Nurse executives are required each day to balance the costs of human resources against the anticipated clinical outcomes produced by those resources. Using sophisticated analyses, landmark studies have repeatedly demonstrated the impact of nurse staffing on clinical outcomes.\textsuperscript{1–8} Other studies establish the business case for a value-based nursing model that produces better outcomes with fewer adverse effects while minimizing total costs of care.\textsuperscript{9–11} One author notes: “This is more than a staffing-level or nurse:patient ratio discussion.”\textsuperscript{11} The American Nurses Credentialing Center has identified that staffing levels, recognition of nurse competency and experience, and flexible care delivery systems are foundational components of a work environment in organizations that achieve Magnet\textsuperscript{®} recognition.\textsuperscript{12}
In addition to balancing staffing costs with clinical outcomes, nurse executives need to ensure a workplace that supports professional engagement, collaboration, and interdisciplinary relationships, all of which increase staff satisfaction. Research has demonstrated the correlation between poor staffing and nurse burnout, job dissatisfaction, and intent to leave a position. Even though staff engagement and staff satisfaction would be assumed by most leaders to have a direct and positive correlation, nurse executives often presume that “the number of nurses” is the most important element of staffing.

This paper describes the complexity of the staffing system, and suggests how the infusion of contemporary science with the art of current staffing could significantly improve staff allocation and deployment going forward.

STAFFING DEFINED

The term staffing means different things to various organizational stakeholders. To a chief financial officer (CFO), staffing refers to the operationalization of a budgeted personnel target that typically is based on average demand patterns and a target workload measure (usually hours per patient-day). If a nursing unit is budgeted for 50 full-time equivalents (FTEs), staffing is the means by which FTEs are deployed. As long as the budget balances to 50 FTEs, the CFO considers staffing to be appropriate.

To a staff nurse, however, staffing has a very different perspective, which centers on the sufficiency of assigned resources for the current patient population given the acuity of those patients. Typically expressed in terms of a nurse-to-patient ratio, this staff assignment is often perceived as the organization’s obligation to ensure that the nursing staff can provide safe and effective care. The human resource consequences of not meeting this obligation include an unfavorable working environment for nurses and poor staff outcomes, such as turnover, disengagement, and burnout. Neither perspective is right or wrong, but rather represent the complexity of staffing and a leadership obligation to develop solutions that address the requirements of different stakeholders.

STAFFING AS A COMPLEX SYSTEM

The staffing system is highly complex, characterized by multiple processes with multiple dimensions that interact with or are affected by other organizational processes. To date, a variety of solutions, such as enhanced scheduling technology and participative scheduling procedures, have improved components of the system, but have had limited success on the overall system. Staffing and scheduling remain tenacious leadership problems in search of a truly innovative and contemporary solution.

Industries with highly complex systems typically use systems theory (also called systems science) to carefully analyze the interactions among system components and other processes. The nurse staffing system can benefit from this holistic approach that would meld high quality human resource management and transformational leadership with innovative and scientifically robust analytical tools and computational methodologies.

A combined art and science approach to resource allocation and deployment identifies the interaction between the system’s processes and many qualitative and quantitative elements. This view enables leaders to better understand the levers which can improve the efficiency and effectiveness of resource allocation, produce better clinical outcomes, and simultaneously improve nurse satisfaction.

ADVANCING THE SCIENCE

The approach begins with study of the core components of staffing in order to understand these processes and their interrelationships with each other and other organizational processes.

The 4 processes of the staffing system are budgeting, scheduling, deployment, and assignment. Each process has a unique set of customer expectations, inputs, interfaces, and outputs. This article focuses on budgeting and scheduling optimization to illustrate the advances available through solution modeling and simulation.

Optimization modeling provides a means of understanding demand patterns and the interaction of that demand with business constraints and environmental variables. Using computational and logistics methodologies that are common in business process optimization, its goal is to identify the best outcome among many possible outcomes. Quantitative components of the optimization model include multiple objectives (e.g., staff preferences, maximizing coverage while minimizing costs), millions of variables (e.g., skill mix, demand fluctuation, patient acuity), plus lots of constraints (e.g., time off requirements, staff availability). Use of high quality metrics related to objectives, variables, and constraints is critical to business optimization.

Unfortunately, the key demand metric used in nurse staffing, upon which annual budgets are based, is average daily census (ADC)—often marked at midnight. Although this metric has served the industry as an effective mechanism for billing Medicare and Medicaid, it does not adequately represent the complex demand patterns of a unit, which behave in both predictable and unpredictable ways. For example, it is not unusual for a busy surgical or telemetry unit to turn over 50% to 60% of its volume during the day, with midnight representing the lowest workload of the 24-hour period.

