Original Article ISSN (O):2395-2822; ISSN (P):2395-2814



# Evaluation of Correlation between Pre-Operative Mobility and Post-Operative Morbidity in Elective Surgery Patients in Geriatric Age Group.

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Received: April 2017
Accepted: April 2017

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## ABSTRACT

**Background:** Old age patients are at a increased risk for post-operative complications and disability. Older adults express that the maintenance of functional independence is the most important health outcome when they prioritize their health decisions, in deciding whether to go through with a major elective operation. Frailty has been promoted as a simple, brief assessment tool that can be completed before surgery with the goal of improving the surgeon's ability to accurately counsel geriatric patients and their families about anticipated post-operative outcomes. **Methods:** This was a prospective study from June 2014 to June 2016at our institutes. A total of 200 patients undergoing elective major surgical procedures (160 general surgery and 40 orthopedics), were enrolled in the study. Informed consent was taken and ethical clearance from ethical committee of the institutes was obtained. Patients were evaluated pre operatively and at the end of 1,3and 6 months post operatively for complications and mortality. **Results:** In this study 200 patients were taken into observation and they were divided into three groups Group 1 - fast group (<10 seconds), Group 2 - intermediate group (11-14 seconds), and Group 3 - slow group (15 seconds or more).Age distribution was divided into 61-70, 71-80 and >80 years. Mean age of our study group was 69.51 years. Majority of our patients underwent colorectal surgery (n=77, 38.5%) followed by head and neck malignancy surgery (n=52, 26%).There was a male preponderance in our study group (m:f=1.89:1).Complications were mostly seen in Group 3 patients (23/52) as compared to Group 1 patients (9/84,p<0.05) which was statistically significant. Post-operative mortality was also significantly higher in Group 3 (14/52) as compared to Group 1 (1/84).This difference was also statistically significant (p <0.05). **Conclusion:** frail older adult. The benefit of using walking speed as a single measure to define the frail patient is that full measurement of phenotypic frailty is time consuming and often impractical. Limiting the evaluation of frailty to measuring walking speed would likely gain wider acceptance for implementation because of its simplicity and brevity.Our study proves that it is a practical tool for assessing the health outcome of patients. Even post-operative mortality can be predicted using this tool and can be effective tool in minimizing the mortality of such high risk patients by keeping them under extended surveillance.

***Keywords:*** Frailty, Mobility, Geriatric, Walking Speed.

## INTRODUCTION

The global population of elderly people aged 60 years or more was 600 million in 2000; it is expected to rise to around 2 billion by 2050.[1] With anaging population, researchers are increasingly interested in frailty,[2,3] a syndrome characterized by agerelated declines in functional reserves across anarray of physiologic systems.

The demographic inevitability of the aging population mandates that all surgeons understand geriatric specialty care issues as they pertain to peri-operative care. Geriatric patients have unique physiologic changes compared with their younger adult counterparts.

Frailty is the term that describes physiologic compromise unique to older adults. Frailty is defined as a state of reduced physiologic reserve associated with increased susceptibility to disability.[4]

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Frailty is a unique phenotype that by definition confers increased risk of adverse health care outcomes for community-dwelling older adults aswell as older adults undergoing an operation.[5-9] Frailty has been promoted as a simple, brief assessment tool that can be completed before surgery with the goal of improving the surgeons ability to accurately counsel older adults and their families about anticipated postoperative outcomes.[10] The

wide adoption of a frailty assessment in the preoperative setting has not occurred, perhaps because of the time required to complete a frailty assessment.

Walking speed, or gait speed, is a test that is commonly used by geriatricians as a measure of physiologic compromise in older adults.[11] The measurement of walking speed is typically accomplished by timing a patient over a short distance (eg, 5 m [15 feet]). Slower walking speed in community-dwelling older adults has been closely related to mortality and other adverse health care outcomes such as need for hospitalization or need for transition from home to an institutional care facility.[12-16] Slower walking speed as a stand-alone measure was recently related to adverse postoperative outcomes in patients undergoing elective operations.[17,18] This article discusses the existing evidence to determine whether measurement of walking speed alone, replacing a multidimensional frailty assessment can forecast postoperative risk of morbidity and mortality in older adults.

## MATERIALS AND METHODS

This was a prospective study from June 2014 to June 2016done at our institutes. A total of 200 patients undergoing elective major surgical procedures (160 general surgery and 40 orthopaedics), were enrolled in the study. Informed consent was taken. Clearance from ethical committee of the institute was taken. Patients were evaluated pre operatively and post operatively at the end of 1, 3 and 6 months for complications and recovery indicators.

