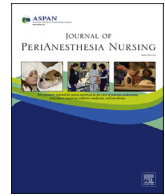




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## Research

## Missed Nursing Care in the Postanesthesia Care Unit: A Cross-Sectional Study

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## A B S T R A C T

**Keywords:**

postanesthesia care unit  
missed nursing care  
omission errors  
intensive care unit overflow patients

**Purpose:** This study aimed to investigate the prevalence, activities, and reasons for missed nursing care in the postanesthesia care unit (PACU) and the effect of intensive care unit (ICU) overflow patients.

**Design:** This is a single-center, cross-sectional survey.

**Methods:** Nineteen PACU-registered nurses of a tertiary care hospital participated. Over a 7-month period, participants were asked to complete a validated questionnaire, which included 19 items related to missed nursing care activities and 10 items related to reasons for missed nursing care.  $\chi^2$  test and 1-way analysis of variance were used for data analysis.

**Findings:** Questionnaires (N = 397) were completed. Prevalence of missed nursing care activities was 78.1% and was significantly higher in cases of ICU overflow patients ( $P < .001$ ). The three most reported missed nursing care activities were "drug preparation, administration, and assessment of effectiveness," "patient surveillance and assessment," and "care associated with pain"; prevalence was significantly higher in cases of ICU overflow patients ( $P = .036$ ,  $P = .003$ , and  $P = .004$ , respectively). The three most reported reasons for missed nursing care were "inadequate number of nursing personnel," "unexpected rise in patient volume or acuity," and "heavy admission or discharge activity".

**Conclusions:** The findings indicated missed nursing care was common in the PACU and increased in case of ICU overflow patients. Therefore, missed nursing care needs to be identified and minimized, while the number and length of stay of critically ill patients admitted to the PACU should be limited.

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The concept of missed nursing care has attracted considerable research interest since this was first studied in 2006.<sup>1</sup> Missed nursing care is defined as any aspect of required patient care that is omitted (in part or in whole) or significantly delayed.<sup>2</sup> Therefore, it constitutes an error of omission, which is more difficult to identify and represents a larger health care problem than errors of commission. Missed nursing care has been identified as an important nurse-sensitive performance measure and is associated with an increased risk for medication errors, patient falls, urinary tract infections, pressure ulcers, critical incidents, compromised quality of care, decreased patient satisfaction, and 30-day mortality after

surgery.<sup>3-5</sup> Although causality of these associations is difficult to confirm, it has been suggested that missed care mainly attributed to nurse understaffing and heavy workloads has the potential to be followed by adverse patient outcomes.<sup>3</sup>

To investigate missed nursing care, Kalisch<sup>1</sup> developed the MISSCARE survey, which included 19 items about elements of care and 17 items about reasons for missed care, all rated on a 4-point Likert-type scale. This survey had satisfactory internal consistency (Cronbach's alpha ranged between 0.64 and 0.86) and test-retest reliability (Pearson correlation coefficients were 0.86 and 0.87). The MISSCARE survey, along with the Basel Extent of Rationing of Nursing Care instrument<sup>6</sup> and the International Hospital Outcomes Consortium/RN4CAST survey,<sup>7</sup> can be found in most current literature reviews.

As per the findings of a recent systematic literature review,<sup>8</sup> studies on missed nursing care have mainly been conducted in

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medical wards, surgical wards, oncology wards, and intensive care units (ICUs) of general hospitals. Prevalence of care left undone ranged from 75% to 93%, with an overall estimate of 88% across 12 European countries. Most commonly reported elements of missed care included planning and communication, comfort/talking with patients, emotional and psychological support, assessment of newly admitted patients, oral hygiene, and documenting care. Monitoring of vital signs was least likely to be reported as missed. Human resource issues, mainly nurse understaffing, have constituted the majority of reported reasons for missed care, along with insufficient material resources and poor communication or teamwork.<sup>8,9</sup> It is worth noting care activities were commonly omitted or delayed in cases of low registered nurse staffing levels.<sup>10</sup> Moreover, less missed care was reported during morning shifts (compared with evening and night shifts).<sup>11</sup>

