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VISUAL MANAGEMENT OF NURSING SCHEDULES FOR WORKFORCE BALANCING AND REDUCTION OF OVERTIME COVERAGE: A LONGITUDINAL QUALITY IMPROVEMENT STUDY

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ABSTRACT

Introduction: Fluctuations in care demand and staff availability can lead to imbalances in nursing schedules and the need for extraordinary coverage. Visual management can support the identification of these imbalances and the reallocation of staff, yet its application to workforce balancing remains underexplored. **Objective:** To evaluate the association between implementation of a visual nursing schedule management system and changes in overtime coverage, personnel costs, and indicators of care demand and workforce allocation. **Methods:** A longitudinal quality improvement study was conducted in a private tertiary hospital in Midwestern Brazil. August 2025 was defined as the baseline period. The intervention began in September 2025 and was followed through May 2026. The system integrated schedules, absenteeism, hospital occupancy, staff redeployment, open positions, turnover, overtime coverage, and costs. Monthly descriptive measures were analyzed for a workforce comprising 132 nursing technicians and 28 registered nurses. **Results:** Overtime coverage decreased from 143 events at baseline to a post-implementation monthly mean of 23.4, an 83.6% reduction. Monthly costs decreased from BRL 32,693.00 to a mean of BRL 6,071.42, an 81.4% reduction. Hospital occupancy remained high, with a post-implementation mean of 82.27%. During the same period, weighted absenteeism was 1.37% and the mean staff redeployment rate was 3.39%. **Conclusions:** Implementation of visual management was associated with sustained reductions in overtime coverage and related costs without a reduction in care demand. The findings suggest that greater operational visibility and structured staff redeployment may improve hospital workforce balancing.

Keywords: Nursing staff, Hospital, Quality improvement, Absenteeism, Hospital costs, Efficiency, Organizational, Hospital administration.

INTRODUCTION

Nursing workforce management is a central determinant of hospital performance, as the availability and appropriate allocation of professionals are directly related to

continuity of care, patient safety, staff experience, and financial sustainability. In highly complex hospital settings, variations in absenteeism, open positions, turnover, and daily occupancy may generate operational imbalances, which are frequently compensated for by overtime coverage, double shifts, or overtime.[1-3]

Visual management is a relevant component of Lean Healthcare and seeks to make operational conditions visible, standardize responses, and support timely decision-making. In hospitals, visual tools have been applied to patient flow, safety, team communication, and process improvement. However, their specific use to balance the nursing workforce and reduce coverage costs remains underexplored.[4-9]

The intervention analyzed was based on the hypothesis that a structured visual system could reveal staffing deficits and surpluses at an early stage, facilitate internal redeployment, and reduce reactive and costly solutions. The objective of this study was to evaluate the association between the implementation of visual management of nursing schedules and trends in overtime coverage, the corresponding costs, and indicators of workforce demand and allocation.

METHODS

Study Design

A longitudinal, single-center quality improvement study structured according to the SQUIRE 2.0 recommendations. Routinely collected operational and administrative data were used, with comparison between one baseline month and nine months of post-implementation follow-up.[10]

Setting and Workforce

The study was conducted in a highly complex private hospital located in the Central-West region of Brazil. The dashboard monitored 64 beds distributed across inpatient units, a general intensive care unit, a coronary care unit, the emergency department, and clinical support areas. The workforce comprised 160 professionals: 132 nursing technicians and 28 nurses. Seven professionals served as float staff to support workforce balancing across units, without expansion of the total workforce.

Intervention

The implementation of visual management began in September 2025. The tool integrated nursing schedules, absenteeism, hospital occupancy, staff redeployment, open positions, turnover, overtime coverage events, and associated expenses. Clinical leadership used the dashboard to monitor staffing deficits and surpluses and decide on internal redistribution before authorizing overtime coverage.

The intervention logic was: visual monitoring of the workforce; early identification of deficits and surpluses; structured redeployment; improved staff balancing; reduction in overtime coverage; and reduction in operational costs.

