Value-Based Benefit Design: Using a Predictive Modeling Approach to Improve Compliance

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ABSTRACT

BACKGROUND: Increased medication compliance rates have been demonstrated to result in improved clinical outcomes and reduced overall medical expenditures. As such, managed care stakeholders should take the total value approach to benefit design and consider total medical costs beyond the cost of pharmacotherapy alone.

OBJECTIVES: To describe the value-based benefit design employed by Pitney Bowes (specifically, the predictive modeling approach), to improve medication compliance, and to report the results of this intervention.

SUMMARY: Despite significant skepticism surrounding value-based benefit design, there is growing evidence that these plans can be used in conjunction with careful pharmacy management. In fact, value-based design provides a different lever on pharmacy management and allows for the appropriate drug to be channeled to the appropriate person. Studies demonstrating the adverse impact of high coinsurance levels further augment the argument for value-based benefit design. Value-based benefit design was employed at Pitney Bowes, a $6.1-billion global provider of integrated mailstream solutions, with noticeable success. Patients were either placed in a disease management program or in a secondary program promoting preventive care. The company selectively cut copays to achieve that end, and this total value approach translated into significant savings.

CONCLUSION: To develop a successful value-based benefit design, stakeholders cannot simply cut costs or cut copays. Action must be taken as part of a concerted program, coupled with disease management or similar interventions. “Value based” means that positive outcomes are the ultimate goal, and barriers to those positive outcomes must be addressed.

C hronic disease places a significant financial burden on managed care and the economy in general. The annual costs of chronic conditions, such as diabetes and cardiovascular disease, are estimated to be $174 billion and $403 billion, respectively, in the United States alone. As these chronic disease costs continue to rise, managed care stakeholders are continually looking for areas in which the quality of care can be improved and expenditures controlled. One such area is medication compliance, where increased compliance rates have demonstrated improved clinical outcomes and reduced overall medical expenditures.

Considering the already high cost of pharmacotherapy, it may seem counterintuitive that increased regular medication use would ultimately result in reduced medical costs. To reconcile this seeming contradiction, stakeholders must consider total medical costs beyond the cost of pharmacotherapy alone—the total value approach. While drug costs inevitably rise with increased medication compliance, the improved clinical outcomes that result from appropriate and adequate use of prescribed pharmacotherapy create cost savings that more than compensate. These savings may be potentially realized in any number of ways including fewer clinically significant events, fewer emergency department visits, fewer hospitalizations, fewer physician’s office visits, and generally reduced morbidity and mortality. As such, payers, providers, and even employers are regularly seeking ways in which to increase rates of medication compliance. One employer who is taking a proactive approach to improving medication compliance is Pitney Bowes.

Founded in 1920, Pitney Bowes is a $6.1-billion global provider of integrated mailstream solutions. The company comprises a global team of 35,000 employees, with 24,000 employees in the United States and > 2 million customers worldwide. Pitney Bowes is known for solid, predictable earnings and growth that is driven through innovation and dependable service delivery. As a result, company costs, including health care costs, must be predictable at all times.

To monitor health care expenditures, Pitney Bowes measures not only the employer contribution but the annual total cost of care for company employees on a “per employee” basis. By comparing their company-specific data for this measure with a benchmark of 18 similar companies via the Hewitt Health Value Index, Pitney Bowes stakeholders are able to establish where the company stands in terms of health care spending and review these results in terms of predictability. From 1994 to 2000, Pitney Bowes’ health care costs were comparable with the benchmarks but experienced questionable yield in managing total cost, with high overhead, despite introducing a managed care/
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A New Approach Using Predictive Modeling

To better understand the employee population and make meaningful changes in benefit design, it helps to first look at the segmentation of users of services based on the enrollee annual cost distribution. In doing so, Pitney Bowes stakeholders were able to break down the population into 4 distinct segments: non-users, those using < $1,000/year, those using $1,000-$10,000/year, and those using > $10,000/year (Figure 2). The following data from the Pitney Bowes employee population are fairly representative of most large organizations that have a self-funded plan; however, the data may not generalize to other organizations.

