SIMULATED STAFFING

Model helps transitional care nursing home deploy workers effectively

BY GAVIN L. COLLINS

Instead of going home, sometimes hospital patients are discharged to a transitional care unit in a nursing home for rehabilitation over an extended period before moving to a home or another permanent setting. Reducing costs in this process is a priority at the federal, state and individual nursing home levels. A study of simulation modeling was conducted at the Boutwells Landing Care Center, a Presbyterian Homes and Services Continuing Care Campus in Minnesota, to see how to improve outcomes.

The unique contribution of simulation is its introduction of uncertainty to modeling. To be useful, the model needed to give practical guidance about care timeliness, work productivity and cost reduction in an environment where care tasks vary randomly. This model, which used MedModel software from ProModel Corp., needed to be simple enough to implement within a reasonably short time with data that was easy to obtain at the transitional care unit.

Average task times are often the basis for calculating the number of staff hours needed on a shift. At Presbyterian Homes and Services, the author shadowed more than 60 shifts of resident assistants (RAs), trained medication aides (TMAs), licensed practical nurses (LPNs) and registered nurses (RNs) to build a real-time database. The research discovered that morning cares, bathroom assists, and medication assists required 17.5, 19.1 and 8.3 minutes on average, respectively.

To illustrate how to plan staffing by using these averages, assume that resident A needs these three cares during the morning shift and that bathroom assists are needed three times before the shift ends. The staffing needed to care for resident A might be calculated at 83.1 minutes, which is the sum of the average times (17.5 + 19.1 + 19.1 + 19.1 + 8.3 = 83.1). If 14 residents all need approximately the same care, the total time needed might be calculated at 1,163 minutes, which is 19.4 hours. Based on average task times, the transitional care unit needs slightly less than 2½ aides working eight-hour shifts (19.4 hours divided by 8 hours = 2.4 aides). A half-aide could be shared with another unit in the care center.

Practically, although task times gravitate toward average, they seldom are average. Times for the three tasks described ranged from 4 minutes to 38 minutes for a.m. cares, from 3 minutes to 27 minutes for bathroom assists, and from 4 minutes to 29 minutes for medication assists. Managers often suspect poor motivation when an RA cannot finish a shift on time, which necessitates overtime pay. However, simple random factors can delay a staff person. The transitional care unit simulation model provides data on each staff position and can help determine the amount of delay to be expected by simple randomness.

Building the model

The goal of the simulation staffing model was to obtain results at the study transitional care unit. An additional consideration was to make the model relatively easy to transfer to another facility. Finally, the model needed to provide statistics by individual staff position on the three key outcomes: the number of late cares (thought to be a proxy for quality of care), the percentage of time spent in productive work (thought to be a proxy for quality of work), and the potential for reduced costs.

The fact that statistics were generated for each staff position is a level of detail intended to help staffing coordinators. Staffing coordinators need to balance workloads both within positions (i.e., among the RAs) and also among classes (i.e., among RAs, TMAs and RN/LPNs). There were 10 staff positions at the studied transitional care unit: four RAs (often called nursing assistants), two TMAs, two nurses (LPNs or RNs), one occupational therapist (OT) and one rehabilitation therapist (RT).

The transitional care unit task times for the baseline model were obtained from data recorded by interns who shadowed staff in real time with a stopwatch. By assuming that shadowed days were typical and actual times were appropriate ("on time"), recorded times were transferred into the baseline model with no variation.

Varied task times were introduced in later scenarios, and the scenario times were compared to baseline times to provide statistics on "late" cares, the percentage of each shift spent in productive work, and costs. The variation in times came from a random numbers generator included in the software.

Shadowing 10 shifts in real time to obtain task times was a significant undertaking for model development. Extending the model to other settings can be made less difficult if a database of task times is developed.

