HOW TO BUILD MORE REALISTIC HOSPITAL BUDGETS?

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ABSTRACT

Hospitals are experiencing increasing cost pressures from Medicare, Medicaid, and other third party payers in addition to competition from their local market. Past and current methods with static assumptions could not come up with realistic and variable budgets for a dynamic environment. As hospitals prepare their revenue and margin projections on these budgets, they feel the need for more realistic budget preparation tools in order to avoid unpleasant surprises. The use of a special tool based on the Crystal Ball add-in to Excel in developing Labor FTEs and dollars and non-Labor dollars results in a more realistic budget. It considers the uncertainty due to probabilistic nature of the projections. This can be applied to single or multiple departments in a single or multi-hospital system. The tool uses a three-step procedure employing Monte Carlo simulation performed by Crystal Ball. It can be used in other service and manufacturing industries also.

1 IMPORTANCE OF BUDGETS IN HOSPITALS

Hospitals plan their budgets not only based on the projected volume but also on the projected reimbursement for the services rendered. The hospitals' ability to pay for the operating and capital expenses depend on how well they forecast the volume and factors; therefore, translating the volume into staffing, supplies and other operating expenses. The staffing standards used will have a major impact on the budgets. The tendency of most departments is to be at the same level or above, but not below the budgets in a majority of the cases. The continuously eroding operating and contributing margins of the hospitals can be impacted significantly if the budgets are impractical to begin with.

2 COMPONENTS OF HOSPITAL BUDGETS

The hospital operating budget is usually a rollup of the individual entities/departments' budgets. Most hospital departments' operating budgets have the following components: labor, supplies, and other. Labor comprises of 60 to 70% of a department's operating budgets and supplies 15 to 25%. Labor is further divided into payroll and non-payroll which is also known as contract, registry, agency, or outsourcing. This covers managerial, professional, technical, and support staff. Supplies include both patient consumed e.g. medical/surgical and department consumed items such as office supplies. Maintenance contracts to cover the equipment, and travel for education are some examples of the other expenses component of the budget.

3 PAST AND PRESENT BUDGETING METHODS & THEIR INADEQUACIES

As labor is a significant and an important component of the total department operating budget, the rest of the discussion will be limited to labor budgets only.

At one time, future labor budgets were prepared as a percent of the past budgets rather than reviewing all the factors that impacted the budget. In years after that, the departmental budgets were prepared based on the percent change to the hospital projected volume. Subsequently, the departmental volume projections were developed based on their ratio to the hospital volumes and the percent change was applied to the labor budgets. In the past quarter century, more hospitals used labor standards to convert the projected departmental volume to the staffing in FTEs and then convert the FTEs to the labor dollar expense. Sophisticated approaches used % of skill mix assumptions to the FTE projections based on labor standards to identify the staffing budgets by professional, technical, and support categories. A small percent of hospitals developed contingency budgets for optimistic and pessimistic scenarios.

All these budgets used deterministic models with no consideration for the probabilistic nature of the projections; whether they are workload volumes, FTEs, skill mix or labor $ making it limited in its reliability. The 'cost plus' reimbursement

methods prior to mid 1970's did encourage such unrealistic budget preparation and management practices as the hospitals got paid not for sticking to budgets but based on the actual expenses incurred. Spiraling healthcare costs warranted changes from the cost plus reimbursement method to prospective payment and continually decreasing reimbursement there after.

4 NEW METHODS AND THEIR PROMISE

There are many variables involved in the departmental labor budget preparation including but not limited to:

- Workload volume
- Workload volume mix
- Non-linearity of the labor standards
- Staffing levels
- Staffing skill mix
- Staffing mix by full time & part time
- Staff scheduling practices & impact of labor laws
- Confounding effects of staffing skills on each other
- Seasonality of workload
- Availability of staffing
- Use of overtime
- Use of supplemental staff i.e. contract labor
- Fringe benefits i.e. vacation, sick, and holidays

Most of these variables involved follow a probabilistic distribution although some of them are determined by policy such as the amount of earned paid time off (PTO) covering the vacation, sick, and holidays. Even in the case of PTO, the actual usage is a probabilistic distribution depending on the needs and mix of staff in a given department.

Preparing the labor budgets with due consideration to the probabilistic nature will help improve the predictability and hence the reliability of the budgets. Accurate planning for the expenses will minimize surprises, especially the unpleasant type that could hurt the financial health of the hospital.