Data Sources and Definitions

Data were extracted from institutional spreadsheets and business intelligence dashboards. Overtime coverage was defined as each individual record of additional paid work associated with a staffing deficit, including open positions, leaves of absence, medical certificates,

vacations, onboarding of a new employee, or other recorded operational needs. The monthly cost corresponded to the sum of the amounts paid each month.

Context indicators were hospital occupancy, absenteeism, redeployment rate, open positions, and turnover. The redeployment rate corresponded to the proportion of internal staff movements recorded in the institutional dashboard. August 2025 was defined as the baseline month. The post-implementation period comprised September 2025 through May 2026.

Data Analysis

Frequencies, monthly means, proportions, and percentage changes were calculated. The post-implementation mean was compared with the baseline month value. Monthly trend graphs and a Pareto analysis of the main reasons for coverage were prepared. Due to the availability of only one pre-intervention month, no formal interrupted time-series analysis or causal inference was performed.

Ethical Aspects

The study exclusively used aggregated and anonymized operational data, without access to identifiable information from patients or professionals. No clinical interventions or additional data collection were performed. The institutional ethical framework may be provided to the journal upon request.

RESULTS

Setting Characteristics

The workforce analyzed comprised 160 nursing professionals working 12- and 8-hour shifts. The 132 nursing technicians represented 82.5% of the workforce, and the 28 nurses, 17.5%. Seven float staff members were incorporated into the workforce and allocated to operational flexibility. The characteristics of the setting are presented in Table 1.

Table 1. Characteristics of the setting and the nursing workforce.

Variable	Value
Total nursing workforce	160
Nursing technicians	132
Nurses	28
Nursing technicians working 12-hour shifts	109
Nursing technicians working 8-hour shifts	23
Nurses working 12-hour shifts	24
Nurses working 8-hour shifts	4
Float nursing professionals	7
Monitored beds	64

Coverage and Costs

In the baseline month, 143 overtime coverage events were recorded, at a cost of R$ 32,693.00. During the nine post-implementation months, the monthly mean was 23.4 coverage

events and R$ 6,071.42, corresponding to reductions of 83.6% and 81.4%, respectively. The lowest level was observed in April 2026, with 13 coverage events and a cost of R$ 3,699.00. In May 2026, there was an increase to 28 coverage events and R$ 7,847.99; even so, these values remained 80.4% and 76.0% below baseline, respectively.

Baseline hospital occupancy was 80.48%, and the post-implementation mean was 82.27%.

Table 2. Monthly evolution of operational and financial indicators.

Month	Phase	Coverage	Cost	Occupancy	Repositioning	Absenteeism
Aug/25	Baseline	143	R$ 32,693.00	80.48%	-	-
Sep/25	Post	30	R$ 7,550.25	83.42%	4.26%	1.93%
Oct/25	Post	28	R$ 7,070.50	79.60%	3.32%	1.63%
Nov/25	Post	23	R$ 5,777.00	82.60%	2.39%	0.75%
Dec/25	Post	19	R$ 5,001.00	79.39%	4.20%	1.75%
Jan/26	Post	35	R$ 8,373.00	81.10%	3.50%	1.72%
Feb/26	Post	18	R$ 5,314,00	80,99%	2.30%	1.30%
Mar/26	Post	17	R$ 4,010,00	88.28%	2.48%	1.19%
Apr/26	Post	13	R$ 3,699.00	80,84%	3.70%	1.10%
May/26	Post	28	R$ 7,847.99	84.20%	4.35%	0.89%

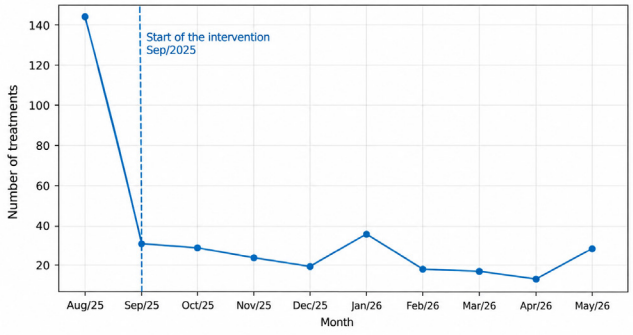

Figure 1. Monthly evolution of extraordinary coverages. The dashed line indicates the start of the intervention in September 2025.

