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# Predictors of Health-Related to Quality of Life after Hip Surgery in Elderly Patients after Acute Care

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## Abstract

**Purpose:** The purpose of the study was to identify if patient characteristics, cognitive impairment, vision impairment, incontinence, pain, depression, fatigue, fear of falling, functional states were predictors of health-related quality of life during the post-surgical period.

**Methods:** This was a descriptive study. Sixty-four patients of 65 years and older, with a diagnosis of hip fractures, and be admitted for surgery were recruited between June 2014 and January 2015. Interviews and medical records were used to obtain data. Quality of life was evaluated at 5th day post-surgical period.

**Results:** Forty-three of participants were female (67.2%) with mean age 78.25  $\pm$  7.82 years and 28.1% (18/64) screened positive for delirium on 1st post-operative date. Level of quality of life was good with the health status part scored 0.71  $\pm$  0.24 (range 0.05-1.00) and the visual analogue scale was 64.58  $\pm$  18.36 (range 10-100). Activity of daily living before fracture ( $\beta$ =0.71, p=<0.001) and frailty ( $\beta$ =-0.22, p=0.007) explained 66.6% of the variance in the quality of life. For visual analogue scale, 59.4% of the variance was explained by pre-fracture activity of daily living ( $\beta$ =0.26, p<0.001), depression ( $\beta$ =-0.28, p=0.003), and frailty ( $\beta$ =-0.24, p=0.010).

**Conclusions:** After hip replacement, quality of life might improve if activity of daily living limitations, frailty, and depression were identified and treated.

Keywords: Hip fractures; Quality of life; Acute care; Elders

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# Introduction

Hip fractures occur after falls are a global public health problem. In Thailand, the total number of hip fractures every year is projected to reach more than 36,000 in 2020 and 65,000 in 2050. The majority (90.0-95.0%) of hip fractures is surgically treated. Hip fractures were associated with a high prevalence of prolonged disability, large health care costs, poor quality of life, and increased mortality.

Traditionally, Quality of life (QOL) as individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. Health-Related Quality Of Life (HRQOL) is defined as the individual's experience of their general state of health, such as physical, social, and mental well-being. The

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assessment of the Health-Related Quality of Life (HRQOL) can complete conventional outcome measures.

Recent studies showed that HRQOL among elders decreased after a hip fracture. Their HRQOL had been evaluated at difference period of time after fracture. Decline in Health-Related Quality of Life was reported that it was still significantly lower than before their injuries [1,2]. Knowledge about determinant aspects are the most issues, could improve interventions for post hip fracture and surgery. A few of studies demonstrated what the determinants of HRQOL reported by elderly after hip fracture during hospitalization [3,4]. The aim is to determine which characteristic of individual, biological function, symptoms, functional status, and characteristics of the environment variables are associated with HROOL post hip fractures and surgery. The determinants of interest are characteristic of the individual, delirium, pain, depression, fear of falling, fatigue, functional states, and environmental hazards.

## Methods

#### Design

This was an observational descriptive study was conducted.

#### Setting and sample

The sample size was calculated based on anticipated effect size=0.35, number of predictors=5, the significant criteria=0.05 and power level=0.90 and using statistics calculators' version 3.0 BETA software. A-priori sample size calculator for multiple regressions, a total sample size of 53 participants would be needed. Also, attrition (20% of total sample) was added up. Finally, total sample size was 64.

A total of 64 hip fracture patients were recruited from 5000 bed tertiary care setting, Bangkok, Thailand. Criteria were age 65 years or over, first hip fracture, surgery for either internal fixation or arthroplasty, and absence of cognitive dysfunction (minimental state with scores of 22 or above. Patients with major trauma, malignancy and rheumatoid arthritis, and other causes of pathological fractures were excluded.

#### **Ethical consideration**

The study was approved by the Human Subjects Ethics committee of Med Chula No. 186/57. The participants were assured of anonymity, confidentiality, and their rights to withdraw from the study at any time at their request without any disadvantages. Before data collection, written informed consent was obtained from each participant who was literate. As for each illiterate participant, oral informed consent was received.

#### Measurements

A Questionnaire was developed, based on Wilson and Cleary model, suggesting that biological function as an antecedent of quality of life is influenced by the characteristics of both individuals and their environment [5].