Non-users—those who never use the health plan at all (i.e., never get screened, never visit a primary care physician)—constitute 10% of the total population and obviously account for none of the total annual spending. Those using < $1,000/year constitute approximately 50% of the total population and account for 10% of total annual expenditures. This largest segment of the enrollee population is most likely taking advantage of preventive services, using primary care, and filling the occasional prescription. Users at $1,000-$10,000/year make up 35% of the total population and account for 15% of total annual spending. It can be assumed that these enrollees may have experienced an accident or a condition that required extensive outpatient care or hospitalization; however, when coupled with the largest segment using < $1,000/year, these enrollees still only account for 25% of total health care spending. Adding in the nonusers accounts for 95% of the population and 25% of the total annual expenditures. The smallest segment (5%) of the employee population—those using > $10,000/year—accounts for 75% of total health care spending.

Unfortunately, most health care approaches are built around chasing this latter group of enrollees: the high-cost patient. While targeting a small number of enrollees and leveraging efforts to control large expenditures may be a reasonable concept yielding solid short-term savings, the remaining largest segment of the group tends to be ignored in the process. To truly provide quality, cost-effective health care, stakeholders must find a way to manage the entire enrollee population. Classic plan design dictates attempting to minimize the utilization of services by implementing copays, deductibles, and changing copay and coinsurance levels. While these actions may serve to control costs, they are short-term solutions that fail to address the root of the problem. An alternate approach suggests that stakeholders must determine the factors that cause enrollees to jump from the largest segment of the population with moderate costs (the 50% using < $1,000/year) to the smallest segment of the population constituting the largest percentage of total health care spending (the 5% using > $10,000/year). At Pitney Bowes, predictive modeling was employed to make this determination by using the claims data warehouse.

Managed Care/Competition model introduced in 1995 with price tags indexed to HEDIS scores.
Curve-out Tiered Co-Pay Pharmacy Plan offered on optional basis.
Questionable yield in managing total cost with high overhead.
HEDIS=Healthcare Effectiveness Data and Information Set; PB=Pitney Bowes.

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competition model in 1995 with price tags indexed to Healthcare Effectiveness Data and Information Set (HEDIS) scores (Figure 1). Also offered as part of the Pitney Bowes employee benefits package was a carved-out, 3-tier pharmacy plan based on coinsurance and carved-out behavioral health services. Still, for the measure of total employee cost of care, the company was not able to exceed the benchmark at any particular point. Executives at Pitney Bowes looked toward benefit design to manage these costs.
Analysis of claims data at Pitney Bowes determined that enrollees do not simply move randomly from segment to segment. Instead, predictive modeling demonstrated that there were several factors in particular that served as indicators that an enrollee would move from a relatively low-cost segment to a relatively high-cost segment in the space of 1 year: chronic disease—specifically, asthma, diabetes, and hypertension—coupled with poor medication compliance. In the model, the predictive value for this set of factors was relatively high, indicating a strong correlation between poor medication compliance in chronic disease patients and migration to a high-cost tier of health care services use. Key predictors for migration to a high-cost tier included > 1 fill of albuterol in a 30-day period in patients with asthma, < 9 thirty-day fills in a 12-month period in patients with diabetes, and < 9 thirty-day fills in a 12-month period in patients with hypertension.

Using this information, stakeholders at Pitney Bowes came to the logical conclusion that chronic disease is a cost driver, but that costs can be managed by increasing enrollees’ compliance with recommended treatments for their chronic conditions. However, the harsh reality is that this push for medication compliance does not happen often. Doctors may not actively encourage patients to take their medications, and there is often little follow-up on poor prescription refill rates. To overcome this lack of an unsolicited push for medication compliance, Pitney Bowes put a disease management program in place. This program was initially carved out, but as time went on, the company began to carve it into the health plans as the plans became more sophisticated in operating the programs.