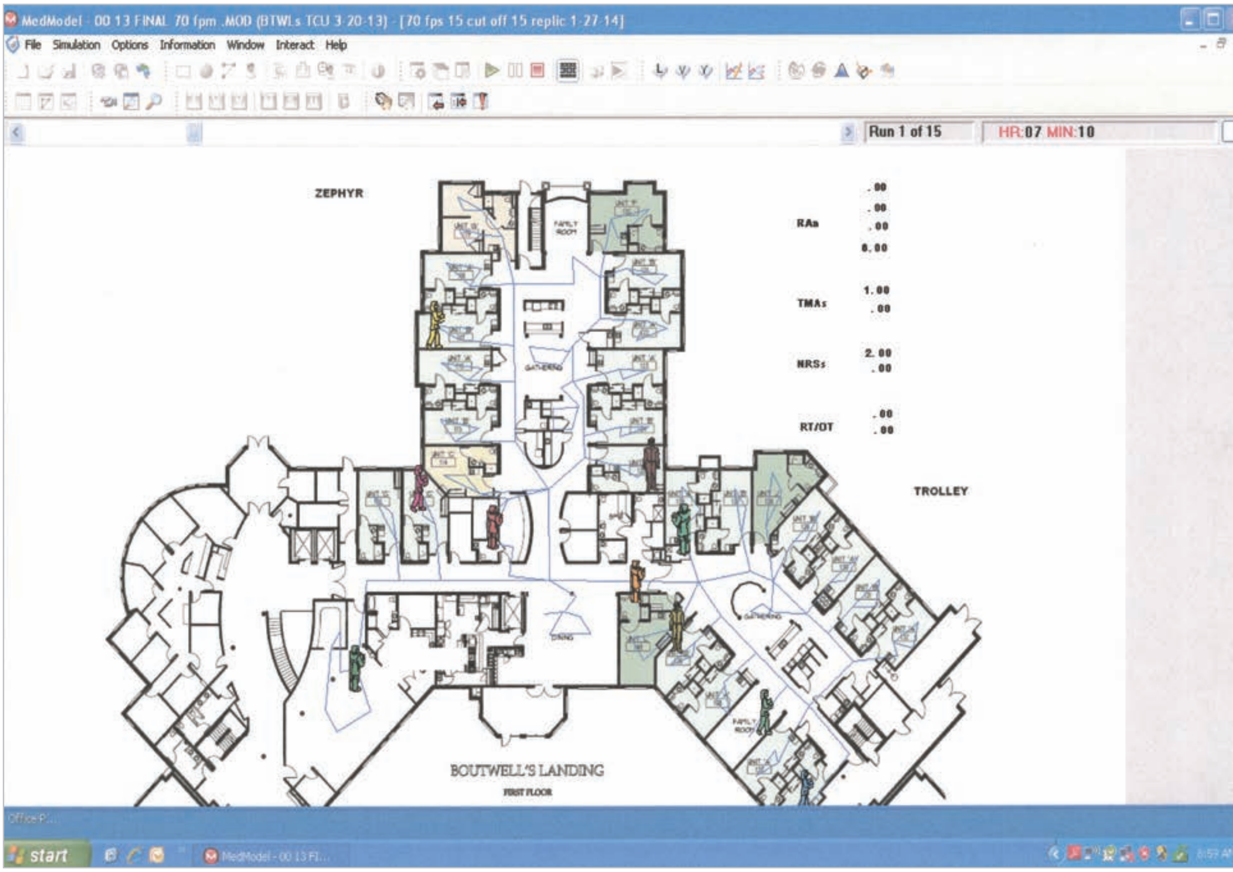
With several more applications, the existing database from the study can be combined with the new data. Then task times can be taken from the database, and shadowing shifts would be required only to test the reliability of the times in the database.

The model highlights a systems 'issue'

Figure 1 shows a visual of the simulation model as it was running on the computer. A clock in the upper right corner indicates the elapsed hours and minutes of the simulated eight-hour shift. The quadrant under the clock contains a "dashboard" that gives immediate results on late times by staff position.

VISUALIZING THE ISSUE

Figure 1. This visual shows the simulation model as it was running on the computer, with the elapsed hours and minutes of the simulated eight-hour shift in the upper right corner.



More statistics can be added to the dashboard. One candidate would be productive time for each staff position. Decision-makers might have particular outputs that are of immediate interest. They might not want to wait until the general statistics are generated automatically at the end of the model run.

The floor plan layout must be to scale. A CAD drawing or a map will work. The scale drawing permits travel time to be calculated readily.

The visual feature proved very powerful. Simply watching staff move room to room highlighted what is likely a "systems" problem of excessive travel on the floor. At the study unit, one RA showed movement from the Zephyr Community (upper left, which was the assignment) to the Trolley Community (lower right) a number of times. Why was there this need to move such long distances when two aides are assigned to each community and are available to share work that requires two people? What became obvious on the visual was later verified by the statistics. Travel time was higher than expected for all staff positions, and it was especially high for the RA identified in the visual.

That the visual alone helped identify a systems problem is a huge positive outcome from the simulation model. Then decision-makers could drill down to identify the root cause of the problem. Was the staff person afraid that shadowing also could be used for performance evaluation, thus guaranteeing excellent work? Did the staff person feel honored by being asked to be in the study, making the employee try very hard to prove the choice was warranted?

On the negative side, was the shadowed aide asked to help with two-person transfers on the opposite community because of poor teamwork between the existing RAs? This ability to identify systems problems from the visual might be sufficient reason alone to apply such modeling to healthcare.

The default travel time built into the software is 114 feet per minute, approximately 1.3 mph. This default time is based on general production modeling and is an average over the whole shift, thus allowing for some slower tasks and some faster tasks.