Data related to demand fluctuation and acuity adjusted demand must be included in the model. To accurately represent mathematically the business situation related to nurse staffing, an optimization model also must include decision variables and business constraints, such as work rules and staff availability. In an organization where staff work every other weekend versus every third weekend, staff configuration will look quite different in order to cost effectively meet staffing requirements. The optimal mix of full-time to part-time staff may diverge, based on operant work rules.

MERGING THE ART WITH THE SCIENCE

Mathematical and logistics science is critical in modeling the most cost-effective budgets in a complex environment. When this science is combined with the art of staffing using transformational leadership approaches, stakeholder needs can be met.
Importantly, the scheduling process has significant impact on nurse satisfaction. Questions that get at the heart of this qualitative lever include: Are my personal preferences accommodated when creating a schedule? Are the schedules fair? How and when are holes in the schedule handled to prevent, for example, frantic calls from the staffing office or charge nurse at all hours of the day or night to convince staff to pick up a shift that has remained notably empty on the schedule for several weeks prior to the actual day?

Given the often-Herculean effort required by managers to schedule and deploy sufficient resources, a push versus pull system typically is created. Faced with the challenge of deploying staff “in the moment,” managers often create schedules based on the “push” capacity of the unit rather than data-driven predictions of typical “pull” demand patterns. In other words, if the unit has the capacity for 34 patients, schedules are created for nurse staffing deemed appropriate for a demand of 34. If there are 34 patients, managers can uncross their crossed fingers. If there are fewer than 34 patients, managers must right-size staffing resources in the moment through use of floating staff, low-census time off, or readjusting schedules and essentially pushing inefficiencies downstream.

Staffing pull-versus-push decision making by health care executives requires a deep understanding of demand patterns and not a simple reliance on ADC. The Toyota production methodologies, which are used by leading health systems to eliminate delays, defects, and deviations in care processes, can also be applied to achieve dramatic benefits in the staffing process.

A pull-oriented demand-based schedule typically will not require the same number of resources each day and each shift unless a unit is running a consistent demand pattern each day of the week. The essence of a pull system is understanding the demand and designing processes to accommodate that demand while minimizing waste, time, defects, and cost. As it relates to staffing, waste is defined as unnecessary scheduled resources that need to be redeployed, time spent calling staff to ask them to work, and resultant staff dissatisfaction, which if it persists, will lead to unnecessary turnover.

LEVERS OF STAFF SATISFACTION

The operating definition of staff satisfaction with nurse staffing may differ from organization to organization, so transformational leaders will consult the staff, asking them to identify those processes whose improvement will lead to increased satisfaction. Nurse satisfaction with staffing typically encompasses more than simply the net number of nurses on the unit on any given day. Commonly acknowledged components of the scheduling and deployment processes, which are staff satisfiers, include:

- Training and education related to the processes
- Involvement in the design and development of work rules
- Standardization of work rules within and between units
- Predictability of timing of schedule postings
- Ease and reasonableness of deployment strategies
- Transparency in process measurement, monitoring, and reporting, including root cause analyses of process variation and poor outcomes

With the exception of those organizations where the terms of employment and specific working rules are outlined in a collective bargaining agreement, staff participation in the determination of certain work rules is a vital component of a shared-decision governance structure. Simulation modeling can help leaders and staff understand the impact of scenarios that are used to balance various work rules with other organizational priorities, such as financial constraints, general human resource policies, and market implications.

MONITORING SATISFACTION WITH NURSE STAFFING

Organizations frequently rely on standardized staff-engagement instruments to measure and monitor satisfaction with staffing results. Typically, these results can be benchmarked against a robust database of similar organizations. Their focus is on overall satisfaction with the staffing process or general perception of nurse availability. The instruments may not be able to measure staff satisfaction with important staffing process components. Many organizations thus may find helpful a quarterly “pulse” survey of important issues related to scheduling, deployment, and assignment processes.

The following are sample probes that can provide useful information in continuously improving the staffing processes.

- I am able to participate in the scheduling process as much as I would like.
- I feel my schedule requests are honored to the extent possible.
- I know how to make myself available to work extra shifts.
- I am called throughout the week to either change my work schedule or to work additional shifts.
- The schedule is posted within a timeframe that allows me to plan.
- I am able to easily exchange shifts after a schedule is posted.
- I often float to areas other than my assigned department.
- When floated, I feel adequately prepared to care for patients on that particular unit.
- My unit is staffed according to the department plan.
- Staffing reflects the acuity of our patient population.
- The staffing office helps staff my unit appropriately.

