

## **Routine Preoperative Frailty Assessment Predicts Postoperative Complication in PCNL Surgery**

**Alfryan Janardhana<sup>1\*</sup>, Suparno Adi Santika<sup>2</sup>**

<sup>1</sup>*Soebandi Hospital, Jember, East Java, Indonesia, 68111*

<sup>2</sup>*Department of Anesthesiology, Faculty of Medicine, Universitas Jember; Soebandi Hospital, Jember; East Java, Indonesia, 68121*

**\*Corresponding Author**

Alfryan Janardhana  
Soebandi Hospital, Jember, East Java, Indonesia, 68111  
Email:  
[ryanjanardhana@gmail.com](mailto:ryanjanardhana@gmail.com)

**Objectives.** Frailty is an assessment of functional status related to postoperative outcome. This observational study aims to determine differences in the frailty status of patients undergoing Percutaneous Nephrolithotomy (PCNL) with the incidence of postoperative complications.

**Methods.** This is a retrospective cohort study design conducted at a tertiary referral hospital in Jember with the patient's medical record as the source of data. The frailty status is evaluated using Clinical Frailty Scale (CFS) which are categorized into frailty and non-frailty. The outcomes of this study were perioperative and the incidence of postoperative complications which included estimated blood loss, fever, sepsis, Intensive Care Unit (ICU) admission, Deep Vein Thrombosis (DVT), and postoperative.

**Results.** Of the 24 patients who were screened, 7 patients with frailty status and 17 patients with non-frailty status before PCNL were performed. Patients with frailty status occur at an older age with a significance value of 0.001 and have a risk of postoperative complications such as fever, length of stay (LOS), sepsis, ICU admission and higher blood transfusion compared to non-frailty patients. The result of the comparison test from length of stay showed a significance of  $<0.001$  ( $p < 0.05$ ). The perioperative events did not have a significant relationship with frailty status.

**Conclusions.** Assessment of frailty status prior to PCNL is very useful for predicting the incidence of postoperative complications. Risks include fever, sepsis, length of stay, ICU care and blood transfusion are higher in patients with frailty status.

**Keywords:** frailty, PCNL, postoperative complication

### **Introduction**

The concept of frailty status and its relation to surgical procedures has been increasing attention recently. Frailty is identical with increasing people's age or aging. The elderly population in Indonesia is expected to continue to increase. Nowadays, approximately 21 million elderly people or around 8% of Indonesia's population are elderly [1], putting Indonesia as the 10th largest elderly population in Asia. Frailty is defined as a state of physiological decline associated with aging that is characterized by a marked vulnerability to health [2]. Frailty status is important because this is a status that assesses functional status in real-time, while other preoperative assessments such as the American Society of Anesthesiology (ASA) score, Charlson Comorbidity Index (CCI), and age are

assessments that tend to assess systemic disease and physical status [3-4].

Percutaneous nephrolithotomy (PCNL) is one of the most frequently performed urological procedures and is one of the urological procedures of choice for the management of large kidney stones and proximal ureteral stones. Several studies have shown that PCNL is safer to perform in older populations [5]. However, several studies have reported an increase of complications due to an increase of PCNL surgery in elderly patients and patients with complicated conditions [6-7]. This demonstrates the importance of perioperative risk stratification to balance the risk of invasive procedures for curative purposes.

Comprehensive perioperative risk stratification can be carried out by implementing routine frailty assessments [8]. In several studies, frailty status was identified as a more specific predictor of

outcome and postoperative complications [8–11]. There are many tools that have been researched that can be used as a frailty assessment, one of the tools that is quite popular is the Clinical Frailty Scale [12]. The Clinical Frailty Scale is a tool developed for rapid screening and does not require geriatric expertise or specific functional test kits [13]. Routine assessment of frailty status for risk stratification in patients undergoing PCNL surgery has not been reported widely.

This observational study aims to determine differences between the frailty status of patients undergoing PCNL surgery with the incidence of postoperative complications.

## **Materials and Methods**

### **Study Design**

This study is a retrospective cohort study conducted at a single tertiary referral hospital in Jember, East Java, Indonesia. After obtaining approval from the hospital's research division, the study was carried out between January 2021 and November 2021.

### **Inclusion and Exclusion Criteria**

Inclusion criteria:

1. Patients aged >18 years undergoing elective PCNL surgery
2. Patients willing to participate in the study

Exclusion criteria:

1. Patients undergoing emergency surgery
2. Patients undergoing multiple assessments
3. Patients whose surgery was canceled

### **Data Collection**

Data was collected from patient medical records and medical notes containing frailty assessment results performed by medical assistants separately. This was done to avoid performance and measurement bias.

