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ORIGINAL ARTICLE

PATIENT CLASSIFICATION AND NURSING STAFF DIMENSIONING IN A PEDIATRIC INPATIENT UNIT

HIGHLIGHTS

1. Implementation of the Patient Classification System
2. Dimensioning the nursing staff in a pediatric inpatient unit
3. Labor management tools
4. Workload measurement

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ABSTRACT

Objective: to describe the implementation of the Patient Classification System and the dimensioning of the nursing staff in a pediatric inpatient unit. **Method:** a descriptive, cross-sectional, and retrospective study, carried out at a university hospital in the Midwest of Brazil. After the implementation of the Pediatric Patient Classification System, we compiled data from the classifications of the level of care complexity (N=4,639) among patients (n=608) admitted from January to December 2019. Descriptive statistical analysis was employed, including proprietary methodology for staff sizing. **Results:** there was a prevalence of intermediate care patients. According to the staff dimensioning, there was a surplus (+10) of mid-level workers, and the projected number of nurses (six) was compatible with the available number. **Conclusion:** the strategic implementation/employment of the Patient Classification System was indispensable for the pediatric nursing staffing forecast, considering that the staffing surplus found should be appreciated with caution.

DESCRIPTORS: Staffing Adjustment; Pediatric Nursing; Workload; Inpatient Care Units; Staff, Hospital.

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INTRODUCTION

In hospital pediatric care, the nursing team acts from care planning to its individualized and continuous execution, taking into consideration the specificities of the family nucleus and of everyone. Thus, the nurse, responsible for managing care and the nursing team, uses a wide range of skills, such as relational, ethical-legal, clinical, research and knowledge production, health education and management, as well as leadership and teamwork[1].

In the deployment of management competencies, the use of tools that rationalize the work process is elementary. Among the various management tools, the dimensioning of nursing staff aims to ensure the quality of patient care and the well-being of workers based on the forecast of human resources to meet the care needs of the clientele according to the degree of dependence and the service organization[2].

The workload in pediatric nursing, or non-pediatric nursing, is a central variable in staff dimensioning. One of the possibilities of measuring nursing workload is based on the average daily number of patients assisted, adjusted by the degree of dependence and average time of assistance spent with each patient according to the classification stratum[2-3]. For this, the use of a Patient Classification System (PCS) defines the degree of dependence of the clientele in relation to the nursing team and identifies the time spent in (in)direct care, enabling quantitative-qualitative planning of nursing personnel[2-4].

The high workload and the inadequate number of professionals have already been observed in research with Brazilian pediatric nursing teams[5-6]. In the United States of America, a study[7] measured the workload in pediatric nursing using two instruments: Subjective Workload Assessment Technique (SWAT) and the Aeronautics Space Administration - Task Load Index (NASA-TLX), which assess, respectively, cognitive, temporal, and psychological stress dimensions and the general perception of task-related workload. It was evident that 65% of the nurses surveyed evaluated time overload as the most important variable in their daily work, and, as for the performance factor, it was the one that most contributed to the workload[7]. This can mean that the pediatric nursing team has a high level of demand on their performance, which reflects a greater load of activities versus an inadequate quantity to meet the demands of the work[5].

A study[4] carried out in a pediatric surgical inpatient unit analyzed the times related to nursing activities and the effectiveness of two instruments, namely: Nursing Activities Score (NAS), which generates a score of up to 178.6 points and reflects the nursing workload; and the Pediatric Patient Classification Instrument (PPCI), which identifies the degree of dependence on care and the hours of assistance demanded. The study concluded that there was a mismatch between the nursing time required to care for pediatric surgical patients and the number of available personnel[4].

It is based on the solid and standardized premise3 that the use of valid and reliable pediatric PCS is fundamental for the care management of this clientele, as well as to guide the staff dimensioning of the nursing team in this segment of care production[4,6,8-10]. However, the strategic and standardized use of patient classification and nursing staff dimensioning in pediatric units is not yet fully consolidated, which indicates the need for further studies on this issue. Moreover, it is believed that the implementation of a PCS or any other means of measuring the nursing workload deserves due organizational adaptation.

