INTELLIGENCE THAT WORKS

Hybrid Productivity Measurement in Hospitals

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Abstract

The traditional productivity model used in hospitals relies on a worked hours per unit of service (WHPUOS) metric to determine target staffing levels appropriate for given levels of volume. In this model, the amount of total staff required is assumed to be proportional to department output volume.[1, 2] A common criticism of this model is that positions in many departments do not vary proportionately with volume (e.g., managers, educators, analysts). This paper explores an alternative model that accommodates fixed staff in productivity measurement. This alternative model predicts more accurately staffing need for a given level of department output.

1 Patterson, P., "Benchmarking labor productivity: How is your OR being compared?" *OR Manager 29*(3) (2013): 1–5, available at: https://www.ormanager.com/download.php?pid=6627

2 Kirby, K., "Hours per Patient Day: Not the Problem, Nor the Solution," *Nursing Economics 33*(1) (2015): 64–66, available at: https://www.nursingeconomics.net/necfiles/2015/JF15/64.pdf

Traditional Model of Productivity

A key objective of hospital finance leaders is to maintain a positive profit margin across their organizations. Doing so necessarily requires managing labor costs in relation to revenues. The primary financial metric used to measure this objective is labor cost as a percentage of operating revenue. At a departmental level, a proxy for this is the ratio of productive hours (worked hours) to department volume. This metric ("worked hours per unit of service" or WHPUOS) is monitored regularly to ensure labor resources are utilized in proportion to demand.

The traditional model of productivity measurement assumes a department is either entirely fixed (i.e., staff is invariant with volume changes) or entirely variable (i.e., all staff varies in proportion to volume changes). In variable departments, when actual volume is below the projected level used to build the productivity target, the traditional variable model tends to show overstaffing relative to actual. This is because most variable departments contain at least some fixed staff. Because the level of fixed staff remains constant, even if the variable staff is flexing to volume, the percent decrease in volume is greater than the overall percent decrease of the staff. Conversely, when volume is above the projected level, the traditional model tends to show understaffing relative to actual.

Consider the simple example of a radiology department with one fixed manager position (invariant with exam volume, and assumed to be one full-time equivalent below) and technical staff that flexes perfectly with exam volume.

Table 1. Example Traditional Productivity Model

		WORKED FTEs[3]			WHPUOS[4]	
Pay Period	**Volume**	**Manager**	**Rad. Techs**	**Total**	**Rad Tech**	**All Staff**
Projected	*1,600*	*1.0*	*10.0*	*11.0*	*0.500*	*0.550*
1	1,280	1.0	8.0	9.0	0.500	0.563
2	1,520	1.0	9.5	10.5	0.500	0.553
3	1,600	1.0	10.0	11.0	0.500	0.550
4	1,680	1.0	11.0	12.0	0.500	0.545

Note, first, that that the technical staff productivity in each of the four pay periods is exactly equal to its target (0.500 hours per exam). Due to the fixed manager position, when volume is below the projection used to set the productivity target, total WHPUOS is above the target of 0.550. The converse is true when volume is above the projection. The traditional model of productivity gives senior leadership an inaccurate picture of how the department is operating. While technical staff is being flexed perfectly with volume, the total WHPUOS shows varying levels of productivity.

Going one step further, the above example does not reflect the fact that the manager of the department would take paid time off (PTO) periodically, which would also impact the WHPUOS. If the productivity target were built with an assumed PTO factor, the department would appear overstaffed where the manager is *not* on PTO, all else equal. Moreover, some positions are "backfilled," which means that the position is filled with another staff member when PTO is taken. Whether or not the position is backfilled will impact the total FTE need significantly. A more robust model of productivity must accommodate variable, backfilled, and non-backfilled staff.

3 Full-time equivalent (FTE) represents the number of hours worked by a full-time employee in a given time period.

4 A standard pay period has eighty hours. The radiology tech WHPUOS is calculated as worked FTEs × 80 / volume.

Benefit of a Hybrid Model

Healthcare organizations have deployed several techniques to address the measurement issues inherent in the traditional model of productivity measurement. One approach employed by organizations that want to keep labor costs consolidated to a single department is to "exclude" the fixed labor from productivity measurements. In the radiology example above, the technical staff would be measured against 0.500 hours per exam. A shortcoming of this approach is that the hours of the fixed staff (in this case, the manager) are not monitored at all by the productivity system. Another technique commonly used is to create additional cost centers. In the radiology example above, an organization may create a "radiology administration" cost center for the manager. While this approach would address the productivity measurement issue illustrated, it would create additional work for the finance department to manage an ever-expanding general ledger when this concept is applied broadly.