There are many tools that will consider the probabilistic nature of variables in building and running the models. This paper covers the application of Crystal Ball (CB) using the Monte Carlo simulation method to generate the probabilities of selected variables impacting the labor budgets. First, a limited number of variables are selected to demonstrate the model as a case study in developing labor budgets for the Emergency Department (ED) of a hospital. Additional variables can be incorporated easily by defining the probability distributions for those variables. Similarly, the model can be changed to include supplies and other components by adding those variables and distributions to the model. By changing the names of the variables in ED model, it can be applied to other hospital departments. For that matter, it can be applied to any other service industry or the manufacturing sector as needed by customizing the variables accordingly.

5 CASE STUDY – HOSPITAL EMERGENCY DEPARTMENT

The Emergency Department is important from a public image perspective and the interaction it has with many areas of the hospital. Although another department could be easily selected for the demonstration of the CB based budget application, ED is selected with the hope that several of the simulation enthusiasts might be familiar with the operation of the ED, although such familiarity is not a pre-requisite to understand and appreciate this application.

EDs are referred as Level I, II or III trauma centers based on their capabilities, equipment, resources,and expertise available to the patients arriving for treatment. This designation is usually given by the accrediting agency called Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

A patient coming to the hospital Emergency Department is categorized as an outpatient who could become an inpatient upon admission. The workload volume indicator is an ED visit. Every time a patient visits the ED, it is considered as an ED visit whether they come by themselves, brought by a family member, transported by an ambulance, or other mode such as helicopter. Such ED visit may be further classified as Emergent, Urgent, and Non-Urgent depending on the medical needs of the patient. They can also have other classifications based on the interaction with the patient i.e. brief visit, complex visit etc. and is used in addition to or in lieu of patient classification system. Patient classification is used either to assign staff and / or to charge the patient based on amount of staff time, tests, treatments and supplies used.

The arriving patient is either first registered or triaged depending on the medical necessity, and then put in an ED bed, nurse assesses the patient and documents the observations, the ED physician assesses the patient and orders the appropriate labs and/or medications. The diagnostic staff either comes to administer the test, e.g., EKG or X-Ray, procures a specimen e.g., Lab. or transports the patient for CT exam. Upon reviewing the results, the ED physician makes a decision, i.e., whether to discharge the patient, transfer to another hospital or admit the patient. The ED physician consults with other physicians if the patient is transferred or admitted.

The labor involved are: Reception, & Registration, Triage nurse, Registered and Licensed Practical Nurse, Unit Secretary, Security Guard, Patient & Materials Transporter, Physician Assistant, and ED physician. Depending on the organizational structure of the hospital and department, some or all of these skills could be part of the ED budget. Certain staff may be working full time while others work only part time. Some may work overtime while others do not. Supplemental staff may come from the hospital's internal float pool, contract help, or called from the on-call roster. Each one of these staff members has different wage and salary structure based on their skill and experience.

Unlike some other departments of the hospital that may be open five or six days during the week with day and evening shifts, ED is open 7x24 year round. The demand for the ED services can vary by hour of day, day of week, week of the month, and month of the year.

Budgeting steps include:

- Project ED visits either total or by type,
- Select labor standards in hours per visit or visit type
- Convert the workload volume into staffing in Worked FTEs
- Break them down by skill levels
- Allocate by position for adequate coverage and round up and add staff necessary
- Add the factor for PTO to come up with the Paid ftes
- Compare with the staff on the payroll to determine the use of contract help if there are no pending staff who are in the hiring pipeline
- Apply the wage & salary factors to convert the ftes to labor dollars
- Add the premium cost of overtime, on-call pay, and call-back pay differential
- Add other labor costs if they belong to the operating budget category.
- The sum total of FTEs is the FTE budget and the dollars are labor dollar budget.

Usually hospitals start the budget four to six months before the start of the next fiscal year.

In terms of the tools hospitals in general and ED in particular may use include either a spread sheet template or printed work sheets included as part of Budgeting Package distributed by the Finance department. The department managers may seek help as needed. Otherwise, the manager verifies the projected volumes, follows the steps, completes the budget and submits that to Finance and will be reviewed by the line administrator.

Every time there is a change involved, uncertainty is a given and is accompanied by risk and dilemma requiring help. Imitating reality in the form of a model whether it is physical, schematic, or mathematical is helpful so that the model can be manipulated rather than the reality to show the probability of certainty for making decisions This is the most appropriate type of help for each potential situation.