To fill the gap in current knowledge of the factors affecting quality of life in hip surgery elderly patients, this study aims to identify if characteristic of the individual, delirium, pain, depression, fear of falling, fatigue, functional states and environmental hazards were predictors of health-related quality of life Health-Related Quality of Life (HRQOL) was assessed using The European Quality of Life questionnaire comprised of two sections, the health status part (EQ-5D-5L) index and the Visual Analogue Scale (EQ-VAS). The EQ-5D-5L descriptive system covers following 5 dimensions, mobility, self-care, daily activities (work, study, housework, family, leisure time), pain/discomfort, and anxiety/depression. Each dimension had 5 levels: no problem, slight problems, moderate problems, severe problems, and extreme problems. The summary score representing a person's health utility values derived from EQ-5D to the Time Trade-Off (TTO) task (-1 to 1). With anchored at 0 (representing death) and 1.00 (representing full health). The EQ-VAS provides self-rated health on a 20 cm vertical, visual analogue scale. Health status ranges from 0 (the worst health you can imagine) to 100 (the best health you can imagine) to provide quantitative selfassessed data on health. Studies showed that the EQ-5D is practical, reliable, and valid instrument for assessing the HRQOL [6].

Activities Daily Living (ADL) was measured using the Barthel Index of Activities of Daily Living (BI). Jitapunkul et al. [7] translated and modified the original BI for use in the Thai cultural context [7]. The questionnaire contains 10 items on feeding, grooming, transfer, toilet use, mobility, dressing, going up and down stairs, bathing, and bowel and bladder control. Score for each activity reflects its relevance to the person's lives. Items are summed with score range from 0-20. Higher scores reflect higher independence with activities daily living. Kappa coefficients of inter-rater reliability and repeatability tests were 0.79 and 0.68, respectively, for the pooled comparisons of all ADL data.

Functional Status (FS) was measured using Rosow-Breslau Functional Health Scale; a 3 item questionnaire that evaluates the relative difficulty of performing tasks of daily living for people with a "high-level" of physical function. Three items measure 3 aspects of gross mobility (climbing stairs, walking 0.8 km, and doing heavy work around the house). Higher scores (a maximum of 3) indicated better physical function, and a score of 0 indicated disability on all items). Test-retest reliability for the Rosow-Breslau Scale was examined using Pearson correlation coefficient (Pearson r=0.81) [8].

Fear of Falling (FoF) was assessed using Tinetti Falls Efficacy Scale [9]. The Tinetti Falls Efficacy Scale is a 10-item questionnaire designed to assess confidence in patients' ability to perform 10 daily tasks without falling as an indicator of how one's fear of falling impacts physical performance. Total scores range from 10 (best possible) to 100 (worst possible); lower scores indicate more confidence and low fear of falling. A total score of greater than 70 indicates that the person has a fear of falling. The tool has excellent internal consistency (Cronbach's alpha=0.91).

Depression was assessed using The Geriatric Depression Scale (GDS) (short version). Form is a brief, 15-item questionnaire with dichotomous yes/no options about fillings over the past week. Of the 15 items, scores of 0-4 are considered normal; 5-8 indicate mild depression; 9-11 indicate moderate depression; and 12-15 indicate severe depression. The study revealed a sensitivity of 0.92 and a specificity of 0.87 in the outpatients (cut-off score of  $\geq$  5), but a sensitivity of 100.0% and a specificity of 49.0% with the LTC home group (cut-off score of  $\geq$  8) [10].

Frailty was scored based on meeting 3 of 5 possible (frailty phenotype model) deficits: slow walking speed, weakness, declining activity levels, shrinking and exhaustion [11]. People who meet 1 or 2 criteria were considered pre-frail; and those without any operational criteria are robust.

Delirium was assessed using the Confusion Assessment Method (CAM) diagnostic algorithm that was based on the cardinal elements of the DSM-IIIR criteria for delirium. The CAM includes four features through to 1 (acute onset and fluctuating course), 2 (inattention) 3 (disorganized thinking) and 4 (altered level of consciousness). The diagnosis of delirium by CAM requires the presence of features 1 and 2 and either 3 or 4. Thai version of CAM had a sensitivity of 91.9% and specificity of 100.0%. Positive predictive value was 100.0% and negative predictive value was 90.6% [12]. Interrater agreement between the family physicians and the psychiatrists was good (Cohen's Kappa=0.91, p<0.001) [12].