There have been several studies in the field of orthopaedics regarding pre habilitation and post-operative surgical outcomes. Most of the studies focus on lower limb (hip and knee) arthroplasties.

However, some studies also show the effect of pre-operative mobility status and outcomes in trauma patients.[19]

We decided to include only upper limb elective surgery patients to rule out any confounding due to lower limb surgeries and diseases.

Also, patients using walking aids pre operatively were not included in the study.

**Inclusion criteria**

1) General surgery-
   a) Gastro intestinal surgery
   b) Hepatobiliary surgery
   c) Head and neck malignancies
   d) Age > 60 years
2) Orthopaedic surgery-
   a) Shoulder arthroscopies
   b) Upper limb tumors
   c) Upper limb non unions and malunions(humerus and radius-ulna)
   d) Elbow stiffness surgeries
   e) Upper limb osteotomies
   f) Age >60 years

**Exclusion criteria**

1) Past history of myocardial infarction/cerebrovascular accident/neurological deficit
2) Amputated patients
3) Bed ridden patients
4) Lower limb trauma and arthroplasties.
5) Walking with walking aids.

Our group studied the relationship of a pre-operative "timed up-and-go" test to postoperative outcomes in older adults undergoing operations across surgical specialities. In our prospective cohort study of adults aged 60 years or older, patients were grouped by their walking speed measured by performance on the "timed up-and-go" test:

- Group 1 :- fast group (<10 seconds),
- Group 2 :- intermediate group (11-14 seconds), and
- Group 3 :- slow group (15 seconds or more)

Postoperative outcomes were then compared in the 3 groups of patients. Postoperative complications were recorded at 1, 3 and 6 months interval.

Post-operative complications were divided into following groups-

- Cardiac
- Pulmonary
- Renal
- Thromboembolic
- Infections

Post-operative stigmata of surgery were also recorded post operatively like:

- Post operativeevents of fall
- Duration of hospital stay
- Events of re operation

**Method to Measure Walking Speed**

Common ways to measure walking speed in older adults is to perform the timed up-and-go test or measuring walking time over a specified distance. The timed up-and-go has become a well-recognized and long-standing test of functional mobility.[20] To complete the timed up-and-go, the clinician times the patient rising from a chair, walking 3 m (10 feet), and returning to the chair, and timing ends when the patient is seated [Figure 1]. This test combines walking speed with the task of rising from a chair, which requires lower extremity strength. Requiring lower extremity strength in addition to walking speed may be of particular importance to the postoperative patient in whom transitions out of bed for post-operative mobilization are essential.

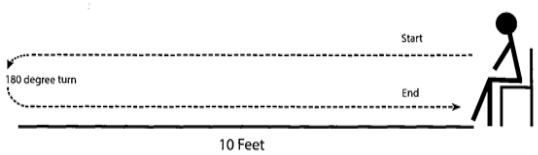


**Figure 1: Timed up-and-go test.**

## RESULTS

**Table 1: Age group of patients with pre op mobility.**

| Age group | Group 1 | Group 2 | Group 3 | Total |
|---|---|---|---|---|
| 61-70 | 58 | 41 | 23 | 122 |
| 71-80 | 23 | 19 | 22 | 64 |
| >80 | 3 | 4 | 7 | 14 |
| Total | 84 | 64 | 52 | 200 |

Mean age of our study group was 69.51(range 61 - 87).

**Table 2: Type of surgery.**

| Type of surgery | No of patients |
|---|---|
| Gastro intestinal surgery | 77 |
| Hepatobiliary surgery | 31 |
| Head and neck malignancies | 52 |
| Shoulder arthroscopies | 13 |
| Upper limb tumors | 5 |
| Upper limb non unions and malunions (humerus and radius-ulna) | 7 |
| Elbow stiffness surgeries | 6 |
| Upper limb osteotomies | 9 |

Majority of our patients underwent gastro intestinal surgery (n=77, 38.5%) followed by head and neck malignancy surgery (n=52, 26%).

**Table 3: Gender wise distribution.**

| Gender | Group 1 | Group 2 | Group 3 | Total |
|---|---|---|---|---|
| Male | 55 | 42 | 34 | 131 |
| Female | 29 | 22 | 18 | 69 |
| Total | 84 | 64 | 52 | 200 |

There was a male preponderance in our study group (M: F=1.89:1).