Crystal Ball, an add-on to Excel spreadsheet using Monte Carlo for rough order predictions is a tool that can do exactly that to provide help. CB can be applied to any situation where uncertainty and risk are involved. Steps involved in CB are very simple. 1) Define assumptions i.e. inputs and forecast, 2) Verify Run preferences and modify as needed 3) Run the simulation 4) Interpret the results e.g. sensitivity 5) Save the model & Results 6) Repeat for other departments.

Let us see how we can apply these steps to develop Labor FTE and $ budget for ED at a hospital with 15,000 visits per year. The staffing excludes ED physicians as they are under contract with St. Andrew Medical Center. Registration function is under ED and they use contract help from an agency due to severe nursing staff shortages in the local market.

Table 1: Procedure for setting up the ED model

Step	Description
1	Complete the demographic info. in the header i.e. Hospital, Dept., Model By and Date.
2	Enter hospital and dept. specific **data** for cells **D6 thru D23 and D25 thru D29**
3	Select Run from the menu **>Run >Reset**
4	Highlight cell D6, pull down **Cell** on the Menu and select **Define Assumption**
5	Select **Triangular Distribution** (2nd from top left) from the Distribution Gallery
6	Accept or Revise the **Min, Likeliest, Max** values on the Triangular Distribution dialog box, Enter
7	Pull down **Run** from Menu, select **Run Preferences** and Update the Max.No. of **Trials** to 1,000
8	Select **Run** from the menu and select **Run** to run the CB Simulation
9	Select **View** from the menu, select **Percentiles** and use it for decision making
10	Select **View** from the menu, select **Statistics** to study the info**.** and use it for decision making
11	Change the grabbers to display different widths for both staffing and labor $ in decision making
12	Copy and paste the prob. Charts and percentile tables onto ppt. for presentation

The procedure is described above (Table 1) and can be used to set up the ED model. The software requirements include: MS-Excel and Crystal Ball.

	A	B	C	D	E	F
1	**Department Budgeting Model for Staffing (FTEs & Labor$)**					
2	**Hospital:**		St. Andrew Medical Center		**Dept.**	Emergency
3	**Model By**:	Andy Ganti		**Date:**	11/16/2003	
4			**Variable**	**Inputs & outputs**		
5			Workload Volume			
6	**Assumption**		ED Visits/Day	43.33	Triangular 25, 60, 45	
7			Emergent %	8		
8			Urgent %	22		
9			Non-urgent%	70		
10			Other %	0		
11			Hrs of Oper.	7		
12			Hrs/E visit	6		
13			Hrs/U visit	3		
14			Hrs/N visit	1.5		
15			Staffing Skill Mix			
16			RN%	67		
17			LVN%	5		
18			US%	10		
19			Registrar %	15		
20			Other Factors			
21			Contract%	3		
22			Paid Time Off %	10		
23			Over time %	2		
24	**Forecast**		**FTEs Worked**	**18.27**	Formula	
25			RN $/Hr	25		
26			LVN $/Hr	15		
27			US $/Hr	10		
28			Registry. $/Hr	9		
29			contr.$/Hr	45		
30	**Forecast**		**Direct Labor$/Yr**	**887,300**	Formula	

Figure 1: ED staffing model

The ED staffing model as it appears on the Crystal Ball screen is shown above (Figure 1)