### **Demographic Data**

Demographic data related to patient demographics such as age, gender, weight, height, medical history, comorbidity history, laboratory test results, American Society of Anesthesiology (ASA) classification, and surgical report, postoperative patient condition, and length of stay were obtained from patient medical records.

### **Frailty Assessment**

In accordance with routine hospital procedures, patients undergoing PCNL surgery will undergo preoperative assessment by an anesthesiologist in the anesthesia and intensive care unit or in the surgical ward. Routine preoperative assessment is performed on patients undergoing elective surgery. During this study period, preoperative assessment was supplemented with frailty status assessment using the clinical frailty assessment performed by a medical assistant before the routine preoperative assessment by the anesthesiologist. The medical assistants had previously received training in frailty status assessment using the clinical frailty assessment. Patients who came to the outpatient clinic were assessed for frailty status before entering the doctor's room, while patients who were in the ward were assessed for frailty status just before the anesthesiologist entered. Informed consent was obtained before frailty status assessment. Patients who refused or did not meet the study criteria were not recorded. In general, frailty assessment using the frailty assessment is quite easy, does not require geriatric expertise or special equipment, and takes approximately 5-10 minutes.

### **Outcomes**

Outcomes recorded from medical records included perioperative and postoperative complications such as estimated blood loss, fever, sepsis, ICU admission, DVT events, and postoperative complications. Separately, the results of the frailty status assessment by the medical assistants were also compiled to classify patients as frail or non-frail. Based on the Clinical Frailty Scale, there are nine levels of frailty status: 1 as very fit, 2 as fit, 3 as managing well, 4 as living with very mild frailty, 5 as living with mild frailty, 6 as living with moderate frailty, 7 as living with severe frailty, 8 as living with very severe frailty, and 9 as terminally ill. In this study, the results of the screening using the clinical frailty scale were categorized as  $\geq 5$  as frail and  $\leq 5$  as not frail.

### **Statistical Analysis**

Statistical analysis for this study used SPSS Statistical Analysis Software Platform for descriptive analysis of age, gender, and comorbidity history. Comparative analysis was performed using the Mann-Whitney U test for normally distributed data and the independent t-test for non-normally distributed data.

## Results

In the 11-month study, there were 24 patients who underwent PCNL with patient characteristics, comorbid history which can be seen in Table 1. Seven patients were categorized as frail and 17 patients were categorized as not frail patients. Based on the test results in table 1. The results of this study show that frailty occurs in older patients,

at an average age of 61 years old or more with a significance value of 0.001 ( $p < 0.05$ ). Patients with frailty also tend to have co-morbidities in the form of Diabetes Mellitus (DM) and Coronary Artery Disease (CAD) and it is known that patients with frailty have a higher ASA score than patients without frailty with a significance value of 0.001 ( $p < 0.05$ ).

**Table 1.** Patients Characteristics

|   |       | Frailty           |        |               |        | Nilai p |
|---|-------|-------------------|--------|---------------|--------|---------|
|   |       | Not Frail (n= 17) |        | Frail (n = 7) |        |         |
|   |       | Frek.             | %      | Frek.         | %      |         |
| Usia (mean±SD) <sup>t</sup>             |       | 50,47             | ±6,98  | 61,71         | ±6,02  | <0,001  |
| Jenis kelamin                           |       |                   |        |               |        |         |
|   | L     | 14                | 82,40% | 4             | 57,10% | 0,195   |
|   | P     | 3                 | 17,60% | 3             | 42,90% |         |
| Pre Op serum creatinine                 |       | 0,95              | ±0,21  | 0,94          | ±0,23  | 0,661   |
| GFR                                     |       | 69,7              | ±3,28  | 68,8          | ±4,02  | 0,302   |
| BMI (WHO) (mean±SD) <sup>M</sup>        |       | 22,29             | ±1,90  | 22,21         | ±4,09  | 0,349   |
| ASA <sup>C</sup>                        |       |                   |        |               |        |         |
|   | ASA 2 | 11                | 64,70% | 0             | 0,00%  | <0,001  |
|   | ASA 3 | 5                 | 29,40% | 1             | 14,30% |         |
|   | ASA 4 | 1                 | 5,90%  | 6             | 85,70% |         |
| DM <sup>C</sup>                         |       | 2                 | 11,80% | 4             | 57,10% | 0,02    |
| HT <sup>C</sup>                         |       | 11                | 64,70% | 4             | 57,10% | 0,728   |
| CAD <sup>C</sup>                        |       | 0                 | 0,00%  | 2             | 28,60% | 0,021   |
| COPD <sup>C</sup>                       |       | 2                 | 11,80% | 1             | 14,30% | 0,865   |
| Rheumatoid Disease <sup>C</sup>         |       | 1                 | 5,90%  | 1             | 14,30% | 0,498   |
| CHF <sup>C</sup>                        |       | 1                 | 5,90%  | 1             | 14,30% | 0,498   |
| Obesitas <sup>C</sup>                   |       | 0                 | 0,00%  | 1             | 14,30% | 0,111   |
| Controlled Thyroid disease <sup>C</sup> |       | 1                 | 5,90%  | 0             | 0,00%  | 0,512   |
| MI <sup>C</sup>                         |       | 0                 | 0,00%  | 1             | 14,30% | 0,111   |
| CVA <sup>C</sup>                        |       | 0                 | 0,00%  | 1             | 14,30% | 0,111   |
| Renal <sup>C</sup>                      |       | 1                 | 5,90%  | 1             | 14,30% | 0,498   |
| Heavy smokers <sup>C</sup>              |       | 3                 | 17,60% | 0             | 0,00%  | 0,235   |
| Previous Stone <sup>C</sup>             |       | 0                 | 0,00%  | 1             | 14,30% | 0,111   |