Cognitive impairment was assessed using the Mini-Mental State Exam (MMSE) developed by Folstein et al. is a 20-item screening test that measures cognitive impairments. The items are clustered into 11 sub scores measuring orientation to time, orientation to location, immediate recall, attention and calculation, delayed recall, naming, verbal repetition, following a 3-stage command, reading, writing and figure copying. A score of less than 24 out of 30 is used as the screening threshold to indicate cognitive impairment, the sensitivity and specificity of Thai MMSE using criteria of 24 was 86% and 92.6% respectively [13].

Pain assessment was assessed using Faces Pain Scale-Revised (FPS-R) that provides descriptions of pain using facial expressions. Test-retest reliability for the FPS-R was 0.44 to 0.94 [14].

#### Procedures

Trained nurses as assistant researchers collected data on activity. Prior to this study, two study assistant researchers each with a master's degree in nursing science participated in two training conferences so that the measurements can be administered efficiently. The data comprised of characteristic of the individual, a patient's Activity of Daily Living (ADL) recognized before injury, fears of falling, depression, frailty, vision problem, comorbidity, incontinence, difficulty of walking, previous fall and environment hazards came from an interview the participants, family members and caregivers at admission period. Cognitive function was evaluated by CAM and MMSE on the 1<sup>st</sup> and 5<sup>th</sup> date of postsurgery. The level of pain and HRQOL was evaluated at on the 5<sup>th</sup> date after surgical.

#### Data analysis

Frequency and descriptive statistics reported. Variables used in the bivariate analysis were specified based on data from previous studies. Variables were screened by Pearson and Spearman's rho correlation. Variables that were significantly in the bivariate analyses were introduced in stepwise multiple linear regressions. A p value less than 0.05 was considered significant. Statistical analyses were carried out using SPSS 20.0 software (SPSS Inc., Chicago, IL).

## Results

Of 64 patients met the inclusion criteria, most of them were female (67.2%) and mean (SD) age was 78.25 (7.82) years, (range 59-93). Before the fracture, fifty-six (87.5%) of them lived in the presence of household hazards as a falls risk factor. Two-thirds of participants (76.6%) were independent living by mean (SD) of BI was 14.92  $\pm$  4.47. More than half of them used walking aids (53.1%), and thirty-three (51.6%) were couldn't walk within a half-mile. Characteristic of the individual, forty-three patients (67.2%) had BMI less than 22.8, forty-eight (75.0%) had vision impairment and sixty-one (95.0%) were living with presence of two or more chronic conditions. In a day of hospitalization, most of patients were neither frailty (65.6% with mean 1.90  $\pm$  1.19) nor fear of falling (87.5% with mean 44.27  $\pm$  21.87). Additionally, thirty-three (51.6%) were GDS of less than 5 points. On 1st date postoperative, eighteen (28.1%) of them were delirium **(Table 1)**.

On 5th date postoperative with analysis of HRQOL, the average

of the health status part (EQ-5D-5L) was  $0.71 \pm 0.24$  (range 0.05-1.00) and average of the visual analogue (EQ VAS) was  $64.58 \pm 18.36$  (range 10-100) in **Table 1**. As shown in **Figure 1**, Twenty-one patients (32.8%) were slight problems with mobility, twenty-two (34.4%) were no problem with self-care, twenty-six (40.6%) were slight problems with usual activities, thirty-seven (57.8%) were slight problems with pain/discomfort, and thirty-one (48.4%) were slight problems with anxiety/depression in **Figure 1**.

Of 18 patient characteristics and post-operative factors, 8 factors were correlated with EQ-5D-5L index and EQ-VAS. Of 8 factors, 6 were correlated with EQ-5D-5L index and EQ-VAS comprised of depression, walking impairment, pre-facture ADL, functional status, frailty on admission, and fear of fall on admission. Other factors were different between two assessment tools of HRQOL. History of falling, and having more than 4 prescribed medications was only associated with EQ-5D-5L index. Cognitive impairment and delirium at 1st postoperative day was only associated with EQVAS (Table 2).