**Table 4: Complications.**

| Complications | Group 1 | Group 2 | Group 3 | Total |
|---|---|---|---|---|
| Cardiac | 3 | 3 | 6 | 12 |
| Pulmonary | 2 | 2 | 5 | 9 |
| Renal | 2 | 3 | 3 | 8 |
| Thromboembolic | 0 | 5 | 6 | 11 |
| Infections | 2 | 3 | 3 | 8 |
| Total | 9/84 | 16/64 | 23/52 | 48/200 |

Slower timed up-and-go was associated with increased postoperative complications following operations (fast 10.71 %, intermediate 25%, and slow 44.23 %; $p<0.05$).

**Table 5: Stigmata of Surgery.**

| Stigmata | Group 1 | Group 2 | Group 3 | Total |
|---|---|---|---|---|
| Post-operative events of fall during 6 months | 4/84 | 5/64 | 9/52 | 18/200 |
| Events of re operation during 6 months | 2/84 | 6/64 | 7/52 | 15/200 |

Post-operative events of fall and re operation were also observed to be more in intermediate and slower groups, though not statistically significant.

**Table 6: Duration of Hospital Stay**

| Duration of hospital stay (average per patient, in days) | Group 1 | Group 2 | Group 3 |
|---|---|---|---|
| General surgery | 7.80 | 8.51 | 9.25 |
| Orthopaedic surgery | 4 | 4.75 | 5.63 |

The average hospital stay post operatively for gastro intestinal, hepato-biliary and head and neck malignancy surgeries (general surgery) was considered to be 7-9 days.

The average hospital stay post operatively for orthopaedic surgeries was considered to be 3-5 days.

Duration of hospital stay post operatively also observed to be more in intermediate and slower groups, though not statistically significant.

**Table 7: Mortality.**

| | Group 1 | Group 2 | Group 3 | Total |
|---|---|---|---|---|
| Deaths | 1/84 | 7/64 | 14/52 | 22/200 |

In addition to examining complication rates based on pre-operative walking speed, this study quantified 6 months postoperative mortality based on pre-operative walking speed. Slower timed up-and-go was associated with increased 6 month mortality (fast 1.19 %, intermediate 10.93 %, and slow 26.92%; $p<0.05$).

## DISCUSSION

Preoperative counselling about anticipated outcomes allows patients and their families to make informed decisions about whether or not to undergo an operation. In deciding whether to go through with a major elective operation, older adults often prioritize patient-centred outcomes such as functional independence, cognition, and physiologic health rather than the standard 30-day morbidity/mortality outcomes most commonly used for preoperative counselling. For example, the chances that the patient will be left functionally dependent and therefore require institutional care in a nursing home following hospital discharge is a piece of information that affects older adults willingness to proceed with major operative interventions.

Choices of medical and surgical treatment are made with uncertainty of the outcomes to be expected. Surgeons historically categorized risk as either high or low by the judgment of an authoritative physician.[21] This initial guesswork to frame a patient's risk evolved to a more quantitative approach that used statistical methodologies to create risk indices forecasting the occurrence of specific postoperative complications.[22]

Frailty assessment recently emerged as a powerful method for forecasting adverse global postoperative events in older adults.[7-9] Frailty indices allow the quantification of the qualitative visual test that surgeons have always relied on to help guide their surgical decision making. In a sense, the past few years of published literature on frailty in surgical patients have brought the history of preoperative risk assessment full circle to where it began. Preoperative frailty assessment quantifies what the authoritative physician was using qualitatively to assign preoperative risk.

Frailty assessment is recommended as standard of care for the preoperative risk assessment of the older adult by a joint best practices statement by the American College of Surgeons and the American Geriatric Society.[23] A frailty assessment captures multidimensional information that subsequently quantifies global surgical risk in older adults. The concept of frailty helps define a patient's physiological or biological age, a factor that is often distinct from the patients chronologic age.[24] Frailty is characterized by the presence of decline or loss of function in multiple systems that are continuous in its trajectory. It is also characterized by the risk of inability to tolerate physical stressors that is independent of, but frequently associated with, increased disability and co morbidities that are also increasingly present in the geriatric population.[5,24] The frail elderly, by definition, are at higher risk for poor health care outcomes and mortality compared with their non-frail counterparts.

Walking speed has emerged as a simple and rapid tool that can reliably identify frailty in the geriatric population.[25] Measurement of walking speed is often a component of the multidimensional frailty assessment. The literature is full of evidence to suggest that slower walking speed alone is a good surrogate measure for other characteristics of frail older adults; including impaired cognition, the presence of geriatric syndromes, and functional dependence.