### The Postanesthesia Care Unit: Particularities and Effects of ICU Overflow Patients

During the immediate postoperative period, surgical patients are at high risk for a number of critical incidents such as hypoxemia, airway obstruction and hypotension, while agitation, nausea and vomiting, excessive pain, and hypothermia are also common. In this context, Phase I postanesthesia care unit (PACU) aims at optimizing safety in regaining consciousness and restoring hemodynamic and respiratory stability of patients.<sup>12,13</sup> PACU staff, with sufficient and appropriately trained nursing personnel, is a prerequisite for the prevention and timely management of critical incidents, continuous assessments, and specialized care interventions.<sup>14,15</sup>

A gap exists in the literature on the prevalence, elements, and reasons for missed nursing care in the PACU. For instance, the findings of studies conducted in hospital wards or ICUs may not be generalizable to the PACU for a couple of reasons: (1) PACU care activities differ considerably in terms of both the nature and time distribution compared with the rest of the inpatient areas. PACU nurses administer intravenous drugs, continuously monitor hemodynamic stability, and support the airway and breathing of patients; little time is spent performing patient hygiene, ambulating patients, and/or conducting patient education<sup>16</sup>; (2) PACU operations are characterized by marked fluctuations of patient arrivals from the operating room and tenuous patient acuity.<sup>17</sup> Missed nursing care is expected to be common during peak periods of such fluctuations, considering that the number of available nurses can be fewer than the number of nurses needed for adequately meeting patient care demands.

During the last 2 decades, there has been a worldwide trend for the admission and temporary care of ICU overflow patients in the PACU, owing to the experience of PACU nurses in managing unstable patients and equipment availability.<sup>18-20</sup> However, critically ill patients are generally characterized by higher care demands than postoperative patients, and PACU nurses may not be properly trained for meeting their demands. For example, PACU nurses may not be trained in the administration of parenteral nutrition or know how to appropriately wean a patient from a ventilator.<sup>19,21</sup> Similarly, PACU nurses had reported difficulty trying to manage both PACU and ICU overflow patients, confusion about physician coverage, documentation, and legitimate privacy.<sup>22</sup> Therefore, increased workload and treatment prioritization may compromise the provision of nursing care to postoperative patients.

### Aims

The aims of this study were to (1) develop a questionnaire regarding missed nursing care perceptions among PACU nurses; (2)

identify the prevalence, activities, and reasons for missed nursing care in the PACU setting; and (c) explore the effect of ICU overflow patients on missed nursing care in the PACU.

### Methods

#### Study Design, Setting, Participants, and Data Collection

This was a single-center, prospective, cross-sectional survey, which adhered to the Strengthening the Reporting of Observational Studies in Epidemiology checklist for observational research. The study was conducted in the Phase I PACU of a tertiary care university hospital in Greece from December 1, 2019 to June 30, 2020. The PACU met the needs of 12 operating rooms and covered the following surgical services: general, cardiothoracic, orthopedic, urology, obstetrics, ear-nose-throat, and neurosurgery. The PACU was staffed by three 8-hour nursing shifts (7:00 to 15:00, 15:00 to 23:00, and 23:00 to 7:00, respectively). Nurses employed in the PACU constituted the study population. Anonymous, self-administered questionnaires were distributed at the end of each shift, and nurses were asked to complete them in private and return them in sealed envelopes (provided by the investigators) to designated boxes.

#### Questionnaire: Development and Validation

Because no instrument for evaluating missed nursing care in the PACU could be found in the literature, the development of a questionnaire that could meet this aim was considered necessary. The elements of and reasons for missed nursing care included in previous surveys were taken into consideration.<sup>1,6,7,10</sup> Moreover, determination of activities in the PACU setting was based on previous descriptions and evaluations of PACU nursing activities through the use of the work sampling technique.<sup>16</sup> The activities were thoroughly discussed among investigators for corresponding definitions to activities and compared with surveys measuring missed nursing care. Overall, 17 items about PACU nursing care activities and 9 items about reasons for missed care were initially formed.