While the design and implementation of a disease management program to improve medication compliance represented a step in the right direction for Pitney Bowes in managing their enrollee population, a simple matter of economics still remained: the elasticity of demand. Basically, this concept states that as the price of a product or service increases, people tend to purchase it less frequently; unfortunately, this holds true for medication as well as any other purchasable item. To overcome this obstacle, the stakeholders at Pitney Bowes turned to benefit design. This was accomplished by moving the price of medication so that enrollees had an easier, more affordable opportunity—or at least fewer financial barriers—to manage their condition. This standpoint is essentially the crux of value-based benefit design.

### Value-Based Benefit Design

Although evidence in favor of value-based benefit design was scarce to virtually nonexistent around the year 2000, some interesting survey material was published by 2001 demonstrating the implications of medication cost to the patient in affecting compliance. For example, a Harris survey from 2001 demonstrated that medication compliance was very income dependent. In this survey, as people made less money, there was a higher probability that they would not take their medication or would try to stretch it by either taking a smaller dose or taking it less frequently (Figure 3). In another Harris survey from 2005, 35% of respondents cited “saving money” as a reason for not taking prescribed medication, making it the third most popular response.

A 2007 meta-analysis of 132 peer-reviewed publications by Goldman et al. further bolsters the argument for value-based benefit design. In this analysis of the impact of financial burden on medication compliance, researchers reported that increased cost-sharing was associated with lower rates of drug treatment, worse adherence among existing users, and more frequent discontinuation of therapy. Ultimately, Goldman et al. found that a 10% increase in cost-sharing was associated with a 2%-6% decrease in prescription drug spending. This outcome was most likely to occur in patients with chronic conditions.

From the patient perspective, the advantages of value-based benefit design and improved compliance can be seen in a study by Sokol et al. from 2005. Researchers looked at a population of patients with diabetes and their corresponding drug costs and total costs in 1 year by compliance rates. Patients demonstrating 1%-19% medication compliance experienced low drug costs ($55 annually) but a higher total cost (approximately $8,700 annually) than any other compliance group. Conversely, while drug costs were highest in patients with 80%-100% compliance ($763 annually), total costs were lowest (approximately $4,500 annually). This study demonstrates that improved compliance results in higher drug costs but ultimately lower overall costs to the individual.
Because the evidence supporting value-based benefit design has been apparent in “real-world” settings, such as the Pitney Bowes population, the primary question that remains concerns the implementation of such a plan. Initially, a list of conditions to target should be formulated based on the prevalence of targeted conditions in the enrolled population. For Pitney Bowes, approximately 25% of the employee population lives in the Northeast—namely, in the New York tri-state region, where one of the highest rates of asthma in the country exists. This elevated prevalence of asthma in the Pitney Bowes population creates an opportunity for improvement. This holds true in the Pitney Bowes population even when there is high turnover, and positive return on investment in an expensive disease management program would be more likely for employers with high retention rates. For conditions such as asthma, returns in terms of increased quality of care for the individual may be evident within 1 year. While the prevalence of other conditions, such as diabetes, in the Pitney Bowes population remains on par with national averages, opportunities for improvement in medication compliance still exist.

After establishing the worth of a value-based pharmacy plan in terms of disease prevalence, stakeholders must establish a baseline for adherence rates to track improvement among enrollees. At Pitney Bowes, the pharmacy benefits manager Caremark tracks adherence rates and reports them back to the company. In reviewing baseline medication adherence for some prevalent chronic conditions among the Pitney Bowes enrollee population, asthma demonstrated the lowest adherence score with 33 compared with 75, 76, and 76 for diabetes, hypertension, and hyperlipidemia, respectively. The rates quoted are indicative of the experience in the more stable population component. Reliable adherence rates were not able to be generated in work groups with high turnover. A common target adherence score for disease management programs is 80. As such, the focus of Pitney Bowes value-based benefit design interventions fell primarily in the realm of asthma and diabetes with only marginal involvement in hypertension and hyperlipidemia, where compliance rates have been traditionally higher.