In view of the above, this study aimed to answer the following questions: how was the process of implementing a Pediatric Patient Classification System? After being properly implanted, what is the dimensioning of nursing staff in a pediatric inpatient unit? In this sense, the objective was to describe the implementation of the Patient Classification System and the dimensioning of the nursing staff in a pediatric inpatient unit.

METHOD

A retrospective cross-sectional descriptive study was carried out in the pediatric inpatient unit of a public university hospital in Cuiabá, Mato Grosso, Brazil. The studied unit is a reference in the state for treatment of chronic, rare, and infectious diseases. It has 14 beds for patients aged 28 days to 16 years. The study was carried out in four stages, as described below:

1st Step: implementation of the PPCI[9] for classification of pediatric patients on the unit nurses' own initiative in mid-2015. On this occasion, it was defined that a validated PCS[8] would be the reference for pediatric classifications. Training was carried out by the unit's own nurses and standardization regarding the collective understanding of the classifications and regarding the daily entries of the digital documentation of the classifications, which became effective in 2018. This process is described in the results by means of an illustrative flowchart and was the basis for the acquisition of the empirical data of the research.

2nd Step: documentary survey in digital media, using Microsoft Office Excel® spreadsheet of the classification data of all patients admitted to the unit (n=608) in 2019 who were evaluated based on the pediatric PCS at least once during hospitalization. These data were obtained through the daily application of PPCI[9] validated in Brazil, which was previously and properly implemented in the studied hospital according to the first step.

The PPCI[9] is composed of three domains (family, patient, and therapeutic procedures) that unfold into 11 evaluative indicators, as follows: Family Domain: companion participation; support network and family support; Patient Domain: activity; oxygenation; mobility and ambulation; feeding and hydration; eliminations; hygiene and body care; Therapeutic Procedures Domain: controls measurement interval; drug therapy; and cutaneomucosal integrity. Each indicator is scaled in four levels/points. With the assessment, the pediatric patient receives a score ranging from 11 to 44 points, defining the degree of care dependence in: Minimal Care patients (score between 11 and 17 points); Intermediate Care patients (score between 18 and 23 points); High Dependency patients (score between 24 and 30 points); Semi-Intensive Care patients (score between 31 and 36 points); and Intensive Care patients (score between 37 and 44 points)[9]. It is prudent to emphasize that in the daily dynamics of classification of pediatric patients under six years of age, at least the classification of intermediate care is assigned, regardless of the presence of a companion[3].

3rd Step: dimensioning of the nursing professionals of the unit. This step was performed after compiling the patient classification data from the second step and the quarterly average (taking as calculation basis 90 to 92 days) of each patient complexity level verified using the pediatric PPCI over the base year. In addition, the daily average of each PPCI category was calculated, based on 365 days.

The calculation of the nursing staff workload was represented, in this study, both by the level of dependence on care of the pediatric clientele as measured by the ICPP[9] and, mainly, by the volume of time (in hours) required to meet this demand. Thus, according to the parameters provided in the Resolution of the Federal Council of Nursing (COFEN) No. 543/2017, the Calculation of Nursing Staffing (QP- in Portuguese) dimensioned in the unit was obtained based on an equation, namely: QP = THE x KM[3], where THE = Total Nursing Hours and KM = Marine Constant.

The weekly workload of the predominant nursing team in the unit studied was 36 hours per week. Since there was no systematized measurement of nursing absenteeism in the study hospital, the minimum Technical Safety Index (IST-in Portuguese) was used (15%). Thus, considering these values and the seven days of uninterrupted work in the week, the reference KM value of 0.2236[3] was used. The qualitative adjustment (percentage of nurses and nursing technicians/assistants) of the dimensioned staffing was defined considering the care dependency level category that demanded the highest volume of nursing hours in

the annual compilation, considering the Brazilian parameters in force[3].