To determine content validity of the questionnaire, the content validity index (CVI) was used. A panel of seven experts (nurses with >20 years of experience in the anesthesia department, who were currently not employed in this PACU) were asked to rate items for clarity, relevance, accuracy, and readability on a 4-point Likert-type scale, comment on their content, and identify important missing themes. For each item, the CVI was calculated by determining the proportion of ratings  $\geq 3$  and was considered satisfactory if its value was  $\geq 0.86$ . With regard to nursing care activities, 1 item did not have satisfactory CVI and was deleted, while three additional items were suggested by the experts and added by consensus. With regard to reasons for missed care, all items had satisfactory CVIs; however, 1 item was split into two more specific ones by consensus.

The final questionnaire form included three sections: (1) shift type and number of ICU overflow patients during shift; (2) missed nursing care activities; and (3) reasons for missed nursing care. Missed nursing care activities were evaluated by the questions "With regard to postoperative patients' care during your last shift, do you believe that any activities were necessary but left undone, or significantly delayed, because you lacked the time to perform them? If yes, which of the following?" These questions were followed by a statement, "no activities were left undone or significantly delayed" and a list of the 19 developed items about missed nursing care activities. Reasons for missed nursing care (responses provided in case 1 or more care activities were left undone or

significantly delayed) was evaluated by the question, "With regard to postoperative patients' care during your last shift, which of the following reasons accounted for care activities left undone or significantly delayed?" which was followed by a list of the 10 developed items about reasons for missed nursing care. For the second and third sections, participants were asked to tick every item that applied.

Because the questionnaire was developed in Greek language, ensuring language validity was necessary. A forward translation of its content from Greek to English was conducted by an English language professor whose native language was English. Subsequently, a back translation into Greek, conducted by a professional translator whose native language was Greek, occurred. The back-translated version was then compared with the original one to identify and solve any word discrepancies between the two versions.<sup>23</sup>

### Ethical Considerations

Permission to conduct this study was obtained by the hospital ethics committee and the hospital science council (approval number 30658/16-12-2019). Study aims and methods were fully explained to PACU nursing personnel, and informed consent was implied by the return of completed questionnaires. Nurses were informed that their participation was voluntary and they could quit the study at any time.

### Data Analysis

The minimum number of questionnaires required for the prevention of significant random sampling error in this survey was estimated to be 241, for <5% margin of error, 95% confidence interval, 50% population variability, and an overall number of 639 shifts (213 days included in the 7-month data collection period, multiplied by three daily shifts).<sup>24</sup>

As per participants' responses, the following measures were estimated:

- (1) prevalence of missed nursing care =  $\frac{\text{number of questionnaires with at least one missed nursing care activity reported}}{\text{number of completed questionnaires}}$ ,
- (2) prevalence of missed nursing care activities =  $\frac{\text{number of questionnaires with a particular missed nursing care activity reported}}{\text{number of completed questionnaires}}$ ,
- (3) prevalence of reasons for missed nursing care =  $\frac{\text{number of questionnaires with a particular reason for missed nursing care reported}}{\text{number of questionnaires with at least one missed nursing care activity reported}}$ ,
- (4) score of missed nursing care = sum of missed nursing care activities reported in a questionnaire.

$\chi^2$  test with Marascuillo procedure for post hoc analysis between groups was used to compare the prevalence of missed nursing care, the prevalence of missed nursing care activities, and the prevalence of reasons for missed nursing care within shifts, and as per the presence of ICU overflow patients. Fisher's exact test was used if cell values were <5. As per Kolmogorov-Smirnov test, the score of missed nursing care was normally distributed. A 1-way analysis of variance was used to test differences of this score within shifts and as per the presence of ICU overflow patients followed by post hoc pairwise comparisons (Scheffe's test). The Statistical Package for Social Sciences v.24.0 (SPSS Inc., Chicago, IL) was used for data analysis, except for the Marascuillo procedure, which was conducted with XLSTAT software (Addinsoft, Paris, France). Statistical significance was set at  $P < .05$ .