Once baseline adherence rates have been established, a value-based pharmacy design can be set into motion, preferably without upsetting an organization’s underlying pharmacy design. At Pitney Bowes, the original pharmacy plan design consisted of the 3-tier coinsurance. In addition, the original plan was a more consumer-based design, with coinsurance levels at 10%, 30%, and 50% (Figure 4) and no minimum or maximum coinsurance levels at any tier. Furthermore, there was an out-of-pocket maximum for pharmacy. Enrollees could actually pay an extra premium to “purchase” a lower coinsurance rate. At the inception of the value-based pharmacy plan design, the company removed all of the standard pharmacy management tools including generic substitution, therapeutic substitution, step therapy, mandatory mail order, and most prior authorizations with the exception of a few related to safety issues. Company stakeholders chose to continue charging for all medications as opposed to offering free prescription drugs and to maintain a degree of price separation between brand and generic. The coinsurance feature facilitates beneficiary awareness of the price difference between brand and generic drugs because the underlying acquisition cost for the pharmacy determines the allowed cost on which the coinsurance base is.

In implementing the value-based pharmacy plan at Pitney Bowes, one key concept that was relayed from the researchers to plan stakeholders was that $20 appears to be the threshold for people acquiring or not acquiring a prescription. Specifically, if the cost is > $20, they’ll think twice and maybe even 3 times about buying the medication. As such, one of the goals of the new plan design, even after reducing all prices, was to keep prices at < $20 for a 30-day supply of medication.

In the new design, all medications for the target conditions (i.e., asthma, diabetes, hypertension) were moved down to tier 1 instead of favoring one medication over another (Figure 5). Stakeholders at Pitney Bowes felt that the discussion of which medication is right for a particular patient should be reserved for the patient, doctor, and pharmacist and not the employer.

Another key element was that individuals did not need to “qualify” for the discount by participating in a disease management...
program or through achieving biometric “targets,” such as glycated hemoglobin (A1c) levels <7%. Thus, medication was continuously available to the individual at the lower price, not only at the first fill.

■ Results

Immediate results were experienced by consumers as a result of the new value-based pharmacy plan design at Pitney Bowes. For enrollees who were on any branded medication for a targeted condition, the cost of a 30-day fill decreased by 30%-80%, and the company was able to keep copays below the $20 level. As a result of this reduced financial burden for prescription medications, changes in behavior soon followed. Medication compliance improved, and there was a marked migration to combination therapy as a result of the movement of combination drugs from tier 3 to tier 1, thereby improving their affordability. This migration was particularly noticeable with parents who had a child with asthma and were now able to afford long-acting controller medications as opposed to multiple medications or albuterol alone. In fact, the use of albuterol monotherapy among enrollees with asthma declined from 51% to 33% between 2001 and 2006, and the use of long-acting controllers increased from 49% to 66%. This was coupled with an observed 22% decline in emergency room use and a 62% decline in avoidable hospital admissions over the same time periods.

Looking at enrollees’ annual cost of care over a 3-year period, those with asthma experienced a 15% decline in total costs and a 19% decline in pharmacy costs from baseline levels. Likewise, enrollees with diabetes experienced a 6% decline in total costs and a 7% decline in pharmacy costs. While these decreases in cost to the patient were coupled with increases in pharmacy costs for Pitney Bowes, the company was now paying far less for medications to treat the complications of noncompliance. Ultimately, the costs offset each other and actually produced some savings for Pitney Bowes. In terms of indirect costs, the active number of short-term disability cases and associated costs among diabetes patients declined between 2002 and 2004, despite a slight increase in the prevalence of diabetes in Pitney Bowes employees.

During the 5 years between 2001 and 2006, the asthma compliance score in the study population rose from 33 to 62, the diabetes compliance score rose from 75 to 81, the hypertension compliance score rose from 76 to 82, and the hyperlipidemia score rose from 76 to 83. The greatest improvement observed in the fledgling stages of the compliance-improving interventions was an ability to move enrollees out of suboptimal adherence and into adherence that approximated a reasonable rate.

