

# Quality of recovery in elderly patients with postoperative delirium

## ABSTRACT

**Background:** Our study aimed to evaluate quality of recovery in elderly patients with postoperative delirium (POD).

**Subjects and Methods:** An observational prospective study was conducted. Patients aged >60 submitted to elective surgery and admitted to Post Anesthesia Care Unit (PACU) in a tertiary hospital from May to July 2017 were included. POD was evaluated with the Nursing Delirium Screening Scale (NuDESC). Quality of recovery-15 (QoR-15) was used before (T0) and 24 h (T24) after surgery to assess quality of recovery. Data collection include patient's characteristics, respiratory events at the PACU, and other perioperative variables. The Chi-square, Fisher's exact, or Mann-Whitney *U*-tests were used for comparisons.

**Results:** Of a total of 235 patients, 12.3% developed POD at PACU. POD was more frequently in patients older than 80 years ( $P = 0.017$ ), patients with neurological disease ( $P = 0.026$ ), dementia ( $P = 0.026$ ), peripheral vascular disease ( $P = 0.016$ ), and diabetes mellitus ( $P = 0.037$ ). At T0, there were no differences at median total QoR-15, whereas at T24, patients POD scored lower in 10 items (including "severe pain" with  $P = 0.001$  and "nausea or vomiting" with  $P = 0.009$ ) of QoR-15 and in total median lower scores ( $P = 0.001$ ). POD patients stayed longer at PACU ( $P = 0.017$ ) and they stayed longer at hospital ( $P = 0.002$ ).

**Conclusions:** POD patients were older and had more comorbidities. POD patients had lower QoR scores at T24 suggesting an adverse impact of delirium in postoperative quality of recovery. POD patients stayed for long in the PACU and at hospital.

**Key words:** Aged; delirium; risk assessment

## Introduction

Postoperative delirium (POD) is a relatively common postoperative complication associated with worse outcomes including increased length of stay, both in hospital and, more frequent medical complications, and increased mortality.<sup>[1]</sup>

The Diagnostic and Statistical Manual of Mental Disorders (DSM-V) classification is considered to be the gold standard

for diagnosing delirium defining Delirium as "a disturbance of consciousness that is accompanied by a change in cognition."<sup>[2]</sup>

Prevalence of POD in the recovery room delirium is described for 10%–40%<sup>[3]</sup> of patients but may be as high as a 45% in selected older patients.<sup>[4]</sup> More than 80% of the patients with

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**How to cite this article:** Cristelo D, Ferreira MN, Castro JS, Teles AR, Campos M, Abelha F. Quality of recovery in elderly patients with postoperative delirium. Saudi J Anaesth 2019;13:285-9.

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<b>Website:</b> www.saudija.org	<b>Quick Response Code</b> 
<b>DOI:</b> 10.4103/sja.SJA_747_18	

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recovery room delirium were also diagnosed delirium-positive during their subsequent hospital stay.

The etiology of delirium is not yet fully understood and is probably multifactorial. It combines predisposing, nonmodifiable factors as comorbidities with precipitating, modifiable factors as medications, infections, or surgery.

Patients with POD may have postoperative increased postanesthesia care length of stay and possibly a worse quality of recovery. However, the impact of delirium on the quality of recovery remains poorly characterized.<sup>[5]</sup>

We aim to evaluate quality of recovery in elderly patients with POD in a tertiary hospital.

## Subjects and Methods

After approval by the institutional ethics committee, an observational prospective study was conducted at Centro Hospitalar Universitário de São João (CHSJ), which is a tertiary, academic hospital situated in Porto, Portugal. It serves as a reference center for a vast area in the northern Portugal, and currently has 1,105 beds distributed across several medical and surgical specialties.

Patients aged >60 years old submitted to orthopedic, gynecologic, urologic, vascular, plastic, and general elective surgery and admitted to Post Anesthesia Care Unit (PACU) from May to July 2017 were included in the study. All the participants, properly informed on the purpose and procedures, signed the informed consent. Exclusion criteria were (i) inability to give informed consent, (ii) emergency/urgency surgery, (iii) inability to understand Portuguese, and (iv) patients admitted in the ICU after surgery.

