Improving Throughput Metrics with Reduced Labor Expenses

PREPARED BY:

**Nicholas Chmielewski,
DNP, RN, CEN, CENP,
NEA-BC, FAEN**
nchmielewski@thinkbrg.com
202.524.8064

**Kevin Browning,
BA, RN, CEN**
kbrowning@thinkbrg.com
202.747.5066

BRG | Review

DISCLAIMER: The opinions expressed in the *BRG Review* are those of the individual authors and do not represent the opinions of BRG or its other employees and affiliates. The information provided in the *BRG Review* is not intended to and does not render legal, accounting, tax, or other professional advice or services, and no client relationship is established with BRG by making any information available in this publication, or from you transmitting an email or other message to us. None of the information contained herein should be used as a substitute for consultation with competent advisors.

Nick Chmielewski has seventeen years of emergency nursing practice, including leadership experience in emergency department manager, director, and associate CNO-level leadership roles. He has spent the last seven years in consulting roles, and his career has spanned experiences at fifty-two EDs in seventeen states. He is a published author in multiple journals. His past national leadership positions with the Emergency Nurses Association include 2014 Resolutions Committee chairperson and 2019 Advocacy Advisory Council chairperson. He is an inducted Fellow in the Academy of Emergency Nursing (AEN) and the AEN Board of Directors' 2021 chairperson-elect.

Kevin Browning has thirty-five years of experience in pre-hospital emergency care, emergency care in the acute care setting, hospital supervision, ED leadership, ED performance improvement, and ED clinical redesign. His ED performance improvement projects have included hospitals of all sizes. Before BRG, he was the vice president of Emergency Services for a large for-profit hospital company, where he was responsible for hospital-based and freestanding emergency departments. His primary duties included ED clinical redesign, patient throughput, patient engagement, and staff engagement. Before that, he was the vice president of Patient Flow, Bed Management, and Emergency Services for a Florida Level 2 trauma center.

Abstract

A hospital emergency department within a recognized Magnet™ center of nursing excellence had exhibited longer-than-desired lengths of stay and a higher-than-desired worked hours per patient visit. A department performance improvement team was formed as part of a systemwide initiative to right-size the organization for optimum quality care at the most efficient cost and to focus on improving both length of stay and staffing practices.

The team transitioned the department from a fixed-budget staffing model to a staffing-to-demand model. Methods included both changes to permanent staffing plans and implementation of real-time staffing-to-demand tools. Comprehensive education on the methodological shift helped reduce the department's staffing by 14.9 full-time equivalents, actualizing $3.35 million in annualized labor savings. The reduction in staffing was accomplished without unfavorably impacting the department's left without being seen rate or key length-of-stay metrics. In addition, most patient-experience scores maintained a satisfaction at or greater than 90%. These improvements allowed the department to treat a higher volume of patients at lower cost.

This case study demonstrates that implementation of staffing-to-demand methodologies can be successful in reducing labor costs while maintaining, if not improving, key performance indicators including patient satisfaction.

Introduction

Problem Description

A multihospital health system embarked on a four-year journey to right-size the organization for optimum quality care at the most efficient cost. As the implementation journey commenced in 2018, the health system included approximately 1,900 certified hospital beds, 790 nursing home beds, and 18,400 employees and had over $2 billion in annual revenue. All hospital nursing areas were evaluated for workforce size, skill-mix, and scheduling optimization opportunities. Patient lengths of stay (LOS) also were examined for improvement opportunities.

An emergency department (ED) in a Magnet™ recognized hospital with a cardiac center of excellence was identified as a unit with opportunities for focused performance improvement. The ED had thirty-four treatment spaces with approximately 28,000 annual visits and growing volumes. The department exhibited a longer-than-desired LOS and a higher-than-desired worked hour per patient visit (wHPPV) productivity statistic.

Available Knowledge

Table 1 details baseline throughput metrics compared to various cohorts. The baseline normalized wHPPV was 6.135, placing it in greater than the 75th percentile in staffing compared to the minor teaching facility with CMI-weighted[1] adjusted discharges greater than 50,000 cohort.[2]

Table 1: Baseline throughput metrics

	1	2	3	4
	ED Baseline*	**EDBA Cohort Median**	**NHAMCS 2017**	**Hospital Compare National Average**
Left without being seen rate	1%	2%**	No data	2%***
Median minutes arrival-to-provider	43	14	16	No data
Median minutes ED discharge LOS	290	138	No data	170****
Median minutes ED admission LOS	559	261	No data	No data

1. Berkeley Research Group (BRG), Dynamic Rapidly Interactive Visual Environment (DRIVE) (2020), retrieved March 18, 2020, from a HIPAA-compliant client-specific online database.