The data from the second and third stages were analyzed by descriptive statistics. To compare the dimensioned chart with the available/actual chart in the pediatric unit, the work schedules referring to the same PPCI collection period were consulted. The option of not analyzing complete data from 2020, but rather from 2019 was intentional due to the context of the pandemic of COVID-19, which greatly altered the work dynamics in the hospital, including relocation of nursing staff.

4th Step: with the pediatric nursing staff dimensioned, an example of allocation/distribution of workers by professional category in work shifts was schematized, considering the dynamics of the researched sector: two-day shifts (morning and afternoon) and three-night shifts. For this, we exemplified the distribution of the ratio of patients per nursing worker in each shift, to verify the (in)compatibility of this ratio with the regulations in force[3]. In this exercise, we considered a 100% occupation in the unit and the removal of 15% (Technical Safety Index) of the total professionals distributed by category, foreseeing that these workers (properly rotated) would not be computed in the scale, because they would have the role of covering absences in the sector. In other words, they represent workers on vacation, time off, or even absenteeism.

The study followed the appropriate ethical requirements and was approved by the Research Ethics Committee (CAEE 07626019,5,0000,5541) under opinion number 3,603,794.

RESULTS

Figure 1 describes the process of implementing the Pediatric Patient Classification Instrument (PPCI) from the initial processes to the possibility of obtaining dependency level data from the pediatric clientele.

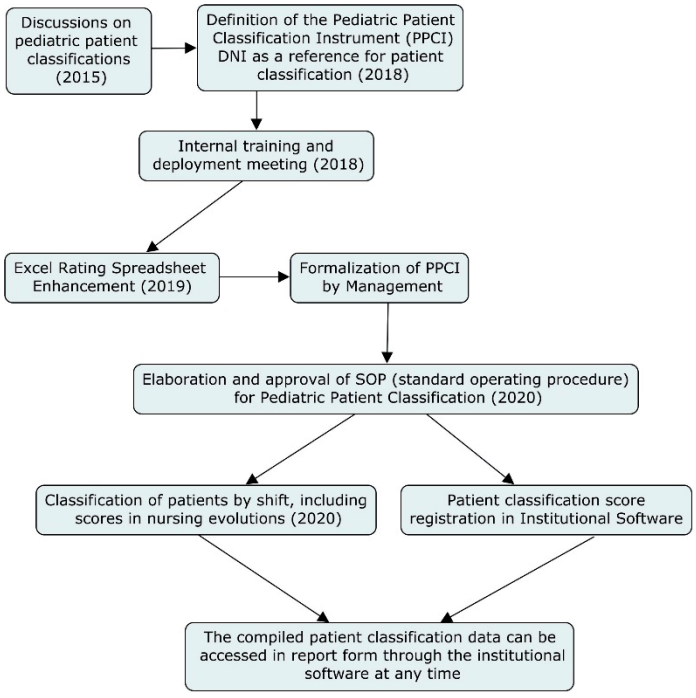

Figure 1 - Flow of activities for the implementation of the Daily Patient Classification System in a pediatric inpatient unit from 2015 to 2020. Cuiabá, MT, Brazil, 2020

Source: authors (2021).

We analyzed 4,639 daily classifications of patients (n=608) admitted in 2019. Table 1 shows the frequency of nursing care complexity level by quarter with emphasis on the demand for intermediate care in all periods.

Table 1 - Distribution of patient classifications according to the level of complexity of nursing care in the pediatric inpatient unit, by quarter. Cuiabá, MT, Brazil, 2019

Period	*MC n(%)	*IC n(%)	*HDC n(%)	*SIC n(%)	*ITC n(%)	Total n(%)
1st Quarter	283(24.1)	799(68.05)	69(5.9)	18(1.5)	5(0.42)	1174(100)
2nd Quarter	315(25.5)	689(55.74)	212(17.15)	18(1.4)	2(0.16)	1236(100)
3rd Quarter	129(10.3)	639(51.44)	444(35.76)	27(2.1)	3(0.24)	1242(100)
4th Quarter	131(13.2)	514(52.07)	324(32.83)	18(1.8)	-	987(100)
Full Year	858(18.49)	2641(56.94)	1049(22.61)	81(1.75)	10(0.21)	4,639

(N= 4.639)

*MC: Minimal Care; *IC: Intermediate Care; *HDC: High Dependency Care; *SIC: Semi-Intensive Care; *ITC: Intensive Care.
Source: author (2019).