POD was detected with the Nursing Delirium Screening Scale (NuDESC),<sup>[6]</sup> a five-item screening tool, easily performed, that evaluates disorientation, inappropriate behavior, inappropriate communication, hallucination, and psychomotor retardation. Each item punctuates between 0 and 2 and the total score varies from 0 to 10. Delirium was defined by NuDESC score  $\geq 2$  and it was evaluated on in the recovery room and on the first postoperative day. Richmond Agitation Sedation Scale (RASS)<sup>[7]</sup> was used to evaluate agitation and sedation and was applied at admission at PACU (T0) and 15 minutes later (T15).

Patients were evaluated up to 14 days before surgery by the investigators, who collected perioperative data and quantified the burden of comorbidity using the Charlson Comorbidity Index. Data collection include patient's

characteristics as age, gender, physical status classification of the American Society of Anesthesiologists (ASA). After surgery perioperative variables as type of anesthesia, type and duration of surgery, prolonged PACU stay, hospital length of stay, postoperative respiratory complications, and mortality were collected.

Quality of Recovery was evaluated using Portuguese version of the Quality of Recovery-15 (QoR-15)<sup>[8]</sup> before (T0) and 24 hours (T24) after surgery. QoR-15 questionnaire has 15 questions that assess patient-reported quality of a patient's postoperative recovery using a 11-point numerical rating scale that leads to a minimum score of 0 (poor recovery) and a maximum score of 150 (excellent recovery).

Respiratory complications were evaluated in PACU and were defined as respiratory failure, deep inspiration incapacity, mild or moderate hypoxia, airway obstruction, aspiration, or reintubation. Each postoperative respiratory complication was defined on the data collection sheet using the criteria and classification described by Murphy *et al.*<sup>[9]</sup> The duration of stay in PACU was considered prolonged when exceeding 24 h.

## Statistical analysis

Variable descriptive analysis was used to summarize the data and Mann–Whitney *U*-test was used for comparison of continuous variables between groups of individuals; Chi-square test and Fisher's exact test were used for comparison of proportions between groups of individuals. All variables were considered significant when  $P < 0.05$ .

The statistical software package SPSS for Windows version 22.0 (SPSS, Chicago, IL) was used to analyze the data.

## Results

Two-hundred and thirty-five patients were included in the study and 12.3% developed POD at PACU. Median age was 69-year old, 58% were ASA I/II, and 42% ASA III/IV. POD was more frequently in patients older than 80 years (34% vs 9%,  $P = 0.017$ ), patients with neurological disease (17% vs 6%,  $P = 0.026$ ), dementia (10% vs 1%,  $P = 0.026$ ), peripheral vascular disease (31% vs 13%,  $P = 0.016$ ), and having diabetes mellitus (41% vs 23%,  $P = 0.037$ ). POD patients had higher Charlson Comorbidity Index Scores (9 vs 5,  $P = 0.004$ ). Perioperative characteristics are described in Table 1.

Concerning quality of recovery, at T0, there were no differences at median total QoR-15 ( $P = 0.385$ ) and all but one item (able to look after personal hygiene unaided) had similar results [Table 2].

**Table 1: Patients characteristics**

Variables, n (%)	POD (n=29)	Non-POD (n=206)	P
Aged >80 years	10 (34%)	19 (9%)	0.017
Gender			
Female	18 (62%)	109 (53%)	0.354
Male	11 (38%)	97 (47%)	
ASA			0.947
I	1 (3%)	4 (4%)	
II	17 (60%)	109 (53%)	
III	10 (34%)	78 (38%)	
IV	1 (3%)	10 (5%)	
Charlson score (median, IQR)	9 (6-11)	5 (4-9)	0.004
Neurological disease	5 (17%)	12 (6%)	0.026
Dementia	12 (41%)	20 (10%)	0.026
Peripheral vascular disease	9 (31%)	28 (13%)	0.016
Diabetes mellitus	12 (41%)	48 (23%)	0.035
Type of anesthesia			0.452
General	20 (69%)	55 (58%)	
Regional	3 (10%)	21 (22%)	
Combined	6 (21%)	12 (13%)	
Sedation/analgesia	0	11 (5%)	
Respiratory complications	6 (21%)	13 (6%)	0.008
PACU prolonged stay	7 (24%)	20 (10%)	0.002
Hospitality length of stay (days, median, IQR)	7 (4-10)	4 (2-6)	0.002
Mortality	2 (7%)	7 (3%)	0.358

