Rear Window: Actuaries and Pharmacists—
Toward a New Competency

by Carol J. McCall

As almost everyone is aware, pharmacy costs in recent years have risen faster than any other component of health care costs, with rates in the mid-to-high teens. Given the estimates of utilization and new pharmaceutical product development, the trend is unlikely to slow in the near future. In fact, as the impacts of biotechnology and genomics research begin to unfold, pharmaceuticals are likely to make up more and more of the health care dollar. Accurately predicting the uptake and cost of new products could emerge as one of the most important issues health plans face.

Pharmacists and actuaries have an opportunity to work together to help estimate the effects of these new therapies. The goal of this article is to lay a foundation for pharmacists to understand the general issues actuaries face in pricing health insurance and to describe the increasing role pharmacists can have in that work.

What Is an Actuary?

Webster’s dictionary defines an actuary as a person who “computes premium rates, dividends, etc., according to probabilities based on statistical records.” I like this explanation of what the actuary does: “If an insurance company were a car, the president has her hands on the wheel, the chief marketing officer has his foot on the gas, the chief financial officer has his foot on the brake, and the actuary is looking out the back window giving directions.” But perhaps most appropriate is the Society of Actuaries’ creed, which is that the work of actuaries is to “substitute facts for appearances and demonstrations for impressions.”

Actuaries put a price tag on future risks. They have been called financial architects and social mathematicians because their analytical and business skills help solve a variety of financial and social problems. Specifically, actuaries improve financial decision making by creating models to evaluate the current financial implications of uncertain future events.

Some examples: A life-insurance company sells a policy to a new customer. How much premium should the company charge to offset the risk of insuring that customer? An auto insurance company is thinking about giving a discount to customers with anti-lock brakes. How big should the discount be to reflect the different risks of cars that have anti-lock brakes and those that do not? The Environmental Protection Agency is considering a new regulation that will reduce harmful refinery emissions but will cost jobs. Is it worth the cost to reduce the risks to the health of people in the community? These are ques-

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KEYWORDS: Actuaries, insurance, pricing, modeling, pharmacy trends

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tions actuaries must answer every day. They must therefore be educated in a variety of subjects. An experienced actuary is not only an expert in applied mathematics and statistics but also has a deep understanding of finance, economics, business law, and accounting.

If you have never met an actuary, that's not unusual. The actuarial profession numbers about 19,000 people in North America. But don't let that small number fool you. Actuaries put their special problem-solving skills to work in many different business situations, and their work has influenced people's lives for more than a century. Common areas of actuarial practice are pensions, life insurance and annuities, health, property and casualty insurance, and benefits consulting. While this article concentrates on health insurance, actuaries influence a wide range of businesses and decisions.

Pricing Health Insurance

Actuaries get involved in a variety of different areas within health plans, among them product development, legislative activities, medical management, claims payment practices, sales initiatives, and provider contracting. The reason is that all these areas can affect the underlying cost of insurance. The actuary's primary goal is to understand and incorporate the impacts of these things into the price of the product. Failure to do so properly can have serious consequences on the financial health of a company.

Insurance, rather than being a traditional type of product, is actually a promise in this case to pay for medical expenses incurred over a specified period. This means that the actual cost of the product can not be known until the period is over because the number of claims is not known at the outset. In other businesses, the costs of a product are known before the product is ever sold.

This uncertainty is not terribly onerous as long as the total costs for a population during the period are easy to predict. Because probability and statistical theory lend themselves well to estimating the total costs for large numbers of people when the probabilities are stable, actuaries can calculate premiums based on probable overall costs.

Complicating this situation for health insurance, however, is the fact that both the number and frequency of medical claims are moving targets at all times. Charges for medical procedures change regularly, as do the types of services that are available and the frequency with which they are performed. In fact, treatments may emerge that were not even contemplated when the original prices were set.