Nursing home staffers move residents more slowly than production or manufacturing workers move boxes or parts. The elderly are frail and often need a walker or are transported in a wheelchair. Therefore, in addition to scenarios at 114 feet per minute, scenarios at 70 feet per minute were used. This slower speed of 0.8 mph was determined by the author trying to approximate the speed of a wheelchair.

Travel time was 5.7 percent of total time at an assumed speed of 1.3 mph. Travel time was 9.2 percent of total time at an assumed speed of 0.8 mph. Neither statistic included travel for rehabilitation supplies, which are stored 600 feet from the rehabilitation auditorium, nor did it include travel to the break room. The statistics confirmed the cues from the visual that travel was inefficient.

Learning that travel was just under 10 percent of total work time was a powerful outcome from the model. Obviously, 9.2 percent is specific to the Boutwells Landing Care Center. However, if such high travel numbers are likely in other care settings, practitioners should check it as a matter of priority.

For instance, if one-third of the travel at Boutwells Landing Care Center could be eliminated, it would equal roughly 2.5 hours per shift (7.5 paid hours x 10 staff members x 0.10 = 7.5 hours; 7.5 divided by 3 = 2.5 hours). Using average salaries at $14 per hour, the savings would be $35 per day for each morning shift, or $12,775 annually. If the same savings could be obtained on the evening shift, the dollar amount would double to $25,550 annually. Moreover, this estimate is low since an average salary of $14 is slightly above wages for a resident assistant. If RAs, TMAs, LPNs, RNs, OCs and RTs are all included in the average, $14 is a greatly understated figure.

Productive staff use

Balancing the workload is a big consideration. Since RAs have the lowest wages, the more work they can do reduces work for higher-priced staff members, also lowering the average cost of care delivery. Moreover, a lack of work balance within levels or between levels will hurt morale and likely cause increased employee turnover. The ability to assess work balance by individual staff position is a very important outcome from the transitional care unit simulation model.

At the study unit, the scenario that used variable task times and 1.3 mph travel time showed RA, TMA and RN/LPN productivity at 83 percent, 70 percent and almost 85 percent of total time, respectively. When travel time was reduced to 0.8 mph, productivity increased to almost 84 percent, 73 percent and 88 percent, respectively. The statistics show that regardless of the speed modeled, RN/LPNs as a class are used heavily. Therefore, any work that can be handed off to a TMA should be scheduled that way. These moves not only will save costs, they likely will reduce stress for this highest paid category of staff.

History has shown that productive use of staff at more than 75 percent often leads to late cares and worker turnover. The model statistics predict that both RAs and RN/LPNs will be at the high end of the range of productive usage. If, as discussed above, travel time for RAs can be reduced, this will cut into their workload. If some RN/LPN work can be shifted to TMAs, then RN/LPN workload will be improved as well.

Is it getting too late?

The simulation model also tabulates the number of cares delivered late, another important output. The model was constructed so the cutoff for registering a "late" care can be changed. First, a late care was registered after two minutes of waiting. When the suggestion was made that two minutes late is too restrictive, it was noted that a daughter whose mother fell would appreciate a planning model with a cutoff of two minutes, which would apply to call lights. Scenarios also were tested using a 15-minute cutoff.

The first scenarios, with a 1.3 mph travel time and a two-minute cutoff, showed an average of 5.8 late cares per shift for the eight nursing staff positions (excluding occupational therapists and rehabilitation therapists). RAs had as few as zero late cares (RA2) to as many as 16 per shift (RA4). With a 15-minute cutoff, the average dropped to one, and the range was zero (RA1 and 2, TMA6, RN/LPN7 and 8) to six (RA4).

The first scenario that used a 0.8 mph travel time and a two-minute cutoff revealed an average of 11 late cares per shift for the eight nursing positions. The lowest number of late cares was four (RN/LPN8), the highest 19 (RA3). With a 15-minute cutoff, the average dropped to 1.6 and the range was from zero (RA1, RA2, TMA6, RN/LPN8) to six (RA4).

One scenario is not really representative, so the transitional care unit ran results for seven iterations (one week) using a 0.8 mph travel time and a 15-minute cutoff. This showed the following averages of late cares per staff position: 2.3 for RA1, one for RA2, 2.3 for RA3, 1.3 for RA4, 0.8 for TMA5, zero for TMA6, 1.1 for RN/LPN7 and 0.6 for RNLPN8.

What will the family of a transitional care unit resident think about an organization that plans staffing so as to minimize late cares? They will not know unless the senior care organization makes the planning method known in the marketing literature. The families of potential residents could view such concerted detail to minimizing patient

GAME THEORY

Want to improve physician-nurse communication at your medical center? Have them play a game that simulates real-world applications.