## Results

### Participants' Demographics and Distribution of Completed Questionnaires

A total of 19 PACU nurses consented to participate in and completed the study. All of them were women and registered nurses, and their mean age was  $43.8 \pm 6.3$  years. Six of them had MSc/PhD degree, and their mean professional experience was  $14.6 \pm 6.8$  years. During the data collection period, 397 questionnaires were completed in total; of them, 180 (45.3%) were completed after the morning shift, 121 (30.5%) after the evening shift, and 96 (24.2%) after the night shift. There were no ICU overflow patients in 40 (10.1%) shifts, 1 ICU overflow patient in 154 (38.8%) shifts, and more than 1 ICU overflow patient in 203 (51.1%) shifts.

### Prevalence, Activities, and Reasons for Missed Nursing Care

Summary statistics for the prevalence and score of missed nursing care are presented in Table 1. A total of 310 questionnaires reported at least 1 missed nursing care activity, indicating that the prevalence of missed nursing care was 78.1%. Prevalence of missed nursing care was higher during the morning and evening shift (compared with the night shift,  $t[2] = 197.046$ ,  $P < .001$ ) and in cases of one and more than one ICU overflow patients (compared with cases of no ICU overflow patients,  $t[2] = 31.973$ ,  $P < .001$ ). The score of missed nursing care ranged between 1 and 10, with a mean score of  $3.80 \pm 1.73$ . This score was higher during the morning and evening shift (compared with the night shift,  $t[2, 307] = 7.162$ ,  $MSE = 2.874$ ,  $P < .001$ ), and in cases of one or more than 1 ICU overflow patient (compared with no ICU overflow patients,  $t[2, 307] = 6.826$ ,  $MSE = 2.880$ ,  $P < .001$ ).

Summary statistics for the prevalence of missed nursing care activities are presented in Table 2. In total, 1,059 missed nursing care activities were reported in the completed questionnaires. Among them, the three most reported activities were "drug preparation, administration, and assessment of effectiveness," "patient surveillance and assessment," and "care associated with pain." These activities were also more reported in cases of one and more than 1 ICU overflow patient (compared with cases of no ICU overflow patients,  $t[2] = 6.659$ ,  $P = .036$  for "drug preparation, administration, and assessment of effectiveness,"  $t[2] = 11.276$ ,  $P = .003$  for "patient surveillance and assessment," and  $t[2] = 11.778$ ,  $P = .004$  for "care associated with pain").

Summary statistics for the reasons for missed nursing care are presented in Table 3. Among them, the three most reported reasons were "inadequate number of nursing personnel," "unexpected rise in patient volume or acuity," and "heavy admission or discharge activity." "Inadequate number of nursing personnel" was more reported in cases of one and more than 1 ICU overflow patient (compared with cases of no ICU overflow patients,  $t[2] = 12.755$ ,  $P = .002$ ). "Supplies/equipment not available when needed" was more reported in cases of more than 1 ICU overflow patient (compared with cases of no ICU overflow patients,  $t[2] = 6.410$ ,  $P = .045$ ).

## Discussion

To our knowledge, this study was the first that investigated missed nursing care in the PACU. Results indicated the prevalence of missed nursing care was high, considering one or more care activities were omitted or significantly delayed in approximately

**Table 1**  
Prevalence and Score of Missed Nursing Care (N = 397)

	Total	Shift Type			P Value	Number of ICU Overflow Patients			P Value
		Morning (n = 180)	Evening (n = 121)	Night (n = 96)		0 (n = 40)	1 (n = 154)	>1 (n = 203)	
Prevalence of missed nursing care <sup>*†</sup>	310 (78.1%)	174 (96.7%)	110 (90.1%)	26 (27.1%)	<b>&lt;.001</b>	21 (52.5%)	118 (76.6%)	171 (84.2%)	<b>&lt;.001</b>
Score of missed nursing care <sup>‡§</sup>	3.80 ± 1.73	4.17 ± 1.85	3.53 ± 1.43	2.46 ± 1.07	<b>&lt;.001</b>	2.33 ± 1.02	3.54 ± 1.42	4.16 ± 1.86	<b>&lt;.001</b>

ICU, intensive care unit.