2. Emergency Department Benchmarking Alliance (EDBA), 2018 performance fractal tables; 20-40k visit cohort, Madison, WI (2019).

3. US Department of Health and Human Services Centers for Disease Control and Prevention, *National Hospital Ambulatory Medical Care Survey: 2017 Emergency Department Summary Tables,* Table 4, "Wait time at emergency department visits: United States, 2017" (2020), retrieved from: https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf.

4. Center for Medicare and Medicaid Services, Hospital compare (2020), retrieved March 18, 2020 from: https://www.medicare.gov/hospitalcompare/

*   Baseline timeframe is July 1, 2017, to June 30, 2018.
**   EDBA uses the term "Leaving Before Treatment Complete" (LBTC), which includes patients who leave before being seen by a qualified medical provider plus patients who leave against medical advice.
***   Criteria OP-22. Data collection period: January 1 to December 31, 2018.
****   Criteria OP-18. Data collection period: April 1 to December 31, 2018.

---

1 The Case Mix Index (CMI) is a relative value assigned to a diagnosis-related group of patients. A hospital's CMI reflects the combined clinical complexity and resource needs for that facility.

2 Truven Health Analytics, Action OI [Healthcare industry productivity labor benchmarking metrics for CY17] (2017), available at: https://actionoi.truvenhealth.com/

Rationale

Although the baseline left without being seen (LWBS) rate of the department was better than the national average, the remaining ED throughput metrics were performing worse than the national average. Nurse consultants from BRG's Care Transformation team recommended the client implement process changes to reduce patient LOS, improve patient throughput, and realign ED labor needs.

Specific Aims

The purpose of this project was to work with hospital and departmental leadership and staff to: (1) reduce ED throughput time intervals and LWBS rates, and (2) optimize labor expenses to meet/match patient demand.

Methods

Context

The performance improvement initiatives outlined in this case study also were part of a broader systemwide ED service-line performance improvement initiative. The initiative included setting standardized approaches to measure and report metrics and replacing site-specific policies with a systemwide approach to improve the door-to-provider interval.

Even though the department promoted and embraced a culture of preassigning the next arriving patient to a care team and treatment space, it continued to "process patients" through a physical triage location. This sustained an unnecessary bottleneck and impacted the arrival-to-provider time metric. Patient care events that occurred prior to the engagement resulted in an environment where leadership was not supportive of implementing immediate bedding. A "nurse greeter" met arriving patients and then took them into a traditional triage area for continued assessments prior to placement in a treatment room.

Department Leadership Framework and Staffing

The ED leadership team was composed of a dedicated and engaged emergency department medical director plus a tenured nurse manager with four assistant nurse managers (ANMs): two for the day shift and two for the night shift. The department shared a nurse educator with the Observation Unit and had daily case manager and social work coverage, plus a dedicated supply technician. Nurses were scheduled for twelve-hour shifts (7:00 a.m. to 7:00 p.m., 7:00 p.m. to 7:00 a.m.); technicians and unit secretaries were scheduled for eight-hour shifts (8:00 a.m. to 4:00 p.m., 4:00 p.m. to 12:00 a.m., 12:00 a.m. to 8:00 a.m.). The ED also used facility-employed nurse practitioners who were assigned to triage patients and enter protocol orders. The ED manager reported to a nursing vice president whose other departments served outpatient areas; the nursing VP position did not oversee any inpatient nursing units.

Nursing leaders were not familiar with staffing-to-demand or wHPPV concepts. Staffing to demand was not part of the culture; leadership simply staffed to budgeted dollars.

Intervention(s)

This project was completed using the "structure-process-outcome" framework described by Donabedian (1988).[3] This model has been utilized frequently by researchers and those in public policy to map out the mechanics of a particular situational process. The continuous quality improvement initiative used the DMAIC (Define, Measure, Analyze, Improve, and Control)[4] method for process improvement. A performance work group was formed consisting of ED nursing, ED physician, imaging, and patient access leaders. ANMs and other managers also were invited to attend the work group meetings.