Table 2 illustrates the average daily number of patients and the respective nursing hours demanded for each level of care complexity, as well as the annual average and total nursing hours (TNH).

Table 2 - Distribution of the daily averages of inpatients and the required nursing hours by level of care complexity in the pediatric unit per quarter. Cuiabá, MT, Brazil, 2019

Period	Average Patients (Nursing Hours Required)					
	MC	IC	HAD	SIC	ICT	TNH
1st Quarter	3.14(12.56)	8.87(53.22)	0.76(7.6)	0.2(2)	0.05(0.9)	76.28
2nd Quarter	3.46(13.84)	7.57(45.42)	2.32(23.2)	0.19(1.9)	0.02(0.36)	84.72
3rd Quarter	1.40(5.6)	6.94(41.64)	4.82(48.2)	0.29(2.9)	0.03(0.54)	98.88
4th Quarter	1.42(5.68)	5.58(33.48)	3.52(35.2)	0.19(1.9)	-	76.26
Full Year	2.35 (9.4)	7.23 (43.38)	2.87 (28.7)	0.22 (2.2)	0.02 (0.36)	84.04

MC: Minimum Care; IC: Intermediate Care; HAD: High Dependency Care; SIC: Semi-Intensive Care; ICT: Intensive Care; TNH: Total Nursing Hours.
Source: author (2019).

Chart 1 shows the comparison between the actual (available) and the dimensioned staff. The study showed a surplus of mid-level personnel and an adequate number of

nurses for the pediatric unit. It also exemplifies the dimensioned staff allocation in a "full scale" period (no absences), in shifts, accounting in this quantity the subtraction of 15% of nurses and technicians/nursing assistants. Based on this, it is possible to predict how many patients each worker would assist in his/her shift, for example, 100% occupation of the 14 beds.

Chart 1 - Dimensioning and allocation of the nursing staff in the pediatric inpatient unit. Cuiabá, MT, Brazil, 2019

Dimensioning of nursing staff	**Real Board**			**Dimensioned Board**			**Déficit / Superávit**		
Inpatient Unit	***N**	***NT/ NA**	**TOTAL**	**N**	***NT/NA**	**TOTAL**	**N**	**NT/NA**	**Total**
Pediatric Clinic	6	23	29	6	13	19	-	+10	+10
Example of staffing allocation in the pediatric inpatient unit by shifts on a full scale based on staff dimensioning and the removal of the Technical Safety Index in the distribution of professionals									
Shift	*N		*NT/NA		Proportion of patients/ mid-level professional		Proportion of patients/nursing staff		
Morning	1		3		4.6		3.5		
Afternoon	1		2		7		4.6		
Night 1	1		2		7		4.6		
Night 2	1		2		7		4.6		
Night 3	1		2		7		4.6		
Índice de Segurança Técnica (Cobertura de ausências previstas e não previstas)	1		2		-		-		

*N: Nurse *NT: Nursing Technician and *NA: Nursing Assistant.
Source: author (2019).

DISCUSSION

The process of PPCI implementation in the pediatric inpatient unit had as a starting point the nurses' common interest in implementing a management tool, to meet the demands and specificities of this clientele. This is commendable, since the PCS enables the measurement of workload and the dimensioning of the nursing team, as reported in a study conducted in a university hospital's medical clinic[11] and, furthermore, the collective interest of the pediatric unit nurses on the subject gives them commitment to quality care.