A hybrid model of productivity measurement accounts for both variable and fixed staff such that organizations can optimize their general ledgers for financial reporting, while ensuring labor costs are appropriately managed. In pay period 1 of the example above, the traditional model would conclude that staffing was 2% above target, while the hybrid model would show more accurately that staffing was in line with the projection.

In addition to improved accuracy, the hybrid model provides additional insight into a department's productivity. Where traditional models would show that a department is over- or underproductive, a hybrid model provides productivity results by staff grouping. This insight can be invaluable to a manager looking to fine-tune a staffing model.

In the following section, we will examine an outpatient physical therapy department composed of fixed and variable staff members.

Hybrid Model

A hybrid model of productivity considers three types of staff: variable FTEs, fixed-worked FTEs, and fixed-paid FTEs. The differentiation between the two types of fixed FTEs is the propensity to backfill (i.e., replace with other staff) when leave occurs. Fixed-worked positions are backfilled, causing the worked FTE of this group to be constant over time. An example of a fixed-worked position would be a security guard or an environmental service technician. Alternatively, a fixed-paid FTE would not be backfilled. This position would have a constant paid FTE over time. Examples of this position would be executives, educators, and analysts.

The target worked FTEs for a department is described by equation (1):

$$T_{Total} = T_{Variable} + T_{Fixed\_Worked} + T_{Fixed\_Paid} \quad (1)$$

Each component target worked FTEs is described by equations (2), (3), and (4):

$$T_{Variable} = \frac{[Variable\ Hours\ per\ Unit\ of\ Service\ Target]*[Pay\ Period\ Volume]}{80} \quad (2)$$

$$T_{Fixed\_Worked} = [Fixed\_Worked\ wFTE\ Target] \quad (3)$$

$$T_{Fixed\_Paid} = [Fixed\_Paid\ pFTE\ Target] * \frac{[Actual\ Fixed\_Paid\ wFTEs]}{[Actual\ Fixed\_Paid\ pFTEs]} \quad (4)$$

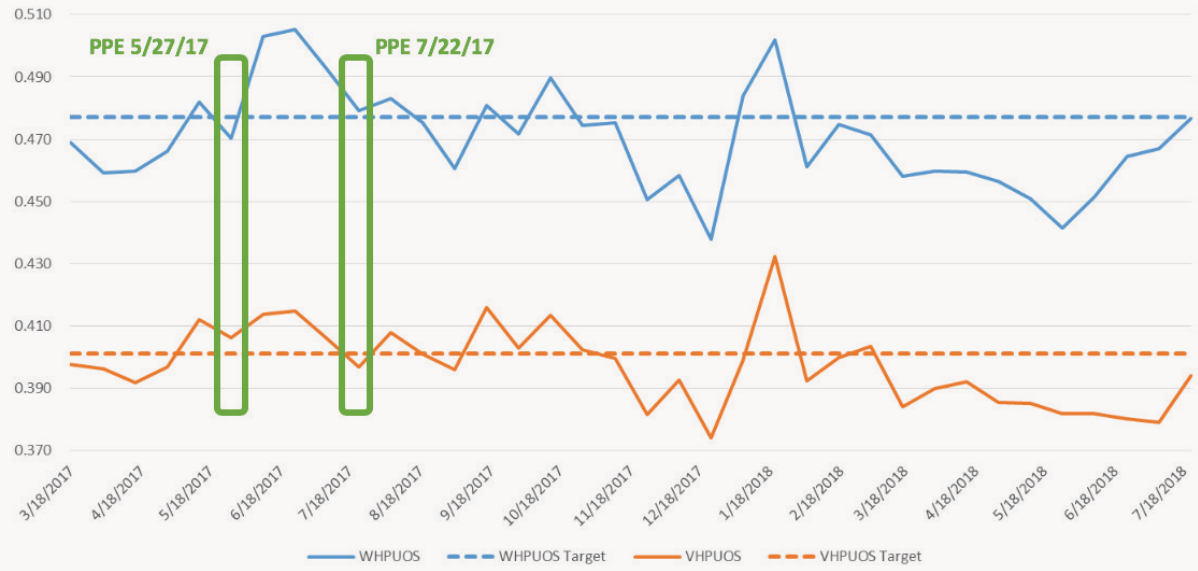
To start with a simple example, we review data from a hypothetical physical therapy department with rehab therapy techs (fixed-worked) and therapists (variable). We will expand this model to include a manager (fixed-paid) later in this section.