In multiple regression of HRQOL, a pre-fracture ADL ( $\beta$ =0.71, p  $\leq$  0.001) and frailty ( $\beta$ =-0.22, p=0.007) were significantly associated with the health status part of EQ-5D-5L (adjusted R<sup>2</sup>=0.67) (**Table 3**). For the visual analogue (EQ-VAS), a pre-fracture ADL ( $\beta$ =0.50, p<0.001), depression ( $\beta$ =-0.28, p=0.003), and frailty ( $\beta$ =-0.24, p=0.010) were related to HRQOL with adjusted R<sup>2</sup>=0.59 (**Table 3**).

### Discussion

In this study, we aimed to identify the factors that influence HRQOL at 5<sup>th</sup> date post-operative (the day before the end of acute care) in patients treated for hip fracture. Patient characteristics of age and gender in our study **(Table 1)** are comparable with characteristics in other studies. The average age of hip fracture is higher than study of Hagino et al. [15] (78.25+7.8 VS 76.1+9.8) [15]. Actually, the incidence rates in four Asia countries increased 5-8 times after 75 years of age [16]. The female to male (F:M) ratio is around 2.05 which lower than that of around 2.5 observed among Hong Kong, Singapore, Malaysia, and Thailand [16], 4.51 among Japan [17] and 2.9 among US whites [16], but higher than among United Kingdom (F:M=1.47) [18]. As we see it, the incidence of hip fracture in men is approximately half the noted in women. Besides, it comes as no surprise that three-fourth of the patients living with environmental hazard related to falls.



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#### Table 1 Patients' characteristics and parameters.

Factors	Categories	n (%) except where indicated
	≤ 80 years	38 (59.4%)
Age in years; mean (SD) and range	>80 years	26 (40.6%)
	78.25 (± 7.8)	range 59-93
Pain at 5 <sup>th</sup> date postoperative; mean (SD)	3.92 (± 1.5)	range 0-8
Quadan	Female	43(67.2%)
Gender	Male	21(32.8%)
Darila Marca Index	>22.8	43 (67.2%)
Body Mass Index	≤ 22.8	21 (32.8%)
Dura da la	Yes	21 (32.8%)
Previous fail	No	43 (67.2%)
Vicion problem	Yes	48 (75.0%)
vision problem	No	19 (25.0%)
Incentinence	Yes	32 (50.0%)
Incontinence	No	31 (48.4%)
Comorbidity	Yes	61 (95.3%)
Comorbidity	No	3 (4.7%)
Mare then 4 prescribed medication	Yes	27 (42.2%)
More than 4 prescribed medication	No	37 (57.8%)
	Independent	49 (76.6%)
Pre-fracture Barthel Index	Mild dependent	13 (20.3%)
	Dependent	2 (3.1%)
	Unable to walk	33 (51.6%)
	Walking half a mile	9 (14.1%)
ROSOW-Bresidu Functional Realth Scale	Walking up and down stairs	10 (15.6%)
	Doing heavy work around house	12 (18.8%)
	Independence	22 (34.4%)
Walking impairment	Shuffle	2 (3.1%)
waiking impairment	Walking with assistance	5 (7.8%)
	Walking aids help	34(53.1%)
	No	33 (51.6%)
Depression on admission	Mild	26 (40.6%)
Depression on admission	Moderate	5 (7.8%)
	Severe	0
Frailty on admission	Yes	22 (34.4%)
	No	42 (65.6%)
Fear of fall on admission	Yes	8 (12.5%)
	No	56 (87.5%)
Environmental Hazards	Yes	56 (87.5%)
	No	8 (12.5%)
	Normal	11 (17.2%)
Cognitive impairment at 1 <sup>st</sup> date postoperative	Mild cognitive impairment	19 (29.7%)
	Moderate cognitive impairment	25 (39.1%)
	Severe cognitive impairment	9 (14.1%)
Delirium at 1 <sup>st</sup> date nostonerative	Yes	18 (28.1%)
	No	46 (71.9%)
Delirium at 5 <sup>th</sup> date nostonerative	Yes	0
	No	64 (100.0%)
EQ-5D; mean(SD)	0.71 (± 0.2)	range 0.05-1
EQ-VAS; mean(SD)	64.58 (± 18.4)	range 10-100

An important is that participants without a history of preceding falls have an increased risk of falling due to the presence of home hazards. The study of Parker et al. [19] indicates that, an environmental hazard is identified for 54.0% of falling [19]. The fracture may therefore be preventable by environment manipulation. Home hazard assessments and modification are frequently recommended as a method of fall prevention and reduction in the community setting [20].