The option for the PCS using the PPCI was because this is the most appropriate for the clientele in question, among the instruments recommended by Resolution No. 543/2017 of COFEN[3], besides the issue of including the family in its classification9. A study conducted in a General Hospital in the South Zone of the city of São Paulo identified that 93% of participating nurses agree with the need to classify and evaluate the pediatric

patient[4]. However, it is known that stating the importance of a work process or instrument does not guarantee its adherence.

The process of PPCI implementation in the pediatric unit was somewhat long, perhaps because it is a public institution, which is often associated with managerial sluggishness. However, it is believed that the shared and systemic nature of the implementation is more important than the time itself for its incorporation into the work routine.

The appropriateness, pertinence, and accuracy of PCS are extremely important, since it is known that institutions serve patients with peculiar characteristics that may sometimes differ from those commonly expected for the clientele in terms of age, socioeconomic profile, severity, and/or diagnostic and therapeutic procedures. This reinforces the need for strict compliance with the validation processes recommended for the construction and/or adaptation of new PCS, which has recently occurred in the context of the PPCI, which was adapted for use with neonatal patients8, who are known to have differences compared to pediatric patients.

A recent study validated the PPCI for more complex pediatric patients admitted to semi-intensive care units, which is consistent with the need for strategic implementation of this instrument to measure the pediatric nursing workload and to support the staffing of spaces beyond the non-critical care units[12]. In turn, the Greek study validated NAS and Therapeutic Intervention Scoring System For Critically Children (TISS-C) for the pediatric intensive care setting[13]. Thus, based on the reported implementation experience and related literature, we infer that the process of appropriation of PCS and other means of measuring workload in pediatric nursing is considerably positive and of widespread interest, but it deserves caution regarding the most appropriate, standardized, and shared means to be employed in the work dynamics.

After one year of implementation and systematic application of PPCI in the pediatric unit, it was found that 84.04 hours of nursing care were required in the year, with a large amplitude between the maximum (98.88) and minimum (76.26) hours in the survey quarters. This amplitude reinforces the need to obtain a reliable historical series of patient classification for the process of staff dimensioning[2]. Therefore, if the unit had been sized based on the maximum workload found, which was in the third quarter, the staff would have been 22 workers, not 19, as found. In counterpoint to this issue, if the nursing staff had been sized based on the minimum workload verified in the fourth quarter, the staff would be composed of only 17 nursing professionals.

The pediatric unit presented a concentrated profile of intermediate care patients added to the current regulation, Resolution No. 543/2017 of COFEN[3], which classifies under six years of age as intermediate care patients, even if classified as minimal care, given the quali- quantitative competencies of nursing care. This finding converges with results from studies conducted in other Brazilian teaching hospitals located in the states of São Paulo[4] and Paraná[6]. It is known that patients defined in this level of complexity are those stable from the clinical and nursing point of view with partial dependence on these professionals to meet basic human needs[3]. Despite this definition, it is prudent to rethink the type of patients seen in pediatric units, who naturally have care demands that go beyond those of organic-functional order. A fact that reinforces this allusion is the new adaptation of the PPCI for the neonatal area, which no longer includes the category of minimal or intermediate care in its stratification[8].

It is noteworthy that the hospital studied does not have a pediatric ICU, but eventually children evolve to intensive and/or semi-intensive care due to clinical worsening, being under the care of the nursing team until their transfer to intensive care in another institution. This assertion is anchored in the fact that, despite the low frequency, we found patients classified in these levels of complexity in the sector, which lacks human resources, materials and technological density appropriate for critical care.

The pediatric unit had the quantity of six nurses, which was in accordance with the

predicted staff dimensioning. According to the example of allocation made with data from the dimensioned staff chart, it would be possible to foresee one nurse per work shift in the sector, and to count on another nurse to cover foreseen and unforeseen absences. In clinical practice, it is agreed that considering the number of beds in the unit (14) and the prevalent profile of intermediate care patients, one nurse per shift seems reasonable for the feasibility of care management, illustrated, for example, by the Nursing Care Systematization and/or management of safety and quality of care protocols. This is because the number of patients could be divided among the shifts, for example, four patients for daytime nurses and six for nighttime nurses, or six patients in the morning, four in the afternoon and four in the evening, etc.