The hypothetical department is projected to have 4.5 rehab therapy tech FTEs, 24.1 therapist FTEs, and 4,800 units of volume (billed time units) per pay period. Therefore, the projected variable hours per unit of service is 0.401.[5] Using equations (1) through (4), the target worked FTEs for this department are described by equation (5):

$$T_{Total} = \frac{0.401 * [Pay\ Period\ Volume]}{80} + 4.5 + 0 \qquad (5)$$

We will now examine conflicting productivity measurement results observed between the traditional and the variable portion of the hybrid model. Figure 1 compares the total WHPUOS to the variable hours per unit of service (VHPUOS) in our example. While the level of WHPUOS is higher than the level of VHPUOS, the pattern is similar over time. This similarity results because a large portion of the department is composed of physical therapists, which is a variable position.. Figure 1 graphs the WHPUOS in blue and the VHPUOS in orange.

Figure 1. Comparison of WHPUOS and VHPUOS



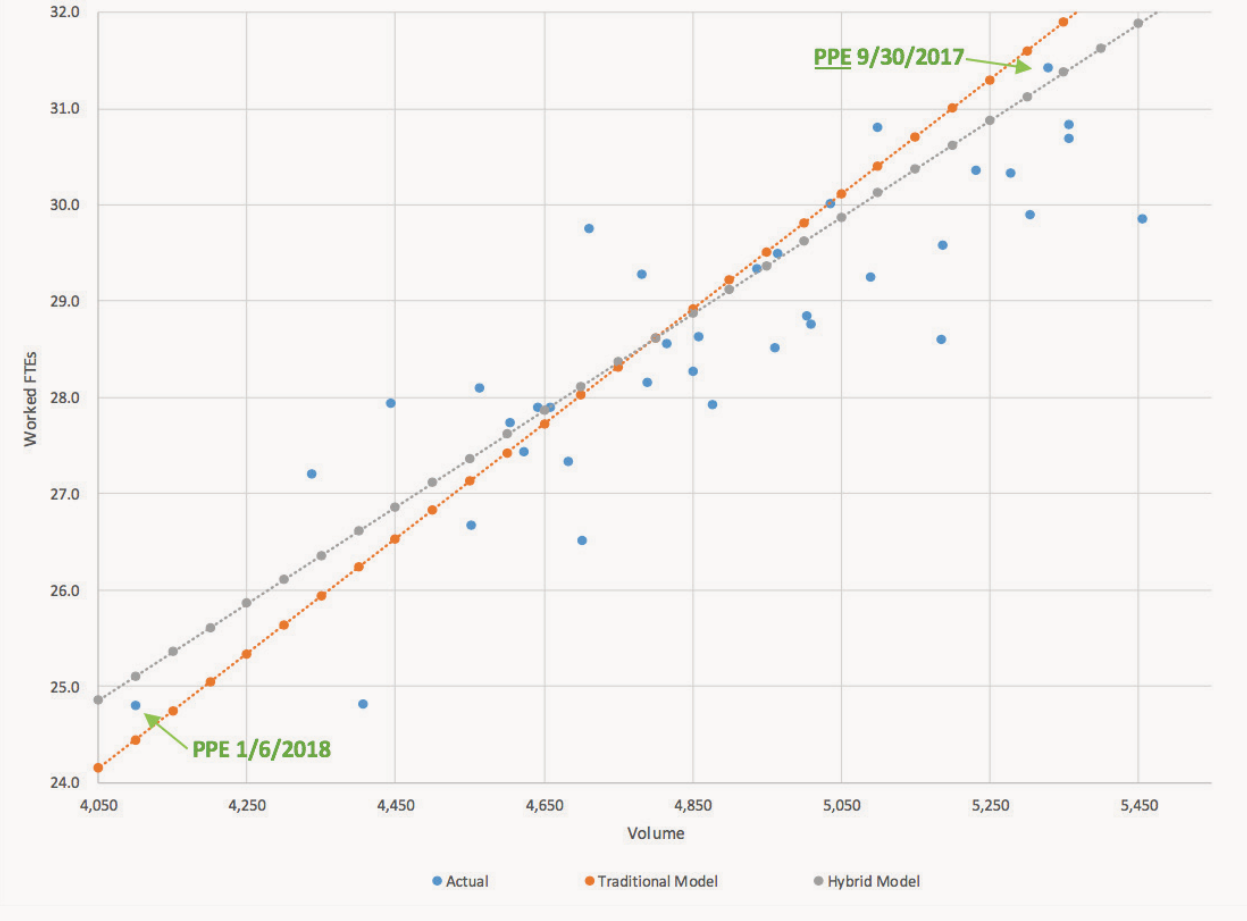
For several pay periods the qualitative results of the two models are not the same. In the pay period ending (PPE) 5/27/2017, VHPUOS (0.406) was above the target of 0.401. However, WHPUOS (0.470) was below the corresponding target because of the decreased level of rehab tech. The answer to the key question of "Is the staff flexing?" has been skewed in this pay period by decreased fixed staff.

