost per case decrease of $1,061. The average variance between payments and costs has been reduced by $571. The following table depicts the LOS and average cost per case improvement over multiple time frames measured during the project.
These results are compelling and substantive as true cost savings has been achieved. To test whether the decreased length of stay is indeed statistically significant (comparing post implementation to baseline medians), the team employed the Mann-Whitney test since the sample data is non-normally distributed. For the Mann-Whitney test results to be valid, the population distributions must have equal variances. The test for equal variances (see Figure 7, below), with a resulting Levine’s Test p-value of 0.903 shows this to be the case.

Figure 7: Test for Equal Variances

The Mann-Whitney Test indicates a p-value of 0.0487, which means that the null hypothesis, that is, the baseline and post implementation LOS medians are equal, and can be rejected. In other words, the median of 4.0 after improvement is significantly shorter than the 5.0 median LOS baseline performance.
Minitab Output:  Mann-Whitney Test and CI: Baseline, Post

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>262</td>
<td>5.000</td>
</tr>
<tr>
<td>Post</td>
<td>65</td>
<td>4.000</td>
</tr>
</tbody>
</table>

Point estimate for ETA1-ETA2 is 1.000
95.0 Percent CI for ETA1-ETA2 is (0.001, 2.000)
W = 44305.0
Test of ETA1 = ETA2 vs ETA1 not = ETA2 is significant at 0.0501
The test is significant at 0.0487 (adjusted for ties)

With these results the Division A team is confident that the measures they employed to improve length of stay, thereby reducing operating costs, have been effective and the team is committed to sustaining these favorable results through the interventions implemented thus far. Monitoring of these metrics will be ongoing and any slippage will be addressed immediately by Division A’s administrative team which will work collaboratively with the Medical Management Committee.
<table>
<thead>
<tr>
<th>Possible X</th>
<th>Response Data (LOS)</th>
<th>Graphical Analysis Tool</th>
<th>Statistical Tool</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS above Geometric Mean between Division A and Division B</td>
<td>Continuous</td>
<td>Descriptive Statistics</td>
<td>Chi-Square</td>
<td>P-value &gt; 0.05; no statistically significant difference for LOS between Division A and Division B.</td>
</tr>
<tr>
<td>Cardio vs. Non-Cardio Physicians</td>
<td>Continuous</td>
<td>Box Plot, Individual Graphical Summaries</td>
<td>N/A</td>
<td>Did not reveal any differences requiring further evaluation.</td>
</tr>
<tr>
<td>Patient Age</td>
<td>Continuous</td>
<td>Box Plot, Individual Graphical Summaries</td>
<td>N/A</td>
<td>Did not reveal any differences requiring further evaluation.</td>
</tr>
<tr>
<td>Procedure</td>
<td>Continuous</td>
<td>Box Plot, Individual Graphical Summaries</td>
<td>N/A</td>
<td>Did not reveal any differences requiring further evaluation.</td>
</tr>
<tr>
<td>Readmission</td>
<td>Discrete</td>
<td></td>
<td>Chi-Square</td>
<td>P-value &gt; 0.05; no statistically significant difference with readmissions between divisions.</td>
</tr>
<tr>
<td>Physician Specialty</td>
<td>Continuous</td>
<td>Individual graphical summaries, box plot</td>
<td>Moods Median</td>
<td>Did not reveal any differences requiring further evaluation.</td>
</tr>
<tr>
<td>Disposition</td>
<td>Continuous</td>
<td>Individual graphical summaries, box plot, scatter plot</td>
<td>Moods Median</td>
<td>Division A: P-value &lt; 0.05; a statistically significant difference with LOS by disposition categories. Division B: P-value &lt; 0.05; a statistically significant difference with LOS by disposition categories. Division A vs. Division B: P-value &lt; 0.05; a statistically significant difference for LOS with Disposition category 3 between Division A and Division B, with Division A’s observed count greater than expected for above geometric mean and observed count lower than expected count.</td>
</tr>
<tr>
<td>Severity</td>
<td>Continuous</td>
<td>Individual graphical summaries, box plot, scatter plot</td>
<td>Moods Median</td>
<td>Division A: P-value &lt; 0.05; a statistically significant difference with LOS by severity levels. Division B: P-value &lt; 0.05; a statistically significant difference with LOS by severity levels. Division A vs. Division B: P-value &lt; 0.05; a statistically significant difference for LOS with Severity 3 between divisions, Division B performing better. P-value &lt; 0.05; a statistically significant difference with LOS for patients with a Severity of 2 between divisions, Division B performing better.</td>
</tr>
</tbody>
</table>

Chi-Square: Pearson correlation = .423
P-value < 0.05
<table>
<thead>
<tr>
<th>Physician Groups grouped by patient volume:</th>
<th>Response Data (LOS)</th>
<th>Graphical Analysis Tool</th>
<th>Statistical Tool</th>
<th>Response</th>
</tr>
</thead>
</table>
| • Determined small volume physician groups to have 11-20 CHF patients | Continuous | Individual graphical summaries, box plot | Moods Median | Division A:  
P-value < 0.05 a statistically significant difference with LOS between physician groups  
P-value < 0.05 a statistically significant difference with LOS between small volume groups  
P-value > 0.05 no statistically significant difference with LOS between large volume groups |
| • Determined large volume physician groups to have greater than 20 CHF patients | Continuous | Individual graphical summaries, box plot | Chi Square | P-value > 0.05 no statistically significant difference with LOS compared against geometric mean between small and large volume physician groups |

**Division B:**
- P-value > 0.05 no statistically significant difference for LOS between physician groups  
- P-value > 0.05 no statistically significant difference for LOS between large volume groups  
- P-value < 0.05 a statistically significant difference for LOS between small volume groups  

**Division B vs. Division A:**
- P-value > 0.05 no statistically significant difference with LOS compared against geometric mean for small volume practices between divisions, Division B performing better  

| Hospitalists vs. Other Physicians | Continuous | Individual graphical summaries, box plot | Moods Median | Division B:  
P-value > 0.05 with LOS of Hospitalist groups compared to LOS with large volume groups at Division B  
P-value > 0.05 with LOS of Hospitalist groups compared to LOS with small volume groups at Division B  
P-value > 0.05 Hospitalist groups versus all physicians Division B |

**Division B vs. Division A:**
- P-value < 0.05 a statistically significant difference between LOS below geometric mean for Division B Hospitalist physicians compared to LOS below geometric mean for Division A large volume physicians
Letter to Medical Staff

Dear Dr. ____________

I want to bring to your attention Case Management performance statistics specific to you/your group, for the previous three months – April 2008 through June 2008. The summary below includes:

- Your average Medicare Length of Stay (Med LOS)
- Your Managed Care LOS (MC LOS)
- Your Managed Care denial rate

(Place the data, with Division A averages here)

Your Med LOS/MC LOS/Denial Rate are tracked, on a monthly basis, by each Division’s Case Management team, and is shared with the Administrative team and the Century Health Medical Management Committee. Individual physician performance will be submitted to Medical Affairs to be included in each physician’s file, to be reviewed at reappointment. Additionally, significant individual outliers will be shared with, and discussed at, the Medical Executive Committee, as provided for within the Century Health Medical Staff Bylaws.

Our Physician Advisor for Case Management is available each day to discuss and assist physicians with case management, utilization review, and LOS guidance. He can be reached at 555-xxx-xxxx, or through the Case Management Office, 555-xxx-xxxx.

Finally, please free to contact me directly to discuss this further or should you have any questions.