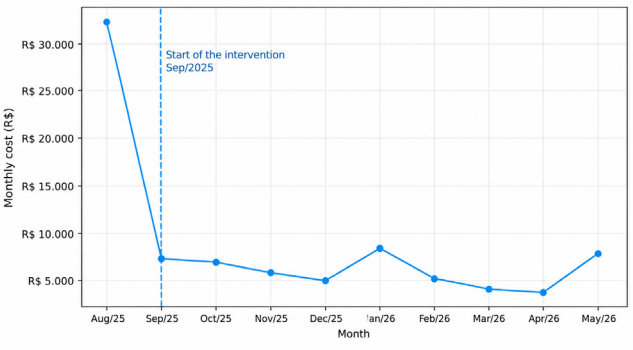

Figure 2. Monthly evolution of costs related to extraordinary coverages.

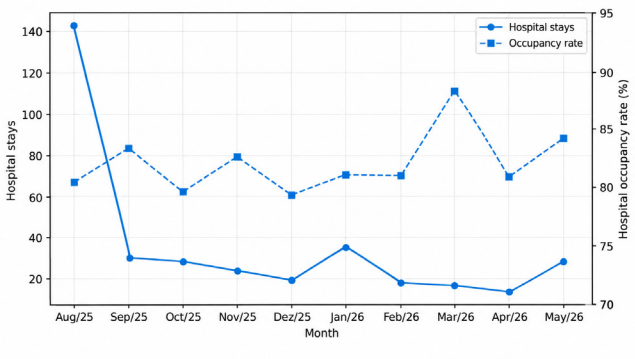

Figure 3. Monthly evolution of extraordinary coverage in relation to hospital occupancy.

Weighted absenteeism during follow-up was 1.37%, while the mean redeployment rate was 3.39%. The monthly series is presented in Table 2 and Figures 1 to 3.

Table 3. Main reasons for extraordinary coverage.

Reason	Events	Cost	%	% accumulated
Open position – termination	126	R$ 31,692.25	35.6%	35.6%
Sick leave	91	R$ 22,433.15	25.7%	61.3%
Accompaniment of new employee	32	R$ 7,801.17	9.0%	70.3%
Open position – leave of absence	29	R$ 7,681.00	8.2%	78.5%
Holidays	15	R$ 3,395.00	4.2%	82.8%
Suspension – administrative measure	14	R$ 3,806.00	4.0%	86.7%
Dialysis = Hemodialysis	13	R$ 2,426.00	3.7%	90.4%
Shortage	11	R$ 2,307.00	3.1%	93.5%
Integration	5	R$ 1,601.00	1.4%	94.9%
Rescheduling	4	R$ 1,334.00	1.1%	96.0%

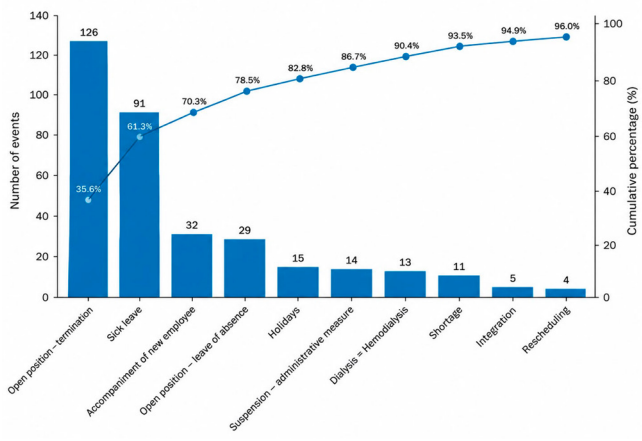

Figure 4. Pareto analysis of the main reasons for extraordinary coverage.