ED leadership was introduced to and educated on the National Emergency Department Overcrowding Scale (NEDOCS)[5,6] and the concepts of productivity and staffing to demand. This included the need to stagger staff to match historical patient-arrival patterns. The optimal goal was to have the right quantity and type of staff at the right time to match the community demand for emergency services. The leadership team and charge nurses were educated on a staffing-to-demand tool to use in conjunction with NEDOCS to drive real-time staffing decisions. The goal was to use the web-based tools every four hours. They also had the opportunity to enter data hourly if they encountered unexpected influxes in patient arrivals.

The ED leadership team worked collaboratively on this initiative. Team members viewed themselves as having the reputation of representing the flagship hospital of the organization and thought it imperative to set labor cost containment expectations for the broader system.

The consulting team's initial recommendations also included increasing the use of mid-shift staff positions by moving shifts from both day and night shifts into the mid-shift to realign staffing with patient census patterns. This also would reduce overstaffing at hours when the census was lower, such as 3:00 a.m. to 9:00 a.m.

Study of the Interventions

A Health Insurance Portability and Accountability Act (HIPAA)-compliant applied analytics platform was chosen for assessing the impact of the interventions. Data was analyzed within the construct of a pre- and post-intervention analysis to assess the impact of the process improvement project. Further, performance updates were shared with leaders and staff at regular intervals throughout the project. Volumes and throughput metrics were available daily and in a monthly digest. Ancillary services turnaround times, including imaging and lab data in aggregate and test-specific formats, were available and reviewed monthly. All of these metrics were reviewed to better refine/optimize individual processing times. Finalized productivity performance metrics were available and reviewed every two weeks, and real-time analysis tools were implemented to assist charge nurses in making staffing-to-demand decisions.

The study included the intentional use of the Hawthorne effect, which is an effective approach in managing human behavior to assist in achieving desired outcomes.[7] Hospitals often implement multiple systemic performance improvement initiatives. As such, no controls were in place to correlate the interventions directly to the observed outcomes.

Measures

The measures chosen for studying the process outcomes included LWBS percentage, median door-to-provider time, median LOS for discharge patients, patient volume, and wHPPV.

3   A. Donabedian, "The quality of health care. How can it be assessed?" *Journal of the American Medical Association* 260(12) (1988, September 23–30): 1743–8, retrieved from https://www.ncbi.nlm.nih.gov/pubmed/3045356

4   K. Moran, R. Burson, & D. Conrad, *The Doctor of Nursing Practice Scholarly Project: A Framework for Success* (2nd ed.), Burlington, MA: Jones & Bartlett Learning (2017).

5   S.J. Weiss, A.A. Ernst, & T.G. Nick, "Comparison of the National Emergency Department Overcrowding Scale and the Emergency Department Work Index for quantifying emergency department crowding," *Acad Emerg Med. 13*(5) (2006, May): 513–8. doi: 10.1197/j. aem.2005.12.009. Epub 2006 Mar 21. PMID: 16551777.

6   S.J. Weiss, R. Derlet, J. Arndahl et al., "Estimating the degree of emergency department overcrowding in academic medical centers: results of the National ED Overcrowding Study (NEDOCS)," *Acad Emerg Med.* 11(1) (2004, January): 38–50. doi: 10.1197/j.aem.2003.07.017. Erratum in: Acad Emerg Med. 11(4) (2004, April): 408. M. Fernández-Frankelton [corrected to M. Fernández-Frackelton]. PMID: 14709427.

7   T.R. Lied & V.A. Kazandjian, "A Hawthorne strategy: implications for performance measurement and improvement," *Clin Perform Qual Healthcare* 6(4) (1998, October–December): 201–4. PMID: 10351289.

Operational Definitions

Left without being seen (LWBS) refers to patients who arrive at the ED for emergency care and subsequently leave prior to initial evaluation by a physician or other qualified medical person (QMP).[8] LWBS sometimes is referred to as "leaving without treatment" (LWOT) or "left before being seen" (LBBS).[9] It is expressed as a percentage. LWBS is not synonymous with leaving against medical advice.

The *door* timestamp is defined as the patient's arrival time, as logged at the time of their quick registration on arrival by patient access.[10]

The *provider contact* timestamp is the documented date and time of first contact with a physician/QMP.[11]

The *door-to-provider* interval is the number of minutes between the door timestamp and the provider contact timestamp.[12]

Worked hour per patient visit (wHPPV) is calculated by taking the total worked hours in a cost center for a specified period and dividing it by the total number of patient visits.[13] For the purposes of calculating a wHPPV, the productivity definition of a visit is utilized.[14]

Ongoing Assessment

The daily department metrics were reviewed frequently and included: Arrival to Provider, Provider to Disposition, and Disposition to Depart/Admit/Transfer. ANMs were encouraged to flex staff down during periods of few patient arrivals and low numbers of patients receiving treatment in the ED. Historically, the 3:00 a.m. to 9:00 a.m. range provided the greatest opportunity to right-size department staffing. Review of the staffing-to-demand tool a minimum of every four hours provided the ANMs and relief charge nurses with the data to make informed decisions regarding the number of caregivers needed. Historical trends in the department also were taken into consideration in this decision making.