Similarly, in the pay period ending 7/22/2017, volume was below projection, and the traditional model of productivity showed overstaffing. However, the VHPUOS line in Figure 1 shows that variable staff was flexed appropriately in this pay period and actually *outperformed* its target. Looking at only the variable staff, however, does not give the full picture of productivity. As shown below, the hybrid model combines both the fixed and variable components of the department.

5 Projected variable hours per unit of service is 0.401 = (24.08 therapist FTE × 80 hours in standard pay period) / (4800 units of volume during standard pay period).

In Figure 2, the orange line represents the set of combinations of volume and worked FTEs that exactly meet the traditional productivity target. The gray line is the corresponding line for the hybrid model represented in equation (5). Note the shallower slope in the hybrid model, reflecting the assumption that not all staff in the department flex to volume. Each blue dot represents actual worked FTEs and output for a pay period. Points above these lines represent an "overstaffed" situation, and points below represent an "understaffed" situation.

Figure 2. Traditional and Hybrid Productivity Measurement



In the pay period ending 9/30/2017, volume is 11% above projection. Since the rehab techs do not flex, the traditional model (orange line) shows the department is understaffed. However, looking at the VHPUOS (0.403), we see that the technical staff is above its target. Since the rehabs techs in this pay period are close to projection, the overall conclusion of the hybrid model is overstaffing. In the pay period ending 1/6/2018, low volume caused the traditional model to produce an overstaffed result, while the hybrid model shows understaffing.

Adding a fixed-paid manager to the model requires a pay-period-specific PTO conversion factor to convert the paid target for this position into a worked FTE target. For example, in a pay period with no PTO for the manager, the worked target would be 1. If the manager were to take PTO for one week of the two-week pay period, the worked target would be 0.5. This adjustment allows the manager's FTE to be compared to a target with the other staff while still holding it to the projected paid FTE target.

Including the manager in the model changes the target worked FTEs in the hybrid model to equation (6):

$$T_{Total} = \frac{0.401 * [Pay\ Period\ Volume]}{80} + 4.5 + 1.0 * \frac{[Actual\ Fixed\_Paid\ wFTEs]}{[Actual\ Fixed\_Paid\ pFTEs]} \qquad (6)$$

When adding a manager to the hypothetical department, the traditional model of productivity would calculate a WHPUOS target of 0.492 for the department that would include a 0.9 worked FTE for the manager, based on long-term PTO projection. When the manager takes little or no PTO, fixed-paid FTE creates the same challenge as the fixed-worked FTE (i.e., they do not flex to volume). However, since fixed-paid FTEs are not backfilled, in cases of PTO, an additional inaccuracy is presented.

An example of this is the pay period ending 8/5/2017. Because the manager takes time off, the traditional model shows a positive result (actual WHPUOS of 0.483, less than target of 0.492). From equation (6), the hybrid model calculates a target worked FTE of 30.1, which represents a negative result against the actual total worked FTEs of 30.8. By incorporating the actual PTO experience of the manager (in this case 100%), the hybrid model accurately reports the variances caused by the other two positions.[7]

Conclusion

By separating and accurately modeling the assumed behaviors of each staff type, the hybrid model offers a more accurate picture of departmental staffing. The simple assumptions of the traditional model can lead to erroneous findings that could lead to suboptimal business decisions. That said, in order to ensure the fixed positions remain appropriate, relative to volumes, a department's WHPUOS should be monitored over the long term.

6 Target worked FTEs = (.401)×5100/80 + 4.5 + 1.0×(0/1) = 30.1.

7 Rehab techs were 0.3 worked FTEs over their target, and the variable staff ran at a rate (0.408) that was less productive than their target (0.401).

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