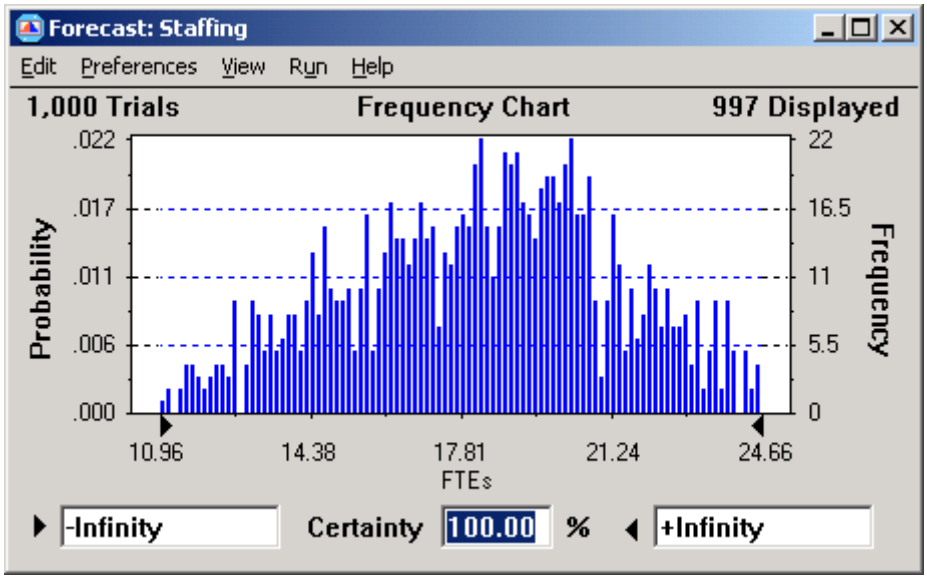

Figure 2: Staffing Forecast

Forecast-Staffing: Frequency Chart (Figure 2) shows the frequency distribution for all the data points corresponding to the randomly generated FTE numbers by the Monte Carlo Simulation. As the side ward triangles on the horizontal axis are moved in wards, the Certainty % changes to selected level by the decision makers.

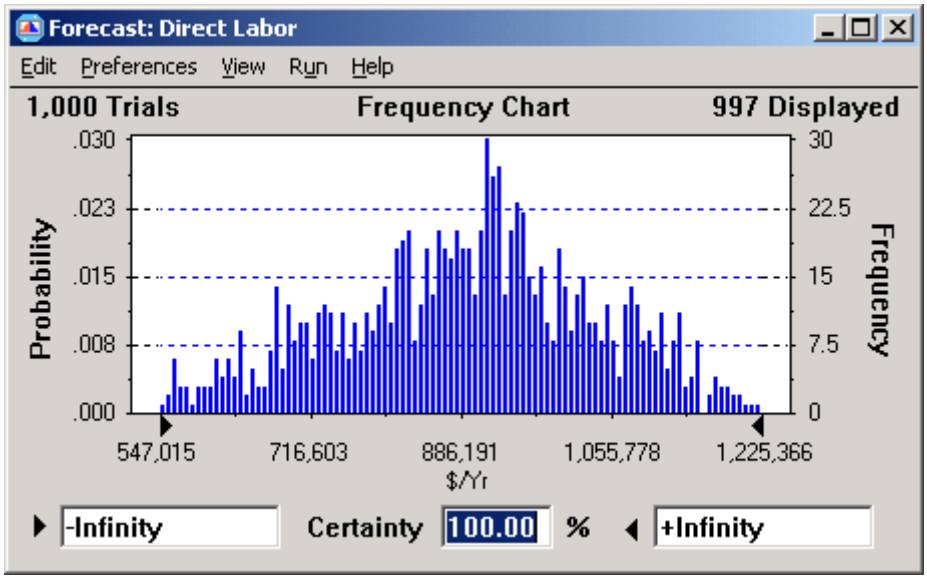

Figure 3: Forecast of forecast-direct labor

Forecast-Direct Labor: Frequency Chart (Figure 3) shows the frequency distribution for all the data points corresponding to the randomly generated labor $ numbers by the Monte Carlo Simulation. As the side ward triangles on the horizontal axis are moved in wards, the Certainty % changes to selected level by the decision makers. The Certainty percentages for FTEs and labor $ should match with each other.