---

8   CMS, "Left Without Being Seen," Measures Inventory Tool, available at: https://cmit.cms.gov/CMIT_public/ViewMeasure?MeasureId=922

9   J. L. Wiler, S. Welch, J. Pines, J. Schuur, N. Jouriles, & S. Stone-Griffith, "Emergency department performance measures updates: proceedings of the 2014 emergency department benchmarking alliance consensus summit," *Acad Emerg Med. 22*(5) (2015, May): 542–53. doi: 10.1111/acem.12654. Epub 2015 Apr 21. PMID: 25899754.

10 Wiler et al. (2015).

11 Wiler et al. (2015).

12 Wiler et al. (2015).

13 J. Moretz & N. Chmielewski, "Emergency Department boarding: methods accounting for lost productivity," *BRG Review 8* (2019, June 21), 6–13. Berkeley Research Group, LLC: Washington, DC. Retrieved January 18, 2021, from https://media.thinkbrg.com/wp-content/uploads/2021/01/18144842/BRGReview_Issue8-final.pdf

14 According to Chapter 12 of the Truven Health Analytics Action OI Department Guide, LWBS patients should not be included in the visit count when calculating productivity.

Completeness and Accuracy

Data in the applied analytics platform originate from the electronic health record (EHR) and the organization's payroll system via a data transfer. This represents the complete data for a specific timeframe, and as such, no sampling techniques were utilized. While no data were excluded in calculating the visit total or hours worked, some cases were excluded when analyzing the clinical throughput data. The exclusionary criteria, which resulted in less than 0.5% of total data, were cases with:

- A null arrival time, null departure time, null disposition type, or null facility
- A LOS greater than seventy-two hours

Ethical Considerations

This performance improvement project does not meet the definition of research under 45 CFR 46.102(d). Access to relevant patient data occurred through a HIPAA-compliant analytics platform.

Results

Table 2 compares the baseline timeframe of July 1, 2017 to June 30, 2018 against the six-pay-period average ending August 3, 2019. The improvement in wHPPV represents annualized savings of $3.35 million, determined by the formula:

Savings = (baseline wHPPV – target wHPPV) × Baseline Volume / 1950 × Department Average Salary w/Benefits[15]

Table 2: Baseline (7/1/17 to 6/30/18) and post-intervention (5/12/19 to 8/3/19) results metrics comparison

	Baseline	Post Intervention	% Change
Annualized volume	28,018	31,997	14.2%
LWBS	1.00%	0.60%	−40.0%
Worked FTEs	88.2	73.3	−16.9%
wHPPV	6.135	4.468	−27.2%
Median minutes arrival-to-provider	43	24	−44.2%
Median minutes ED discharge LOS	290	267	−7.9%
Median minutes ED admission LOS	559	431	−22.9%

---

15 1 FTE is commonly equated to 40 hours per week or 2,080 hours annualized. This health system defines 1 FTE equivalent to 1,950 hours annualized. The health system's definition was used in all calculations.

Discussion

Summary

Despite a 14.2% increase in volume, the department was successful in reducing its labor by 14.9 FTEs. This 16.9% FTE reduction translated to a 27.2% reduction in wHPPV. This improvement did not require human resource workforce reduction actions and was accomplished through scheduling changes, staffing-to-demand actions, and more judicious use of overtime. In addition, there were observed improvements in all key throughput metrics, namely door-to-provider (44.2%), ED discharge LOS (7.9%), and ED admission LOS (22.9%). Despite these improvements, performance improvement work continues as the team strives to meet the EDBA cohort described in Table 1.

The tenured ED leadership team was key to achieving the desired wHPPV. The department nurse manager provided reassurances and leadership within the department. The leadership team was open-minded and responsive while we assisted them in navigating and optimizing patient throughput processes. At the same time, the leadership team remained cognizant and sensitive to both staff and patient needs. This created an atmosphere of mutual trust between management and staff caring for patients. Front-line leaders became amenable to flexing down at 3:00 a.m. and having some 7:00 a.m. staff delay their arrival times based on departmental patient volumes and acuity.