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	5 <sup>th</sup> date of post-operative						
Patients' characteristics	EQ-5D-5L index			EQ VAS index			
	Pearson's coefficient	Spearmen's coefficient	p value	Pearson's coefficient	Spearmen's coefficient	p value	
Gender		-0.15	0.237		-0.09	0.499	
Previous fall		-0.41*	0.001		-0.18	0.15	
BMI		-0.21	0.097		0.07	0.59	
Comorbidity		-0.01	0.977		-0.05	0.709	
Incontinence		-0.16	0.213		-0.17	0.184	
Vision		0.03	0.8		0.04	0.785	
Walking impairment		-0.64*	<0.001		-0.50*	<0.001	
Environment Hazard		0.05	0.71		-0.05	0.698	
More than 4 prescribed medication		-0.27*	0.034		-0.12	0.345	
Depression on admission		-0.31*	0.007		-0.57*	<0.001	
Delirium at 1 <sup>st</sup> date postoperative		-0.19	0.138		-0.28*	0.028	
Age	0.01		0.96	-0.11		0.38	
Pre-fracture Barthel Index	0.82*		<0.001	0.71*		<0.001	
Functional status	0.54*		<0.001	0.63*		<0.001	
Frailty on admission	-0.50*		<0.001	-0.51*		<0.001	
Fear of Fall on admission	-0.72*		<0.001	-0.68*		<0.001	
MMSE at 1st date postoperative	0.25		0.051	0.48*		<0.001	
Pain at 5 <sup>th</sup> date postoperative	-0.15		0.253	-0.06		0.668	
$p \leq 0.050$ significant							

Table 2 Association between Factors with EQ-5D-5L index and EQ VAS.

Table 3 Multiple regression analysis of factors influencing HRQOL at 5<sup>th</sup> date post-operative.

Factors	EQ-5D-5L index			EQ VAS				
	В	β	95%CI of B	p value	В	β	95%CI of B	p value
Pre-facture BI	0.04	0.71	0.03 to 0.05	< 0.001	2.11	0.5	1.32 to 2.89	<0.001
Depression					-9.92	-0.28	-16.27 to -3.58	0.003
Frailty	-0.04	-0.22	-0.08 to -0.01	0.007	-3.58	-0.24	-6.28 to -0.89	0.010
Adjusted R <sup>2</sup>	0.67			0.59				
p ≤ 0.05 significant								

In our study, almost half of the patients report slight problems of mobility, usual activities, pain or discomfort, and anxiety or depression. Consistency with study of Buecking et al. [3] using EQ-5D-3L, findings showed that the level of all dimensions of HRQOL was some problems which covering of slight, moderate, and severe problem of EQ-5D-5L [3] The HRQOL at 5th date postoperative day is interpreted as good QOL according to EQ-5D with time trade-off (TTO) valuation techniques scored 0.71  $\pm$ 0.26. The HRQOL at 5<sup>th</sup> date postoperative day are consistent with recent studies [21] Moreover, the finding reflecting that among elderly adults around the same age as our sample are expected HRQOL after surgery should be in the range from 64.1 (± 22) to 67.6 (± 19.3) by the visual analogue (EQ-VAS), in congruence with studies of Sugeno et al. [4,20] Summing it up, we can say that the primary approach should be to aid individuals overcome barrier to achieve sustained HRQOL. Nurses should have plan to assist them with eliminating restriction and encouragement in walking and doing their usual activities and relieving pain and/or discomfort and anxiety and/or depression.