The University of Texas-Dallas, the University of Texas-Arlington and Baylor Scott & White Health teamed up to develop GLIMPSE (A Game to Learn Important Communications Methods for Patient Safety Enhancement). Susan Houston, Baylor's director of nursing research, said many healthcare errors result from miscommunication between physicians and nurses. The practitioners who played the game were supportive during the three-year project, and the game has received international recognition.

"Ideally, we will see the long-term effects, not only just in the results of this study, but through a marked decrease in healthcare errors that occur due to miscommunication," Houston said.

waits as the most important factor in deciding where to place their family member, making this possibly the most important outcome obtained from the model.

Lunch breaks and the long run

The simulation model assumed each staff member receives two short breaks, one midmorning and one midafternoon, along with a 30-minute unpaid lunch break and 20 to 30 minutes of "open" time at the end of the shift to facilitate charting. The breaks were built into the model so that when unexpected events caused staff to start shifts late, the next break, lunch period or charting period was reduced to help make up the lost time. Therefore, overtime only would be generated after adjustments to some breaks. In short, the model made explicit what actually happens on the floor, where conscientious staff members give up break time if they get behind.

In simulation, it is important to know about missed lunch breaks because of wage and hour laws. The shadowed lunch breaks included in the baseline averaged nearly 30 minutes. The exception was the TMA5 staff position, which had a low of about 19 minutes. When variable time was introduced while travel time was maintained at 1.3 mph, the average lunch break dropped to about 29 minutes. The lunch break for TMA5 shortened to almost 18 minutes. When travel time was reduced to 0.8 mph, the lunch breaks averaged about 23 minutes, and TMA5 dropped to almost 6 minutes. This last scenario reduced the lunch break for the RN/LPN7 position to about 15 minutes.

Smaller breaks, even if not illegal, are not good for morale and could lead to significant employee turnover. The evaluation of breaks and lunches during the shift illustrates the flexibility of the transitional care unit model. The model can be modified to gather these and other statistics that may be of interest.

The model also can help administrators balance short-run versus long-run costs. With 10 staff members, annual labor costs without benefits for the Boutwells Landing Care Center approximated $404,500 for the morning shift. This number was calculated using reasonable wages for the four staffing classes. Adding 17 percent for benefits brings the annual total to $473,265. As detailed above, more efficient travel could save $12,750 immediately, which comes to 2.7 percent of labor costs ($12,750 divided by $473,265 = 2.7 percent).

Conventional decision-making would transfer the reduced travel into reduced hours to save money in the short term. However, this decision would not improve on late cares or reduce high workloads. It's possible that holding staff hours constant after travel is reduced might be better at reducing workloads and the number of patient calls answered late. The second choice also could reduce staff turnover, improve resident satisfaction and generate better long-term results. Happier residents are good for marketing, and less turnover reduces staff training costs. Providing data for this kind of expanded decision-making is a major benefit of this simulation model.

Other model applications

An interface was created for the model to allow new data to be input as it becomes available. A simple Excel spreadsheet was added for task times, and another Excel spreadsheet was added for changes to the order of scheduled room locations. If new task times come from shadowing or the database and new schedules come from the staffing coordinator, it should take only a matter of hours for a new computer run to generate results.

What's more, much of the coding for the study model can be transferred to a new transitional care unit. Help from a proficient modeler who has access to the full version software is required for the original setup. An abbreviated version of the software is free, and it is sufficient to run the scenarios after the application has been created.

Applying the model to new construction could be decisive when choosing between competing designs for senior care homes. Often, there is trade-off between increased construction costs and decreased downstream operating costs. If reduced travel costs help reduce the operating budget, the effect could be felt for many years. The model permits an easy test on whether travel time is decisive.

The application can be modified to apply to other situations where travel may be critical. For instance, it might be used to evaluate alternate plans to deliver home care in the community, which is a focus of the federal government. It could help evaluate alternate routing of the flow of medical paperwork in a large, corporate healthcare setting. Such travel time statistics would require a scale drawing, which could be a CAD drawing or a map, and an ordered schedule of expected trips to work locations. Shadowing staff members to find out how long they spent at each location wouldn't be necessary for such paperwork.

Efficiencies for the future

The study goal was to learn whether simulation modeling would be useful to Boutwells Landing Care Center specifically and to the industry in general. The model does provide practical guidance about whether cares are delivered on time, whether staff is over- or underworked, and whether costs can be reduced further.

The principal opportunity at Boutwells Landing Care Center is to reduce staff travel. Normal rehab supplies might be distributed more closely to the work locations. Call lights and two-person transfers might be handled more cooperatively on each community. RNs and LPNs might hand off some work to TMAs.

The people most likely to identify efficiencies are those doing the work. Staff should be encouraged to present ideas for improved work flow. Good ideas should be tested with the simulation model. Ideas that promise improvements in care delivery, work time or cost may then be implemented.

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