\* Data shown as n (%), bold indicates statistical significance ( $\chi^2$  test).

† P < .001 between morning and night shift, and between evening and night shift; P < .001 between no and 1 ICU overflow patient, and between no and >1 ICU overflow patient (Marascuillo procedure).

‡ Data shown as mean ± SD, bold indicates statistical significance (1-way analysis of variance test).

§ P < .001 between morning and night shift; and between evening and night shift; P < .001 between no and 1 ICU overflow patient, and between no and >1 ICU overflow patient (Scheffe's test).

four of five shifts. This finding comes in contrast with previous reports of less missed care in small clinical areas and in settings similar to the PACU, such as the operating room and the ICU, compared with hospital wards.<sup>11,25</sup> High prevalence of missed care in the PACU could possibly be attributed to the wide variation in the number and acuity of patients, which is expected to be followed by imbalances between overall patient care demands and the amount of care that can be provided by available nurses. Such variation is rarely encountered in other clinical settings and is expected to be more common when the number of elective operations is high. In this context, the finding that missed care was significantly higher in the morning and evening compared with the night shift seems to support this explanation because the vast majority of patients who have undergone elective operations are admitted in this PACU between 10:00 and 18:00.

Previous speculation was that care activities most likely to be omitted or delayed are those perceived to be of minor importance by nurses.<sup>26</sup> However, this did not seem to be the case for care activities most commonly reported to be missed in this study. Considering that the primary role of PACU nurses is the optimization of patient safety in regaining consciousness and restoring hemodynamic and respiratory stability through the prevention, early detection and treatment of complications after anesthesia and

surgery, “patient surveillance and assessment” and “drug preparation, administration, and assessment of effectiveness” were activities in which PACU nurses reported to allocate large amounts of their time.<sup>16</sup> Similarly, “care associated with pain” is a key task because most patients admitted to the PACU experience some degree of postoperative pain, which can deteriorate their cardiorespiratory status when left untreated. Inability to accurately perform respective activities could seriously compromise care quality, patient safety, and negatively affect patient outcomes.

In agreement with previous findings,<sup>11</sup> “inadequate number of nursing personnel” was the most reported reason for missed nursing care. “Unexpected rise in patient volume or acuity” and “heavy admission or discharge activity,” which indicated increased nursing workload, were the second and third most reported reasons, respectively. Relationships of low nurse staffing and high workload with high levels of missed care have been previously reported.<sup>3,27</sup> Although the observational study design cannot document causal associations, it seems highly plausible that missed opportunities to timely identify and prevent patient deterioration can be the mediator between understaffing and adverse patient outcomes, as in cases of failure to rescue.<sup>4</sup>

The presence of even 1 ICU overflow patient was associated with a significantly higher prevalence of missed nursing care and a