Because health expenditures are so dynamic, prices for health insurance are constantly updated. They are typically set monthly and guaranteed for a 12-month period. Thus, if you are an employer group buying insurance in April, the price (the rate) for your group remains the same until April of the following year. If you were buying in May rather than April, your rate might be higher, but it would also be good for 12 months.

Predicting Claims

The methods that actuaries use to determine prices can get fairly complicated but they all boil down to one thing: The price is equal to the expected claims, adjusted for expenses.

\[
\text{Price} = \frac{\text{Expected claims}}{1 - \text{Expense load}}
\]

We will ignore the expense component. They are important in setting price, but all of the difficulty lies in expected claims. To calculate Expected claims, you need three things: Experience period claims, claims adjustments factors, and trend.

\[
\text{Expected Claims} = (\text{Experience Period Claims}) \times (\text{Claims Cost Adjustments Factors}) \times (\text{Trend})
\]

Experience Period Claims

This is the actuary looking out the rearview mirror: Experience period claims are historical claims for some defined population over a period of time. It is important that the experience represent or be able to form a solid basis, after adjustments for the costs of the population for which you are setting the rate. The experience could be for a single employer group or an entire block of business. If you are pricing for large employer groups with credible experience, you can use their own experience for setting rates.

More likely, though, you are setting rates for an entire block of business (i.e., a collection of groups or insureds with similar products or other characteristics, such as group size, underwriting method, or geography). While specific groups within the block may have purchased coverage at different times and be paying different premiums, many of the factors used to calculate the rates are the same for the entire block of business. For pharmacy, a block of business could be Medicare+Choice, for example. It would be difficult to use the experience from a commercial block of business to model pharmacy claims for Medicare, since the underlying populations and cost drivers are so different.

Claims Cost Adjustment

Once the experience period is selected, the adjustment factors are used to adjust the historical claims up or down for any changes that will affect your costs. They are adjustments for changes that have already occurred, or that you know will occur but are not entirely reflected in the experience period. Their purpose is to restate the historical claims as though the impact of any changes were in place during the entire experience period just as they will be during the rating period.

Some of the things for which adjustments to historical expe-
Experience might need to be made may be tied to the demographics of specific groups, while others apply to the broader population. When they are group or insured-specific, the rates for the group or person may be adjusted based on their demographics. If they cannot be applied differentially during rating, it is important not only that the factors be accurate but that you estimate correctly the mix of these individuals or groups within the entire block of business. For example, if you have factors that reflect differences in cost by age but do not (or cannot, perhaps by law) set different rates for people based on age, you would need to estimate the average age mix you will have. Even if your factors are correct, if you miscalculate the mix, the final rates would be wrong.

Regardless of the type of adjustment, the goal is to estimate how changes in the following areas will affect claims costs. For each area, there is often an impact to both cost and utilization for different types of health care expenses. Actuaries need to estimate both.

- **Covered Services**: What if, for example, the definition of covered services changed so that you began to cover OTCs (over the counter medicines)? What if a new drug like Viagra was coming onto the market and your contract did not have specific language dealing with this type of medication? If you cover it, how will it affect costs?

- **Benefit Levels and Cost Sharing**: These are the copay, deductible, and other cost-sharing provisions. Benefit levels affect not only the net cost of a service but also utilization, as is clear from changes in drug copays. Small increases in copays can reduce costs by more than the change in the copay amount would indicate. Changes in office visit copays can also affect drug costs: If office visit copays go down, prescription utilization will increase.

- **Geographic Area**: Many costs differ by area, often due to differences in physician practice patterns. If your historical experience has the majority of business in one area but your sales organization has decided to target another area, what sort of adjustments should you make?

- **Age/Gender/Family Mix**: Costs can differ dramatically by age and gender. What if you discovered that recently you had a higher proportion of younger people than you have had historically? If one of the rating factors you apply to individuals is based on age, would you make any adjustments? Are there any “side effects” of this shift for which you do not have individual rating factors that could affect your future experience?