Note: <sup>M</sup>= tested with Mann Whitney; <sup>C</sup>= tested with Chi square; <sup>t</sup>= tested with independent t-test.

If  $p < 0.05$ = significant

## Discussion

In our study, frail patients had higher postoperative complications than non-frail patients. Frail patients have a risk of postoperative complications such as fever, length of stay, sepsis, care in the ICU, and transfusion. In another study

conducted by Bhatia et al. patients with frailty had a higher rate of sepsis complications, including fever, sepsis and bacteremia. Besides that, frailty also affects length of stay, patients with high frailty scores need 3 days longer than non-frailty [3]. Meanwhile, mortality and incidence of DVT are not related to frailty scores. Our study also shows that

frailty is strongly associated with a higher incidence of postoperative complications. This is in line with a study conducted by Suskin et al. on urological interventions, which stated that frailty became independent of post-operative complications [14].

Currently, frailty status is increasingly being used to measure functional physical health in various branches of medicine, especially in surgical patients [15–18]. A similar retrospective study by Michel J et al. using the Hopkins Frailty Index to predict postoperative outcomes in patients after radical cystectomy said that there was no association between frailty and ICU admission, perioperative mortality and longer length of stay [18]. We identified a comparison of frailty status and perioperative complications after PCNL, in our study there were no significant differences between perioperative complications and frailty status.

There are many tools available that can be used to assess frailty status, such as the Hopkins Frailty Assessment, Timed Up and Go Test, the NSQIP frailty index PRISMA-7 questionnaire, and the Gerontopole Frailty Screening tool (GFST). In this study, frailty assessment was carried out using Clinical Frailty Score namely direct face-to-face assessment to evaluate the presence of comorbidities, frequency of bosses, daily activities [19]. CFS is a tool for assessing frailty that is simple, popular and easy to use. Based on research conducted by Sukkriang et al. CFS has a sensitivity of 56% with a specificity of 98.41%, Positive Predictive Value (PPV) 82.35%, and Negative Predictive Value (NPC) of 94.42%. Based on this research, it is stated that CFS is the most appropriate tool used for diagnosis. CFS has the highest specificity and accuracy compared to other screening tests, namely CHS criteria, FRAIL questionnaire, PRISMA-7 to quiz and Gerontopole Frailty Screening Tool (GFST) [19]. CFS can also provide an overview of the patient's cognition and can be observed in patients with CFS 1-2 may not be present or may experience mild cognitive impairment [12]

This research has several limitations. This research is a single center study which was carried out at a tertiary referral hospital in Jember, so the results cannot be generalized to other circumstances. Second, we have a relatively small number of samples that are not sufficient for predictor analysis. Screening was carried out on 24 patients who would do PCNL, only 7 patients had a high frailty score. One other important thing is follow-up with a longer duration to evaluate the relationship between frailty status and complications, we cannot assess complications after the patient is discharged from the hospital due to

limited data available. A multi-center study with a prospective cohort is needed to improve data accuracy regarding the relationship between frailty status and the incidence of postoperative complications.

## Conclusion

Frailty status is important to evaluate, especially in patients who are elderly, have high ASA scores and are about to undergo surgery. Clinical Frailty Scale (CFS) is a valid and easy-to-use tool for evaluating frailty status. This frailty status is closely related to the incidence of postoperative complications such as fever, length of stay, sepsis, care in the ICU, and blood transfusion. Patients with frailty status have a higher risk of complications than non-frailty patients. In this study, there was no significant relationship between frailty status and perioperative events. Of course, further research is needed with a prospective cohort study to improve accuracy, as well as a larger population and longer follow-up to assess short-term and long-term outcomes.

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