**Table 2**  
Prevalence of Missed Nursing Care Activities

Missed Nursing Care Activities	Total (N = 397)	Number of ICU Overflow Patients			P Value
		0 (n = 40)	1 (n = 154)	>1 (n = 203)	
Drug preparation, administration and assessment of effectiveness <sup>*</sup>	165 (41.6%)	9 (22.5%)	67 (43.5%)	89 (43.8%)	<b>.036</b>
Preparation and administration of blood/blood products	3 (0.8%)	0 (0.0%)	1 (0.6%)	2 (1.0%)	.786
Connecting patients to monitors/respirators	12 (3.0%)	1 (2.5%)	4 (2.6%)	7 (3.4%)	.644
Care associated with venous/arterial lines	15 (3.8%)	2 (5.0%)	6 (3.9%)	5 (2.5%)	.238
Care associated with tubes/catheters	27 (6.8%)	2 (5.0%)	10 (6.5%)	15 (7.4%)	.661
Receiving blood samples	18 (4.5%)	1 (2.5%)	7 (4.5%)	10 (4.9%)	.349
Care associated with breathing/oxygenation	30 (7.6%)	3 (7.5%)	11 (7.1%)	16 (7.9%)	.902
Care associated with fluid balance	97 (24.4%)	8 (20.0%)	39 (25.3%)	50 (24.6%)	.458
Care associated with body temperature	96 (24.2%)	7 (17.5%)	36 (23.4%)	53 (26.1%)	.299
Care associated with pain <sup>†</sup>	136 (34.3%)	5 (12.5%)	54 (38.3%)	77 (35.5%)	<b>.004</b>
Care associated with level of consciousness	12 (3.0%)	2 (5.0%)	4 (2.6%)	6 (3.0%)	.692
Care associated with hygiene/comfort	33 (8.3%)	5 (12.5%)	12 (7.8%)	16 (7.9%)	.189
Care associated with surgical wound	9 (2.3%)	1 (2.5%)	4 (2.6%)	4 (2.0%)	.814
Patient surveillance and assessment <sup>‡</sup>	143 (36.0%)	6 (15.0%)	51 (33.1%)	86 (42.4%)	<b>.003</b>
Communication with patient/emotional support	74 (18.6%)	7 (17.5%)	31 (20.1%)	36 (17.7%)	.423
Communication with other staff	7 (1.8%)	0 (0.0%)	1 (0.6%)	6 (3.0%)	.316
Documentation of care	99 (24.9%)	10 (25%)	38 (24.7%)	51 (25.1%)	.719
Development/updating of care plans	27 (6.8%)	3 (7.5%)	11 (7.1%)	13 (6.4%)	.495
Assisting physicians	56 (14.1%)	3 (7.5%)	21 (13.6%)	32 (15.8%)	.174

ICU, intensive care unit.

Data shown as n (%), bold indicates statistical significance ( $\chi^2$  test).

\* P = .024 between no and 1 ICU overflow patient, P = .011 between no and >1 ICU overflow patient (Marascuillo procedure).

† P < .001 between no and 1 ICU overflow patient, and between no and >1 ICU overflow patient (Marascuillo procedure).

‡ P < .001 between no and 1 ICU overflow patient, and between no and >1 ICU overflow patient (Marascuillo procedure).



**Table 3**  
Prevalence of Reasons for Missed Nursing Care

Reasons for Missed Nursing Care	Total (N = 310)	Number of ICU Overflow Patients			P Value
		0 (n = 21)	1 (n = 118)	>1 (n = 171)	
Inadequate number of nursing personnel*	231 (74.5%)	9 (42.9%)	89 (75.4%)	133 (77.8%)	<b>.002</b>
Lack of backup support from team members	5 (1.6%)	0 (0.0%)	2 (1.7%)	3 (1.8%)	.554
Inadequate number of assistive personnel	19 (6.1%)	1 (4.8%)	7 (5.9%)	11 (6.4%)	.311
Medications not available when needed <sup>†</sup>	29 (9.4%)	1 (4.8%)	10 (8.5%)	18 (10.5%)	.112
Supplies/equipment not available when needed	41 (13.2%)	1 (4.8%)	10 (8.5%)	30 (17.5%)	<b>.045</b>
Unexpected rise in patient volume or acuity (eg, a patient's condition worsening)	65 (21.0%)	2 (9.6%)	29 (24.6%)	34 (19.9%)	.085
Inadequate handoff from previous shift	3 (1.0%)	0 (0.0%)	2 (1.7%)	1 (0.6%)	.877
Tension/communication breakdowns among nursing personnel	2 (0.6%)	0 (0.0%)	1 (0.8%)	1 (0.6%)	.906
Tension/communication breakdowns with medical or assistive personnel	45 (14.5%)	1 (4.8%)	18 (15.3%)	26 (15.2%)	.071
Heavy admission or discharge activity	59 (19.0%)	2 (9.6%)	23 (19.5%)	34 (19.9%)	.082

ICU, intensive care unit.