In contrast to the above, relying on "only" one senior professional to cover absences may not be ideal, since absenteeism among nurses is cited in the literature as a serious problem to be addressed by leadership[5]. In this context, if we consider the nursing team, a study carried out in a public hospital in the South region of Brazil showed that the absenteeism rate is three times higher in nursing when compared to other professional categories in the health area[14].

Another problem that eludes the expressed data and interpretations is the fact that in the hospital work dynamics, nurses often have their activities bureaucratized, even assuming demands that could be performed by workers from other areas, besides being frequently interrupted during the work day[15], which exceeds the workload measured by the PPCI and, consequently, the planned staffing. This reinforces the need not only to provide staff in terms of quantity and category, but also to rationalize, qualify, and streamline work processes to add improvements without, however, demanding rework and/or bureaucratization.

Despite the surplus of mid-level workers (+10), it is prudent to point out that in periods with an occupancy rate of 100%, the professional/patient ratio can vary in levels of overload, depending on the number of staff present, with reflections in overwork, accumulation of functions, and lack of professionals in hospitals[16].

It was possible to predict that, based on the dimensioned framework, it would be feasible to allocate one mid-level nursing professional (responsible for most of the demand of direct care of patients with lower severity) for seven patients with predominantly intermediate care, as well as one nursing worker for every 4.66 patients, considering the total team. This, in turn, disagrees with the Brazilian regulations in force, which recommend one nursing worker for every four patients in the different work shifts in case of clients with a prevalence of intermediate care[3].

Despite the above, it is reasonable to deduce that, considering only one nurse for each work shift, their participation in the execution of direct care would be unrepresentative in comparison with the mid-level team. Based on the proportion recommended by the current nursing staff dimensioning parameters in Brazil[3], we can see that the surplus of nursing technicians must be seen with caution, and possibly deserves revision in its interpretation. Therefore, to meet the ratio of one worker for every four patients, it would be necessary to add at least one more nursing technician/auxiliary in each work shift, which would still result in a surplus of mid-level personnel, however, lower than the observed.

A study carried out in a hospital in the interior of the state of São Paulo estimated the TSI to be around 42% for nurses and 38% for nursing technicians[17], in other words, much higher than the minimum 15% recommended by the Resolution in effect, which is perhaps another perspective to interpret the observed surplus with caution and reasonableness.

In view of the above, it is believed that the major limitation of the study is because minimal IST was used for the pediatric nursing staff dimensioning process, but that it was a product of the conditions or lack of absenteeism monitoring in the survey hospital. However, it is considered that the research brings concrete contributions to pediatric nursing management for having collected data over a long period; presenting the sizing in a procedural manner, focused not only on the equations and parameters needed, but also on

the very incorporation of the PPCI in the unit routine; and, mainly, for clearly demonstrating that the results of the sizing need careful and well contextualized appreciation by decision makers. In this scope, the study evidences its social contribution under the perspective that the forecast and provision of adequate nursing staff is an emblem of qualified and safe care.

CONCLUSION

The process of implementing a PCS in the pediatric inpatient unit was long and included activities of standardization of conducts among nurses, strategic definition of an instrument for patient classification and data computerization. In all stages, teamwork, and managerial support, including technological support, were fundamental.

With the standardized application of the pediatric clientele classification instrument, the predominance of patients dependent on intermediate care was verified. Thus, it was observed, by the staff dimensioning, a surplus of mid-level workers and an adequate number of nurses in the unit in comparison to the available staff. However, this surplus deserves to be evaluated with caution as a conclusive finding because, considering the profile of mostly intermediate care patients and the recommendations in force, the ratios of patients to workers allocated in shifts may not be adequate.

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