POD=Postoperative delirium, PACU=Post Anesthesia Care Unit, ASA=American Society of Anesthesiologists

**Table 2: QoR-15 evaluated in T0**

QoR-15 items (median, IQR)	POD (n=29)	Non-POD (n=206)	P
Able to breath easily?	10 (9.5-10)	10 (9.75-10)	0.808
Been able to enjoy food?	7 (6.5-10)	8 (7-10)	0.116
Feeling rested?	8 (6-10)	8 (7-10)	0.401
Have had a good sleep?	8 (5-10)	7 (6-10)	0.886
Able to look after personal hygiene unaided?	5 (4.5-10)	7 (6-10)	0.003
Able to communicate with family or friends?	10 (10-10)	10 (10-10)	0.369
Getting support from hospital doctors and nurses?	10 (8.5-10)	10 (8.75-10)	0.949
Able to return to work or home activities?	7 (6.5-10)	7 (6-10)	0.484
Feeling comfortable and in control?	8 (6.5-10)	8 (6-10)	0.275
Having a feeling of general well-being?	7 (6-10)	9 (7-10)	0.429
moderate pain	9 (5-10)	10 (5.75-10)	0.804
Severe pain	10 (10-10)	10 (10-10)	0.797
Nausea/vomiting	9 (9-10)	10 (10-10)	0.590
Feeling worried or anxious?	7 (3-8)	7 (4-8)	0.172
Feeling sad or depressed?	8 (3-10)	8 (5-10)	0.590

POD=Postoperative delirium, PACU=Post Anesthesia Care Unit

As shown in Table 3, at T24 patients, POD scored lower in 10 items (including “severe pain” with  $P = 0.001$  and “nausea or vomiting” with  $P = 0.009$ ) of QoR-15 and in total median lower scores ( $P = 0.001$ ).

Patients with POD had lower scores for RASS at T0 and T15 (-2 vs 0,  $P < 0.001$ ; -1 vs 0,  $P < 0.001$ ). The rate of respiratory complications at PACU was higher for POD patients (21% vs 6%,  $P = 0.008$ ).

POD patients stayed longer at PACU (24% vs 10%,  $P = 0.017$ ) and they stayed longer at hospital (7 vs 4 days,  $P = 0.002$ ).

Mortality was not different between two groups (7% vs 3%,  $P = 0.358$ ).

## Discussion

The principal findings of this study were the following. (1) POD patients were more frequently older than 80 years and had more comorbidities particularly neurological disease, dementia, peripheral vascular disease, and diabetes mellitus. (2) using QoR-15, POD patients displayed a preoperative similar health status, but after surgery, they have a worse quality of recovery. 3) POD patients had a higher incidence of inadequate early recovery having lower scores for RASS measured until 15 min of recovery after surgery and the rate of respiratory complications was higher. Even though the POD patients stayed longer at PACU and at hospital.

The incidence of POD in this group of surgical patients >60 years was 12,3%.

The incidence of POD in the study population is consistent with that described in the literature for postoperative patients admitted to a PACU (5%–15%).<sup>[10]</sup>

Across a great variety of surgical interventions, numerous patient susceptibility characteristics have been reported as risk factors for POD. Like in our study, increasing age, pre-existing neurological and mental illnesses, comorbidities, have been consistently shown to be associated with POD in a variety of postoperative patients.

Indeed, elderly patients are more susceptible to delirium because they are more vulnerable and often present multiple risk factors including previous delirium, mild cognitive impairment, dementia, depression, Parkinson’s disease, decreased mobility, visual or auditive disturbances, and multiple comorbidities as cardiac, cerebrovascular, renal, hepatic diseases.<sup>[11]</sup> These patients are often malnourished, dehydrated, socially isolated, and only hospital stay can be, for itself, a delirium trigger.<sup>[2]</sup>

In our study, POD group showed more comorbidities, as demonstrated by a higher Charlson comorbidity score. Most