Data shown as n (%), bold indicates statistical significance ( $\chi^2$  test).

\*  $P < .001$  between no and 1 ICU overflow patient, and between no and >1 ICU overflow patient (Marascuillo procedure).

<sup>†</sup>  $P < .001$  between no and >1 ICU overflow patient (Marascuillo procedure).

higher number of missed care activities. Considering most critically ill patients were characterized by a high acuity, their stay in the PACU was expected to be followed by much higher total care time and workload for PACU nurses.<sup>19</sup> Therefore, the care needs of postoperative patients may be neglected when ICU overflow patients are present. Key care activities such as patient surveillance, drug preparation and administration, and patient pain had a higher frequency of being omitted or delayed in case nurses had to care for one or more ICU overflow patients. These findings suggested that the provision of necessary care by PACU nurses could be significantly compromised. Finally, insufficient staffing and lack of supplies or equipment availability, which were more commonly reported as reasons for missed care in cases of ICU overflow patients, seem to support the opinion that the PACU is not appropriately designed, staffed, or equipped to serve as an ICU.<sup>20</sup>

### Study Limitations

First, this study had an observational, single-center design and used a convenience sample to enroll participants. Thus, generalizability of findings to other hospitals and countries might be limited owing to differences in organizational issues associated with nursing care. Second, reporting bias was possible because missed care measures were generated through participant reports and open to their own subjective perception about needed care and whether this care was provided or not. Third, despite surveying anonymously, self-esteem and social desirability bias was possible because participants could respond in a favorable manner toward themselves or others. In this case, true prevalence of missed care could be even higher than reported and more care activities could have been omitted or delayed. Fourth, although nurses were asked to complete the questionnaire as soon as they completed their shift, collected data might have been subject to recall bias. Fifth, this study did not record the volume of missed care activities, that is, the number of times a particular activity was omitted or significantly delayed during a shift.

### Implications for Practice and Research

Health care professionals employed in the PACU setting should be aware of the high risk for errors of omission and the potential to mediate adverse outcomes in patient care. In this context, timely completion of activities directly associated with the prevention of postoperative complications needs to be highlighted. From an

organizational point of view, nurse managers are called to promote safety culture by establishing reporting systems for monitoring activities of and reasons for missed care. Early-warning information provided by these systems is expected to assist PACU nurses detect flaws in patient care before critical incidents occur, determine staffing needs, and guide respective decisions.

Significant increases in missed nursing care and the omission of important activities in the presence of ICU overflow patients do not support the use of the PACU as a temporary admission location for them. The PACU has long been used as an easy solution for the shortage of critical care beds, yet postoperative patients' care should always be the primary criterion for evaluating its function. In many PACUs, appropriate nurse:patient ratios are already difficult to be kept during peak periods of postoperative patient admission owing to cost-containing policies. Therefore, the number and length of stay of critically ill patients in the PACU should be limited, considering that the workload associated with their presence favors the further aggravation of the nurse:patient ratio and compromises care of postoperative patients.

The associations between understaffing or heavy workload and difficulty of nurses to complete their necessary tasks are recommended to be investigated by the use of objective measures (eg, nurse:patient ratio) except from subjective reports of PACU nurses. Future studies should also explore the associations between missed nursing care and indicators being both common in the PACU and sensitive to errors of omission (eg, hypoxemia, hypotension, bradycardia, prolonged duration of pain, length of PACU stay).

### Conclusions

The findings of this study add to the increasing evidence that missed nursing care is a global concern for diverse health care settings. The prevalence of missed nursing care in the PACU was as high as 78.1% and was higher during the morning and evening shifts and if the nurse had one or more ICU overflow patients. Drug preparation and administration, patient surveillance, and care associated with pain were the most reported omissions or delays in the PACU. These activities were further impacted with ICU overflow patients. Inadequate nursing personnel and increased workload/patient acuity were the main reasons for missed care. Postoperative patients, regardless of surgery, are highly susceptible to critical incidents if necessary care is omitted. Thus, drawing the attention of PACU nurses on missed nursing care is of primary importance.

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