The results of our study are similar to those reported in previous

studies. Pre-fracture ADL [3,4], functional status [4], cognitive function [3,4], depression [3], FOF [22], and frailty [23] are associated with EQ-5D or EQ VAS. Interestingly, delirium is associated only with EQ-VAS, which is consistent with one report in which delirium onset after hip fracture lowered HRQOL even more using SF-36 assessment [23]. Patients with limited ADL prior fracture are at risk for lower HRQOL both two assessments. Inconsistent with previous studies, Activities of daily living are significantly associated with a change in only EQ-VAS score [24]. One reason may be that EQ-VAS measures something which is conceptually different than EQ-5D profile. EQ-VAS index used patients' own overall assessment of their health, but EQ-5D restricted to the five dimensions. The fact is the improvement of the ability to perform of ADLS appeared to speed up recovery in HRQL [3]. Therefore, patients who are independent prior fracture should be protected from a loss of independent, whereas, patients who dependent before fracture and high frailty, declined functional should be protected and recovered. Nursing intervention based on encouraging appropriate levels of physical activity or exercise, especially weight-bearing activities should have been developed.

Frailty is a negative association with HRQOL both 2 assessments. Rockwood et al. [25] found that frailty gave rise to vulnerability and adverse outcomes [25]. Furthermore, after adjusting for socio-demographic and health related co-variables, being frail remained associated with lower scores on HRQOL scales [26]. Frailty (five Fried's criteria) also impacted HRQOL negatively among Italian community-dwelling older adults [27]. Establishing project to decrease frailty through exercise and a multifactorial intervention should be implemented for caring for patients post hip replacement [23].

The onset of depression is common after hip fracture [28]. Thirty-one (48.4%) of patient had an incident depression after hip fracture (DGS scores of more than 4 points). Consistency with Lenze et al. [28] study, the risk of developing depression is greatest immediately after the fracture and in particular the first 2 weeks. Greater depressive symptom severity was associated with poorer HRQOL [3]. Most importantly, major depressive [29] episodes mainly occurred within the first 200 days following the fracture. These results suggest that depression screening should be considered, and if there are episode of depressive symptoms evident, a psychiatrist should be consulted.

However, despite the efforts of previous studies, the most protocols have yet to be determined post-acute care. In consistency with Buecking et al. [3], during the hospitalization period, the mean of EQ-5D-5L index and EQ VAS is reduced [3]. From the results of this study, it may be proposed that ADL limitation, frailty, and depression should be given consider, aiming for the attainment of HRQOL. Comprehensive care, with enhanced rehabilitation, improved self-care abilities, management of depressive symptoms can help to improve HRQOL. Therefore, successful rehabilitation and mental support intervention program should be developed. Of course, these have been verified by future research.

There are many limitations in this study. First, demented patients were excluded a priori. Patients with internal fixation and those with total hip replacement were not distinguished in the analysis. Tidermark et al. [30] found that the reduction in HRQOL (EQ-5D index score) was lower in the Total hip replacement group than

in the internal fixation group, when comparing the pre-fracture situation with follow-up reviews [30]. Small sample and for some factors of interest, for example, FOF, only a few patients had positive responses. Finally, patients treated in another setting, indifferent environment of care and by different providers may have different results.

## Conclusion

In conclusion, ADL limitation, frailty and depression emerging in older adults who falls and hip fracture has an influence in lower HRQOL on day 5 after hip surgery. In addition, the study findings confirm the revised Wilson and Cleary model (1995) and suggest that symptoms such as depression and fatigue and functional states such as activities of daily impairment were influential in a lower HRQOL. These findings imply that a starting point for advocated HRQOL may be influenced by managing ADL limitation and incident of depressive symptoms, and fatigue. Important strategies should be initiated as soon as possible during the hospitalization. The efforts should be aimed to maintain and promote their activity of daily living and to diagnose and treat frailty and depression adequately. A model of care, for example, geriatric consultations were delivered by a geriatrician and a geriatric nurse to detect potential problems such as depression and fatigue. If indicated, managing fatigue and depression should be implemented. Rehabilitation should be started on the first day after surgery, and emphasized pain relief. A structured discharge planning as well as knowledge deficits and providing corresponding interventions should be initiated.

# **Conflicts of Interest**

The authors declare no conflict of interest.

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