Interpretation

As leadership reviewed the daily and historical trends in the staffing-to-demand tool, they realized they needed to start using those trends to inform staffing decisions. Leadership subsequently supported the recommendation to relocate positions into a mid-shift. This change helped to relieve the burden of having to flex and supported patient safety by having an additional caregiver in the department during peak census.

During initial pre-intervention department interviews, the ED leadership team believed more staff yielded better outcomes. They perceived that nurses were at a 10:1 ratio during peak times. However, this perception was not supported by data. The staffing-to-demand concept was foreign and had not been taken into consideration previously. Departmental leadership operated from a culture of fixed staffing numbers irrespective of volume. Day and night staff schedules mirrored each other with only 0.8 FTEs in mid-shift coverage. The same held true for unlicensed personnel.

Throughout the performance improvement implementation, throughput times decreased even as ambulance and walk-in traffic increased. Despite the greater volume, patient satisfaction scores ranked above the 90th percentile for most questions. After reviewing department performance and staffing trends, leadership was agreeable to achieving and maintaining a wHPPV target of 4.468. No new or additional labor or supply costs were recommended or incurred during the project. There is the inherent risk of patient surge after flexing staff down during periods of decreased or low census, though this was seldom observed.

Limitations

This work represents findings at one hospital; some actions taken may not apply to other hospitals. As previously discussed, the Hawthorne effect was used intentionally to change behavior and drive results.

Department leadership integrated the concepts of staffing to demand and wHPPV rather than budgeted dollars when making staffing decisions. The deployment of a staffing-to-demand tool was effective in matching available staff with patient demand while optimizing labor expenses. The tool assisted leaders and staff by removing the subjectivity and perceptions of overcrowding by incorporating objective measures. Also, an organization-wide Position Review committee was formed to review hiring decisions for new positions in addition to any replacement positions for departments not meeting their productivity standard.

Lessons Learned and Next Steps

Hospital nursing and emergency department leadership are essential in guiding a department toward meeting and maintaining productivity targets. Holding leaders accountable is key to ensuring fiscally responsible stewardship of human resources and budgeted dollars. Transparency in sharing key performance indicators at the staff level contributed to the project's success. Reviewing these metrics daily created a culture of ownership in which staff were engaged and empowered to DRIVE™ additional improvements.[16]

Next steps for the department include sustaining front-line leaders using the staffing-to-demand tool and taking necessary actions based on the results. Departmental leaders also must review volumes and productivity continually and take steps to mitigate negative trends. Further reallocation of night-shift positions to mid-shift positions is needed.

Last, while the department reduced labor expenses by 14.9 FTEs, department staffing remains above the 75th percentile compared to its cohort. Additional ongoing opportunities exist to titrate staffing and continue to achieve high-quality outcomes at the lowest possible expense without jeopardizing patient safety and satisfaction.

Other Information

The authors provided implementation consulting services for this project. This paper and the metrics included are being published on a deidentified basis with the health system's written permission.

Funding

The healthcare organization contracted with BRG for performance improvement implementation consulting services. This performance improvement initiative was funded through an at-risk benefit methodology based on the return on investment that was realized.

---

16 DRIVE stands for Dynamic Rapidly Interactive Visual Environment. It is a web-based BRG platform that transforms raw data into actionable information through advanced analytics and novel visualizations. BRG's Healthcare Performance Improvement (HPI) practice uses DRIVETM to provide analytic tools to enhance decision making, monitoring, and sustainability of performance improvement goals. BRG HPI's products are conducted on HIPAA-compliant platforms.

BRG combines world-leading academic credentials with world-tested business expertise and purpose-built emerging technologies. Our culture centers on agility and connectivity which sets us apart and gets you ahead.

At BRG, our professionals include specialist consultants, industry experts, renowned academics, and leading-edge data scientists. Together, they bring a diversity of real-world experience, data, and human and artificial intelligence, to economics, disputes, and investigations; corporate finance; and performance improvement services that address the most complex challenges facing organizations across the globe.

Our unique structure nurtures the interdisciplinary relationships that give us the edge, laying the groundwork for more informed insights and more original, incisive thinking. When paired with our global reach and resources, our diverse perspectives and technical capabilities make us uniquely capable to address our clients' challenges. We get results because we know how to apply our thinking to your world.

At BRG, we don't just show you what's possible. We're built to help you make it happen.

THINKBRG.COM