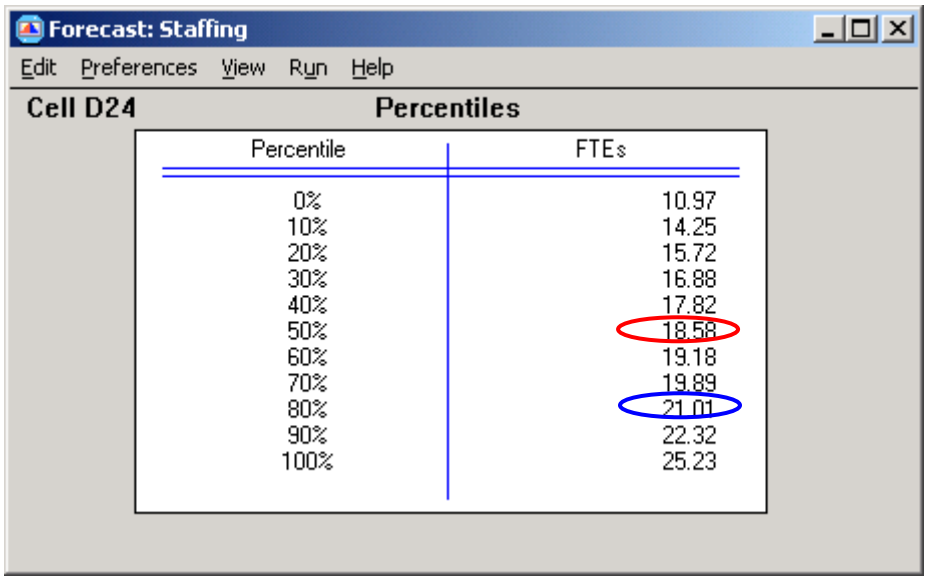

Figure 4: Forecast of staffing shown in percentile view

Forecast-Staffing: Percentiles (Figure 4) shows the FTEs corresponding to various percentile. As it can be seen**,** 50th percentile is what they might typically use in a static method which could have a negative impact when more staffing is needed but can not be provided or when provided will exceed the budgets. The probabilistic method shows all the FTEs corresponding to various percentiles so that the decision maker can select the appropriate risk level.

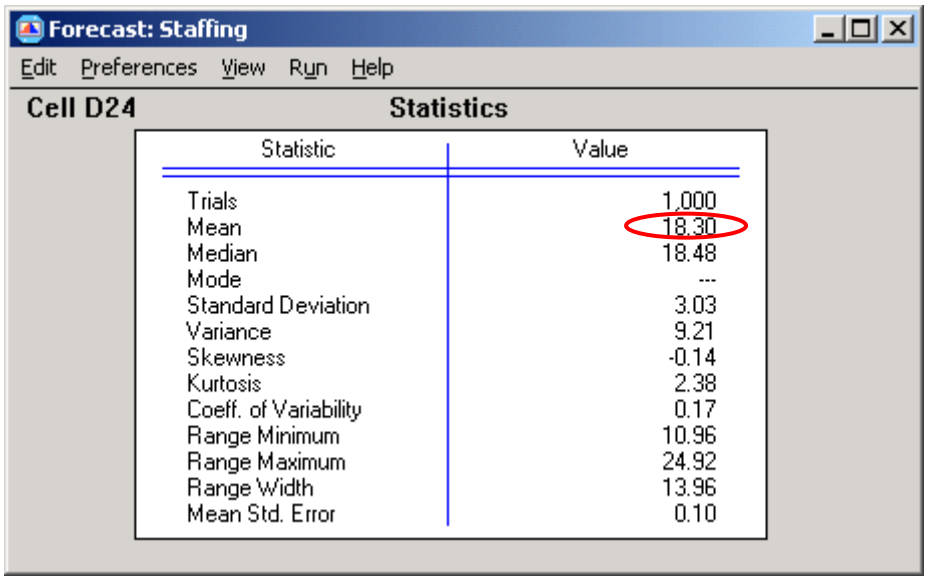

Figure 5: Forecast of staffing shown in statistics view

Forecast-Staffing: Statistics (Figure 5) shows the statistics associated with the frequency distribution generated by the simulation trials indicating the range of staffing fluctuation from approximately 11 FTEs to 25 FTEs.

6 ENHANCEMENTS TO THE MODEL

The model can be further enhanced using historical data for labor standards and staffing skill mix percentages either by fitting the values to the distribution or using Triangular distribution for skill mix percentages by skill type.

7 OBSTACLES AND ACTIONS FOR USING PROBABILISTIC BUDGETS

There are many obstacles that could potentially offer resistance to using the new budgeting tool.

- Healthcare is relatively slow to adapt new approaches especially simulation
- Lack of awareness of the tools
- Misconception that such tools are for aerospace
- Lack of understanding of its applications to healthcare
- Lack of appreciation of its value
- Lack of expertise

Certain actions, if taken, will help overcome these obstacles.

- Expose Decision Support i.e. Management Engineers, Industrial Engineers, or Operations Audit as they may be referred to depending on the hospital to the tools and benefits
- Start with simple departments with fewer variables to demonstrate the ease of use of the tool without compromising the validity of the model and hence the outputs
- Begin with quantitatively oriented managers such as Finance or Nursing before taking to the other areas

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BIOGRAPHIES

Mr. Andy Ganti is a Senior Consultant and a Lean six Sigma Master Black Belt with GE Healthcare. He has an MSIE degree and is a senior member of IIE and a life member of HIMSS. He published/ presented over 38 papers in leading professional journals/ conferences and developed hospital staffing and quality control methodologies. His e-mail address is andy.ganti@med.ge.com.

Dr. Anita G. Ganti is a physician and a Paul Harris Fellow Rotarian. During her externship, she developed clinical pathways and standard protocols using statistical tools while serving as a liaison with Center for Medicare and Medicaid)CMS). She believes in the Lean Six Sigma methodologies and accompanying tools and promotes them to her peers to enhance the quality of and access to medical care.