The units with the highest participation were the General ICU, 4th Floor, Emergency Department, 5th Floor, and CCU, which accounted for 81.1% of the events (Table 4).

Table 4. Units with the highest number of extraordinary coverage events.

Department/Unit	Events	Cost	%	Cumulative %
General ICU	77	R$ 18,704.75	21.8%	21.8%
4th Floor	72	R$ 20,219.65	20.3%	42.1%
Emergency	55	R$ 13,550.34	15.5%	57.6%
5th Floor	42	R$ 10,382.00	11.9%	69.5%
UCO	41	R$ 9,999.50	11.6%	81.1%
6th Floor	38	R$ 8,246.50	10.7%	91.8%
CME (Central Sterile Services)	15	R$ 3,202.00	4.2%	96.0%
Surgical Center	8	R$ 1,776.00	2.3%	98.3%
Diagnostics	2	R$ 371.50	0.6%	98.9%
Coordination	2	R$ 481.50	0.6%	99.4%

DISCUSSION

Main Findings

The implementation of visual management of nursing schedules was temporally associated with a substantial reduction in overtime coverage and related costs. This result occurred with sustained hospital occupancy and in the presence of factors that could increase the need for coverage, such as open positions, turnover, and absenteeism. The partial increase observed in May 2026 did not eliminate the observed operational effect, as the indicators remained substantially below baseline.

Interpretation

Lean Healthcare emphasizes transparency, flow, and waste reduction. In this study, visual management was applied to workforce allocation, making the relationship between schedules, absences, occupancy, redeployment, and costs visible. This arrangement facilitated faster and more structured decisions and reduced dependence on reactive responses.[4-7]

The relatively low weighted absenteeism suggests that the reduction in coverage was not solely due to a lower frequency of absences. Likewise, sustained occupancy indicates that the result was not explained by reduced demand for care. The most plausible interpretation is improved balancing of the existing workforce, supported by operational visibility, float staff, and internal redeployment.[11-14]

Hospitals frequently respond to variability in demand and staff availability through overtime or temporary hiring. Capacity and flow management strategies indicate that reducing avoidable variability and improving resource allocation can increase efficiency without compromising care delivery.[15-17]

In addition to operational tools, the ability to sustain improvements depends on organizational

maturity and governance structures capable of integrating monitoring, leadership, and decision-making. In a longitudinal study conducted in a Brazilian hospital, an evolution in organizational maturity was observed, with higher performance in the governance domain and progress in workforce management, reinforcing the importance of the institutional context for sustaining structured improvement interventions.[18]

Practical Implications

The tool can function as an operational control tower for nursing resources. Its implementation requires the definition of indicators, an update routine, transparent redeployment criteria, and active participation of leadership. The model has a relatively low technological cost and can be adapted to hospitals with different structures, provided that local staffing requirements and care complexity are taken into account.

Limitations

The study was conducted in a single hospital and used routinely collected administrative data. Only one pre-intervention month was available, limiting causal inference and precluding formal interrupted time-series analysis. There was no concurrent control group or direct assessment of clinical outcomes, staff experience, or missed care. The operational definitions of redeployment and coverage may limit direct comparability with other institutions.

Strengths

The study used real-world operational data, integrated financial and workforce indicators, and included hospital occupancy as a contextual measure. Follow-up through May 2026 included a month of partial rebound in coverage, allowing for a more conservative interpretation of the sustainability of the result.

CONCLUSION

Visual management of nursing schedules was associated with a substantial reduction in overtime coverage and staffing-related costs, without a reduction in hospital occupancy. The intervention increased the visibility of imbalances and supported the structured redeployment of available professionals, promoting better utilization of the existing workforce. Future studies should include longer baseline series, comparator groups, and measures of patient safety and staff experience.

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