When made transparent to the staff by the leadership team, these survey results provide a practical and tangible basis for staff-directed interventions.

ORGANIZING A TRANSFORMATIONAL, MULTIDISCIPLINARY TEAM

As with other important functions, the chief nursing officer (CNO) needs highly engaged executive colleagues to bring their expertise to the task of improving staff satisfaction, flexibility, and costs. A multidisciplinary executive team, led by the CNO, can leverage the diverse expertise of key colleagues in addressing complex staffing issues. This team should
include the CFO, and executives representing human resource, information technology (IT), clinical education, and other functions as appropriate.

Each executive team member manages intersecting components of the staffing system. For example, staffing costs may be rising. Through a thorough root cause analysis, nursing leadership identifies the key issue as vacancies in the float pool, which result in increased use of more expensive agency nurses.

The solution to the problem requires collaboration with the CNO and assignment of accountability to various members of the multidisciplinary team. Working with the CNO:

- The CFO addresses whether the float pool has an adequate budget for the current demand and work rules.
- The HR executive addresses whether the organization’s branding and recruitment strategy for the float pool is as effective as it could be.
- The clinical education executive evaluates the strategy for onboarding and orienting float staff.
- The IT executive addresses whether the electronic scheduling system has the capability to provide float nurses with adequate and efficient access to information on available shifts.

The CNO must educate the executive team about core components of nurse staffing, the interconnections, and levers of staff satisfaction. Broad knowledge of the staff’s opinions related to each of the staffing processes, as shared by the CNO, also is critical to effective executive team functioning. Through increased understanding of resource deployment and the drivers of staff engagement, executive team members own a critical share of effective staffing, thereby supporting nursing leadership.

Monitoring the effectiveness of the 4 staffing processes—budgeting, scheduling, deployment, and assignment—also can be a team responsibility, with the CNO maintaining overall executive accountability. A dashboard of core indicators can be created and reviewed at each team meeting to examine overall trends, staff satisfaction with each process, and common and special cause process variation. Metrics to achieve these goals could include: nurse turnover; vacancy rates; percent of time units meet staffing targets; nurse satisfaction with staffing and its processes; time to fill positions; nursing cost per unit of service; use of premium pay; clinical education process and results; and nurse-sensitive quality indicators. Dashboard data can help the team identify and remove barriers for nurse managers to achieve optimal staffing.

**IT’S A NEW WORLD, DESERVING NEW APPROACHES**

In complex environments such as health care, a multidisciplinary perspective with cross-departmental engagement brings more robust analysis to complex problems and encourages thoughtful solutions that improve overall organizational outcomes.

Understanding care processes and interconnections between these processes is critical to high quality patient care. Listening to the voice of the patient has yielded substantial improvement of care processes. The same can and should be said for managing staffing resources. The voice of the nurse in staffing-related decision making can be equally as valuable when enhanced with organization-wide understanding of staffing processes and interconnections between these processes. Such understanding enables the appropriate deployment of clinical human resources, which improve nurse satisfaction. An engaged, appropriately staffed workforce is critical to achieving value-based goals of improved clinical outcomes and quality and lower overall system cost.

T.R. Clancy of the University of Minnesota has written extensively about complex systems and the need to understand their dynamic network of multiple agents (processes) often acting and reacting in parallel to what other agents are doing. The outcome of a process is dependent, not only on highly controlled activity within that discrete process, but also on the interaction between and among processes as they each strive for homeostasis.

As environmental complexity intensifies and interdependencies within organizations and disciplines evolve, the analytic methods and the magnitude of data required to make decisions must evolve as well. Visualizing, querying, modeling, and processing big data related to supply and demand is the first step in this process.

Traditional approaches to understanding health care supply and demand, and resultant deployment techniques in nurse staffing have been problematic. An innovative solution is needed—one that applies the science of advanced mathematical tools and techniques to the art of transformational leadership to revolutionize business processes and improve operating results. Complex industries have achieved success infusing art and science. Health care is an increasingly complex environment. Keen leadership understanding of nurse staffing within a value-based health care economy is critical to nursing’s future. Now is the time for health care leaders to challenge “flat-Earth approaches” and embrace a new world connected by mathematical tools and techniques that enable science to inform art.

**References**


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