The disease management program at Pitney Bowes is still credited with contributing most significantly to these improvements by utilizing an incredibly active communications campaign around compliance. Obviously, the pricing changes also contributed to these improvements, particularly for asthma, diabetes, and hypertension. Statins and statin fixed-dose combinations were moved from tier 3 to tier 1 in the early stages of the pharmacy plan redesign; this may have likewise had an effect on improvements in compliance for hyperlipidemia, although not as profound an effect as for the other 3 conditions. Similar interventions by other employers have demonstrated the advantage of adding a value-based benefit design to disease management interventions. In a recently published study, Chernew et al. reported the effects of Marriott International’s value-based benefit design initiative for improving compliance to recommended treatment regimens. The value-based benefit design initiative reduced copayments for 5 chronic medication classes in conjunction with a disease management program. Compared with a control employer that used the same disease management program, medication compliance increased among enrollees in Marriott’s value-based initiative for 4 of 5 medication classes as noncompliance was reduced by 7%-14%.

While these improvements in medication compliance represent a positive trend, the matter of enrollees taking the right medications still remained. Evidence dictates that patients with diabetes who are postcardiac event should be maintained on statin
therapy; however, in the Pitney Bowes population, approximately only 60% of postcardiac event diabetes patients were receiving statin therapy. Furthermore, approximately only 50% of enrollees who had experienced a heart attack, bypass surgery, or stenting were on a statin. As a result, beginning in 2007, Pitney Bowes made statins and statin fixed-dose combinations available free of charge to enrollees with the 2 aforementioned conditions. At year’s end, the percentage of diabetics on a statin rose 10% with increases in adherence scores. Results for the high-risk cardiac group were not available at the time this paper was written.

Contrary to the supposition that a value-based design will cause a shift from generic to branded products, this has not been the case in Pitney Bowes enrollee population. For example, in the case of diabetes medications, there was not a rush to buy branded products after implementation of the value-based design, even with prices dropping by 30%-80%. Even as late as 2006 at 5 years after the implementation of the value-based design, there was still a reasonable distribution between generic and branded products among Pitney Bowes enrollees.

In terms of key pharmacy metrics, generic utilization improved from 38.3% to 54% between 2001 and 2006 for the Pitney Bowes active population. Prescriptions per member per year (PMPY) likewise rose during the same time period from 8.1 to 10.6, and net PMPY cost rose from $320 to $632. The compound annual growth rate for generic utilization increased by 7%, prescriptions per member increased by 5.3%, and PMPY increased by 14.6% between 2001 and 2006. Furthermore, compliance interventions at Pitney Bowes have contributed to the company being able to consistently track below benchmark in terms of total employee health care cost since 2001 at the inception of the value-based pharmacy plan design (Figure 6). The rate is currently 15%-20% below benchmark levels. The annual growth rate of this figure remains at approximately 6%. Putting these results in perspective, for 2007, the gap between Pitney Bowes per-employee cost and the benchmark, if extrapolated out over the corporation, is worth about $40 million in avoided costs. Of that, approximately one third is due to the company’s purchasing and plan design, and two thirds are due to the company’s preventive measures and chronic disease management program.

**Conclusions**

Despite significant skepticism surrounding value-based benefit design, there is growing evidence that these plans can be used in conjunction with careful pharmacy management. In fact, value-based design provides a different lever on pharmacy management and allows for the appropriate drug to be channeled to the appropriate person. Data demonstrating the adverse impact of high coinsurance levels further augment the argument for value-based benefit design.

To develop a successful value-based benefit design, stakeholders cannot simply cut costs or cut copayments. Action must be taken as part of a concerted program, coupled with disease management or similar interventions. “Value based” means that positive outcomes are the ultimate goal, and barriers to those positive outcomes must be addressed. At Pitney Bowes, the ultimate endpoint was either placing the patient into the disease management program or, in a secondary program, promoting preventive care. The company selectively cut copays to achieve that end, and this total value approach translated into significant savings.

**DISCLOSURE**

Author John J. Mahoney discloses that there was no financial relationship or financial interest relating to the topic of this activity. Mahoney was responsible for the entire study concept and design of this article. He performed all of the data collection, data interpretation, writing, and revision of this article.

**REFERENCES**