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Estimating IBNR from Authorized Bed Days

by Kevin L. Pedlow

Estimating IBNR from authorized days provides greater accuracy than if estimated from membership, given the "right" business environment. This gives rise to lesser restatements and greater confidence in current month expense estimates. The success of estimating from days is tied to many factors including significant membership, comprehensive models, per diem contract structures, and an IBNR effective inpatient authorization processes. This article reviews these factors.

Statistically Significant Membership

Statistically estimating recent month reserves requires sufficient volume whether estimating from days or members. We develop inpatient reserves from six independent models with membership ranging from 75,000 to 110,000 commercial and 7,000 to 17,000 Medicare risk. These generate monthly acute days from 1,300 to 1,900 (commercial) and 800 to 2,300 (Medicare risk).

The volumes in our models are sufficient to statistically overcome the differences in cost per day of acute, sub-acute and other levels of care. Reviewing our historical inpatient costs, incurred acute days and membership, we find a higher correlation of costs to days, about 0.70, than to that of members, about 0.20. Correlation varies by model, and in no instance does the correlation to members exceed that of days. I believe that estimations can be further improved by use of days at varying levels, however, our lags do not currently separate medical expense by such levels, and the cost to change is not likely worth the benefit. A multivariate model may provide greater value.

Statistically completing open inpatient stays is possible with sufficient volume. We apply estimated continuance based on current duration. Alternatively, the utilization management department can provide estimates for each open stay (provided volume is low).

Data Effective Inpatient Authorization Process

Much of the success of our inpatient IBNR estimation is due to strong pre-certification requirements and concurrent review of every case, whether on-site or telephonic. Every inpatient stay is entered into the referral/authorization system either prior to admission or shortly after. Daily, the utilization management department approves or denies that hospital day and enters the verdict into the referral/authorization system. This process provides a system with data that is current and does not restate significantly.

There are occasions when authorized admissions do not make their way into the system until well after month end, causing some mis-estimation. Such occurrences are not highly prevalent, and the impact is not considerable, thanks again to volume.

More frequent are hospital discharges that aren't noted in the system until late. This causes stays to be considered open that are truly not, to which we would have added continuance, unnecessarily increasing the length of the stay. These mis-estimations are common, moderate and stable, and are recognized as inherent conservatism in our models.

Hospital Contract Structure

Our inpatient cost structures are primarily per diem, with some case rates and discounts from billed charges. Intuitively, this cost structure is conducive to IBNR estimates based on days. I suspect that other contractual structures would provide less correlation of medical expense and days.

Appropriate Models

Developing the best estimates for IBNR requires sound modeling. We estimate only inpatient costs based on days, recognizing lesser correlation of outpatient costs to days.

Applicable per diems are developed based on completed historical costs per day.

Consistent with the estimation method, costs include all inpatient care being estimated, and days are from the authorization system. Trends consistent with known changes to contracts and charge levels are applied to the historical rates. Choosing trend becomes another opportunity for conservatism.

These models will estimate the most recent months' incurred costs purely from the days and the more distant months' from the lags. "Transitional" month estimates will have a blend of the days and lag estimates through credibility. Transition and credibility choices are driven by many issues, including: claims processing stability, correlation of days to medical expense, and level of restatements of the days. Once transition/credibility is developed for the models, restatements should be monitored and adjustments to credibility can be made as patterns suggest.

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Table 1
Correlation of Inpatient Costs to Members and Bed Days
Comparison for Calendar Year 1999

Inpatient IBNR Model	Correlation of Costs to Membership	Correlation of Costs to Bed Days
CPA HMO	0.004	0.549
WPA/OH HMO	0.299	0.498
CPA PPO.POS	0.382	0.733
WPA/OH PPO/POS	-0.035	0.160
CPA M+C	-0.053	0.838
WPA M+C	0.410	0.922