- **Group Size and Underwriting Method**: Within commercial business, smaller groups may have been underwritten and therefore represent a different risk (or estimated cost) than groups that have not. Underwriting (the process of risk selection and classification) can wear off: Groups that were initially classified as representing a certain level of risk can have their classification change as they regress toward the mean. In addition, any change in your underwriting methods can change the risk you attract or retain. Assuming you currently underwrite your business, what would you predict to happen to costs if the sales force tells you it will bring in twice as many groups next year as this year? Would your answer change if they told you that, in order to do so, you needed to change how you underwrite your groups?

- **Medical Management Programs**: There are a large number of programs designed to control the medical costs of insureds. They include case, disease, and pharmacy management programs that are targeting specific diseases, situations, or conditions. What would happen to costs if you implemented an asthma program within your block of business? How would you reflect this in your rates?

- **Provider Contracts**: Changes to contracts with hospitals, physicians, labs, pharmacies, etc. take place throughout the experience period and you need to adjust your experience to reflect the most recent deals. These adjustments must also reflect adding or removing providers. Such changes can influence your sales to or retention of certain types of risks, or change the geographic distribution of business. How would you adjust your experience to estimate what would happen if you lost the flagship hospital out of your network?

- **Legislative Changes**: Changes in the regulatory environment could be classified under another category (such as mandating coverage of certain drugs), but others are broader. What happens, for example, when the government institutes a program for Medicare that includes pharmacy coverage? If you are offering pharmacy coverage to your Medicare + Choice population, will you retain these members? If so, will they have the same cost levels as your members have had in the past? Perhaps your coverage is richer than the alternative choices and those who stay are only those who need the higher coverage. In that scenario, your average claims costs per retained-member would be higher than they had been.

There are other areas where you might need to make adjustments, but this gives you some idea of the scope and variety of things that can impact costs, and thus insurance pricing.

### Trend–The Last Frontier

Most of the adjustments you have just made to your experience, while very important, did not move the claims through time. Most of them adjusted the historical claims up or down based on new business dynamics; they did not take into account that, all other things being equal, the cost and utilization of health care tends to go up over time.

Trend is the last adjustment, the magic factor that moves these adjusted historical claims through time to the period for which rates are being set. It is meant to take into account your best predictions for what is going to happen in the future after you make all the previous adjustments. This is where time is not on your side; there is a large gap between when you are doing the work
needed to calculate the rates and when they will be used.

Through the Looking Glass
Imagine it is September 1, 2000, and you need to set rates for January 1, 2001. You cannot wait any longer; legislative requirements and your internal systems for calculating premiums require that rates be available within two weeks. The usual experience period used is often one year, which is large enough to be credible and avoids seasonality issues, so you decide to use July 1, 1999 through June 30, 2000, with a midpoint for the period of January 1, 2000.

Why the two-month gap between the end of the experience period and now? This is called the completion period. It takes time for all the claims to be submitted to the payer for reimbursement and processed as a claim. For pharmacy claims, most of which are adjudicated on-line, claims are paid very quickly. The information on claims data can be made available almost immediately. For medical claims, which are not adjudicated on-line, the process can take anywhere from 6 to 12 months.

Actuaries have ways to estimate the final claim liabilities for months where only a portion of all claims have been submitted. Collectively, amounts for “incurred but not reported” (IBNR) claims are called reserves. Actuaries use various methods to calculate reserves. A typical method uses historical data to calculate how long it takes for a month of claims to be completely paid. When these calculations indicate that 65%–75% or more of claims are likely to have been paid, actuaries will start using these “completion” estimates to increase the known, paid amounts in each month by the percent estimated to remain, thus calculating the final liability. For months with less than this percentage, usually the most recent two to three months, there is insufficient information to make credible completion estimates, so reserves are set using different methodologies. That is why the two most recent months are typically avoided for experience studies.