**Table 3: QoR-15 evaluated in T24**

QoR-15 items (median, IQR)	POD (n=29)	Non-POD (n=206)	P
Able to breath easily?	9 (6-10)	10 (9-10)	0.005
Been able to enjoy food?	4 (2-7.5)	7 (2-10)	0.017
Feeling rested?	7.5 (3.5-8.5)	6 (5-10)	0.07
Have had a good sleep?	7 (3-9)	5 (4-10)	0.08
Able to look after personal hygiene unaided?	3 (1-5)	6 (2-10)	0.006
Able to communicate with family or friends?	9 (6-10)	10 (9-10)	0.001
Getting support from hospital doctors and nurses?	10 (7.5-10)	9 (8-10)	0.36
Able to return to work or home activities?	4 (1.5-6)	6 (2-8)	0.006
Feeling comfortable and in control?	5 (2.5-8)	8 (5-9)	0.008
Having a feeling of general well-being?	5 (4-7.5)	7 (4-10)	0.016
Moderate pain	7 (4.5-8)	7 (5-10)	0.36
Severe pain	10 (6.5-10)	10 (10-10)	0.001
Nausea/vomiting	8 (7-10)	10 (8.5-10)	0.009
Feeling worried or anxious?	6 (3.5-8.5)	7 (5-10)	0.037
Feeling sad or depressed?	7 (4.5-9)	8 (6-10)	0.10

POD=Postoperative delirium, PACU=Post Anesthesia Care Unit

frequent comorbidities associated were dementia, peripheral vascular disease, neuropathy, and diabetes mellitus. Dementia is a recognized risk factor, possibly related with decreased cerebral blood flow or metabolism, cholinergic deficiency, and inflammation. This relationship can explain a frequent association between diabetes and delirium. Balhara showed that hypoglycemic episodes or diabetic ketoacidosis can result in delirium in diabetic patients. Diabetic patients are associated with additional risk factors related to higher delirium incidence, as psychiatric disorders.<sup>[12]</sup> Peripheral vascular disease, often related with peripheral neuropathy, is also reported as delirium risk factor in literature.<sup>[13,14]</sup>

Evidence show that delirium is associated with higher costs; higher hospital stays; more frequent complications as infections, pressure ulcers, incontinence, or falls; and higher hospital and after discharge mortality (up to 75% and 40% 1-year mortality, respectively).<sup>[15,16]</sup> In our study, delirium was associated with higher stay at the PACU and at the hospital.

Respiratory complications were more frequent in POD patients. According to our results, Yonekura *et al.*,<sup>[17]</sup> reported that patients with delirium had a higher incidence of respiratory complications and longer hospital stays compared with the non-delirium patients after esophageal surgery concluding that delirium may have a negative effect on respiratory complications suggesting that POD patients may have an additional risk for POD. Similarly, Xará

*et al.*<sup>[18]</sup> study showed an association between hypoactive emergence, early respiratory complications, and delirium at PACU.

Delirium may have a profound impact on postoperative quality of recovery and our study is unique in adding important data on quality of recovery in POD patients. In our study, POD patients had lower QoR scores 1 day after surgery. Our results are consistent with other studies showing worse clinical outcomes in POD patients. Brown *et al.*<sup>[19]</sup> showed that delirium after surgery was independently associated with increased intensive care length of stay and greater hospital charges, and recently a study by Royse *et al.*<sup>[20]</sup> observed that participants with delirium had worse overall quality of recovery using Postop QRS.

Our study has some limitations. It was conducted in a single university-affiliated hospital, therefore, generalization to outside population is unknown. "Older age" is a no consensus definition in the literature, which can lead to misinterpretation of the results and inaccurate comparison of different studies results. Otherwise, the selection of a group of patients with more than 60-year old increases the delirium risk. Our sample was also relatively small, and, consequently,  $\beta$  errors may be the reason for the lack of statistical significance in some endpoints. Surgical risk stratification was not evaluated; therefore, higher delirium risk could be associated with surgery and not exclusively with patient itself.

In conclusion, POD patients were older and had more comorbidities. POD patients had lower QoR scores at T24 suggesting an adverse impact of delirium in postoperative quality of recovery. POD patients stayed for long in the PACU and at hospital.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

There are no conflicts of interest.

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