Slow walking speed has been closely related to impaired cognition in older adults. There are multiple studies that relate slower walking speed to impaired cognition. Donoghue and colleagues found that a slow timed up-and-go test was associated with poor memory,[26] reduced executive function, and slower cognitive processing speed.

In a separate study of healthy 80-year-olds, Katsumata and colleagues found that a slow timed up-and-go test predicted which patients would subsequently develop global impaired cognitive function.[27] The investigators suggested that measuring timed up-and-go may play a role in the early detection of cognitive impairment. Other studies confirm the relationship ofslow walking speed and poor cognition.[28,29]

Slow walking speed can be used to forecast the occurrence of future geriatric syndromes, particularly falls. Geriatric syndromes are clinical symptoms that represent the frail older adult.[30] Falling is a geriatric syndrome and slow walking speed has been associated with both falls and recurrent falls in older adults.

Viccaro and colleagues found that both slower gait speed and slower timed up-and-go forecasted increased falls over 1 year in adults aged 65 years and older.[14] Lin and colleague studied 1200 community-dwelling older adults and found that slower timed up-and-go (17 seconds in patient who subsequently fell and 13 seconds in patient who did not fall) was related to recurrent falls in the subsequent 12 months.[13]

Rothman and colleagues found that slower walking speed was related to the occurrence of an injurious fall (odds ratio,[31] 2.19; 95°/o confidence interval, 1.33-3.60). This finding is similar to those of other studies that have related falling to slow walking speeds.[13,14]

Slower walking speed has been related to the occurrence of functional dependence in older adults. Wennie Huang and colleagues found that a slow timed up-and-go forecasted future difficulties with activities of daily living at 6, 12, and 18 months.[32]

Walking speed is a component of almost every type of frailty measurement. The benefit of using walking speed as a single measure to define the frail patient is that full measurement of phenotypic frailty is time consuming and often impractical. Limiting the evaluation of frailty to measuring walking speed would likely gain wider acceptance for implementation because of its simplicity and brevity.

Slow walking speed forecasts a variety of adverse healthcare outcomes that are associated with the frail older adult. Slow walking speed is so closely related to adverse health outcomes that it has been recommended as the sixth vital sign for geriatric patients.[33,34] There is a well-established relationship between slow walking speed and increased mortality in community-dwelling older adults.

Laukkanen and colleagues measured walking speed in 466 adults aged 75 years and older. Slow walking speed over 10 m was associated with an increased risk of death (odds ratio, 1.98; 95 %confidence interval, 1.18-3.34).[35]

Studenski and colleagues performed a pooled analysis of 9 studies on walking speed and mortality and concluded that slower walking speed was associated with decreased survival in decreasing increments of 0.1 m/s.[12]

Slow walking speed additionally predicts increased need for future hospitalization. Bouillon and colleagues showed in a cohort study of community-dwelling adults aged 55 to 79 years that slow walking speed was associated with a 14.2 % chance of hospitalization in 3 years compared with 8.5 % of adults with fast walking speed (1.0001),[36] which translated to a hazard ratio for hospitalization based on walking speed of 1 .6; a ratio that was greater

than any other single measurement performed as part of the phenotypic frailty examination. In addition to hospitalization, slow walking speed is incrementally predictive of recurrent cardiovascular events.

## CONCLUSION

Current evidence suggests that improving a patients walking speed is associated with increased survival in community-dwelling older adults.[34] This suggestion leads to the question of whether improvement of a patients walking speed before an elective operation might improve the surgical outcome. Attempting to improve a patient's physical or physiologic reserves before a health care intervention is termed rehabilitation. At present, there is evidence that preoperative inspiratory muscle training before cardiac operations decreases both pulmonary complications and length of hospital stay.[37] In the literature on preoperative physical therapy and surgical outcomes, most studies include patients undergoing hip and knee operations who have slow mobility because of musculoskeletal pain. Older adults who are physiologically frail have not been included in these pre-intervention physical therapy trials. There is the potential for future studies specifically to provide preoperative physical therapy, nutritional support and an overall status of wellbeing to slow-walking, frail older adults undergoing elective surgeries.

As the world starts getting aged day by day, modern day research should now be directed to focus on ways to improve the surgical outcome sin geriatric elective surgery patients by pre habilitation.

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**How to cite this article:** Katlana A, Rassiwala M, Neema PP, Rathi A, Rai PK. Evaluation of Correlation between Pre-Operative Mobility and Post-Operative Morbidity in Elective Surgery Patients in Geriatric Age Group s. Ann. Int. Med. Den. Res. 2017; 3(3): SG31-SG36.

**Source of Support:** Nil, **Conflict of Interest:** None declared