The rate you are setting is for January 1, 2001, but the estimate you make must be for all medical expenses for the 12-month period from January 1, 2001 through December 31, 2001, with a midpoint of July 1, 2001. In order to move your adjusted claims forward from its midpoint of January 1, 2000 to the midpoint of the rating period, the trend adjustment must be for 18 months. Because the time lags are long, estimating trend is critical. If you are off even by a little, the difference is compounded because the period over which trend must be estimated is so long.

Measuring Trend
Trend should represent the change in the underlying dynamics of cost and utilization for health care, not changes in cost per se. Looking at your financial statements or reports, you may see a trend of, say, 8% for pharmacy. This represents the change in costs, period over period, but not the underlying secular trend. The 8% change could be the result of some change in the past that may not be repeated (such as increasing copays or introducing three-tier benefits). To measure secular trend, you need to remove or normalize everything so you can see the underlying patterns absent any of those changes.

Here again we have actuaries looking out the rearview mirror. Trend is supposed to be an estimate of the direction and degree to which our future will differ from our past, yet the only data we have is our historical data. When looking at historical experience, you need to look at different types of trends (12 month, 3 month, 1 month) and use external estimates in addition to those based on company experience. It is important to know not only the degree of trend but where it is headed. Is it going up? Going down? Will it change direction? Are there new technologies on the horizon that are not yet taken into account? Are formularies being outlawed or severely restricted? When? What will the impact be?

Missing Trend
Estimating trend incorrectly can be painful. Suppose we think secular trend will be 7% between our experience period and the time for which we are setting our rates. Compounding 7% over 18 months gives us the amount by which we would increase our adjusted historical claims:

\[(1.070)^{(18/12)} = 1.107.\]

If trend were really 9%, the factor should have been \((1.090)^{(18/12)} = 1.138\), and our estimates—and rates—would be too low by almost 3% (the ratio of 1.138 and 1.107).

Pharmacy trends can be difficult to estimate. Characteristics like patient demand, consumer advertising, physician detailing, and technological development combine to make the dynamics of pharmacy costs different from other types of health care; pharmacy trends may be more volatile. If, for example, pharmacy costs are 15% of total costs, missing pharmacy trends by 5% (perhaps due to the unanticipated demand associated with a new breakthrough drug) can mean missing overall trend by 0.75%.

The situation is magnified by the fact that, whatever the reason for your initial trend estimate, it will take time for you to find out that your estimate was wrong. If you continue to use the same numbers until you see new information emerge in your experience and trend calculations, it can have a dramatic financial impact—enough that, if continued over time or if large enough, it can create serious financial consequences for a health plan.

All the King’s Horses
This is where pharmacists and actuaries need to work together. While vice president of pharmacy management for a large health plan, I became aware that a partnership of actuaries and pharmacists (and clinicians in general) can create a compelling value. Together, we created new knowledge and methods that
proved vital to managing and estimating drug costs, techniques that neither of us could have created without the other. In any health plan, I would recommend that pharmacists:

• Partner with actuaries to help estimate trends for pharmacy costs, recognizing that of the three elements discussed (experience periods, adjustment factors, and trend), estimating trend is the hardest.

• Keep actuaries informed about new drug launches. The time lags associated with setting rates make the situation even more critical, especially with the pace of new drug development.

• Jointly create models for emerging therapies and work together to estimate their impact. In doing so, work with them to:
  • Understand the models and the populations being used in the experience.
  • Document assumptions and sensitivity-test models so you know which assumptions are the most important.
  • Track these assumptions against emerging experience so you can make any necessary adjustments quickly.
  • Involve the actuaries in the design of medical and pharmacy management programs, so they know what business will be affected, when, and by how much.

The need for this type of partnership will continue to grow. Pharmacy trends show no signs of slowing; pharmaceuticals continue to make up more and more of the health care dollar. Given all the new drug research and likely resultant products, accurately predicting their timing, uptake, and cost will become critical to