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The Relationship Between Frailty Syndrome and Geriatric Anxiety in Hospitalized Older Adults

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A B S T R A C T

Introduction: Aging leads to declines in both physical and mental performance, resulting in major disorders such as frailty syndrome and anxiety. This study aimed to explore the relationship between frailty syndrome and anxiety among older adults hospitalized in educational hospitals in Ilam City in 2024.

Materials & Methods: This cross-sectional study examined 240 older adults at educational hospitals in Ilam from May to July 2024. Data were collected using demographic questionnaires, the Mini-Mental Status Examination (MMSE), the Groningen Frailty Index (GFI), and the Geriatric Anxiety Index (GAI). Data analysis was performed using SPSS V.16, applying Kolmogorov-Smirnov, chi-square, Mann-Whitney, Kruskal-Wallis, simple linear regression, and descriptive statistics (mean, standard deviation, frequency) at a 5% significance level.

Results: The participants had a mean age of 72.44 ± 5.19 years, with GFI and GAI scores of 11.04 ± 2.68 and 15.58 ± 2.55, respectively. Significant relationships were found between literacy level and reasons for hospitalization with the GFI, and marital status and daily care needs with the GAI. A significant positive relationship was observed between the physical dimension of the GFI and mild to moderate anxiety, the social dimension and severe to total anxiety, the psychological dimension and susceptibility to anxiety, and the total GFI score with severe and total anxiety.

Conclusion: The study found that the physical, cognitive, and psychological dimensions of the GFI were related to varying levels of GAI, with specific correlations between the GAI and the social dimension of the GFI.

Keywords: Frailty, Geriatric, Anxiety, Syndrome, Hospital

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Introduction

At present, the phenomenon of aging is on the rise globally, primarily due to increased life expectancy, improved satisfaction, and a decline in mortality and population growth (1). Aging is a natural outcome of the passage of time and is a fundamental aspect of life for those who live a typical lifespan (1, 2). Old age is often defined as starting at age 65 and beyond, marking the beginning of biological changes that impact an individual's social, physical, and psychological capabilities (3). The global population of individuals aged 80 years or older is expected to reach 120 million by 2022. Additionally, by 2050, the proportion of individuals over the age of 60 is projected to rise from 12% to 22%, resulting in a population of 2 billion. Iran is anticipated to enter an aging phase within the next 8–10 years, transitioning from a youthful to a mature state, as indicated by statistical indicators (4). The 2016 census in Iran recorded 7 million and 450 thousand senior individuals (5). This figure is expected to rise to 10.5% by 2024 and 27.9% by 2050 (6). In their later years, individuals experience physiological, psychological, functional, and social changes that can affect their overall well-being (7). A crisis occurs when an older adult is unable to adapt to the natural process of aging (8).

Common age-related changes include increased susceptibility to conditions such as hypertension and diabetes, financial strain, the responsibility of caregiving, emotional stress, mood disorders, anxiety, self-dissatisfaction, and a decline in overall quality of life (9). The initial stage of aging is marked by noticeable physical changes compared to earlier decades of life (10). Significant physical alterations commonly observed during this phase include involuntary weight loss, fatigue, reduced walking speed, muscular weakness, and decreased mobility, collectively known as frailty syndrome (11). Frailty syndrome is characterized by increased vulnerability to stressors due to declines in function and reserves across multiple physiological systems, including muscle weakness, fatigue, slowed motor performance, low physical activity, and unintentional weight loss in older adults (12). Older adults with frailty syndrome experience reduced autonomy in daily activities and increased dependence on others (13). Frailty syndrome leads to various negative consequences, including a higher risk of mental disorders, social isolation, prolonged hospitalizations, susceptibility to accidents and fractures, limitations in physical abilities, and increased mortality rates (14).

Worldwide, it is estimated that between 14 and 25 percent of individuals aged 65 and older suffer from mental illnesses (15). Symptoms associated with these conditions can include reduced cognitive abilities, social disengagement, anxiety, and disturbed sleep patterns (15). Anxiety, one of the most prevalent mental health issues among older adults, can significantly impact their quality of life (15, 16). Changes in these aspects may negatively affect the treatment of older adults. This study indicates that the prevalence of anxiety among older adults in Iranian society ranges from approximately 8% to 15%, while the prevalence among those residing in care facilities is around 30% (17).

Due to the high prevalence of mood and anxiety disorders, older adults are at increased risk for psychological damage, anxiety, and disruptive behaviors (18). Higher levels of anxiety in older adults can lead to a decline in their ability to perform self-care activities, an increase in depressive feelings, and reduced social engagement (15). The research suggests that caregivers, particularly nurses, should prioritize screening for frailty syndrome and implementing interventions to enhance the mental health of those at risk. This approach is crucial for minimizing adverse outcomes and complications (19).

Based on existing studies, frailty syndrome is a common aspect of old age, with its severity and prevalence influenced by various factors. Anxiety is also known to exacerbate the severity of common diseases in older adults. This study aimed to explore

the relationship between frailty syndrome and geriatric anxiety among older adults hospitalized in educational hospitals in Ilam City in 2024.

Materials and methods

This cross-sectional study was conducted from May 2024 to July 2024. The aim was to investigate the relationship between frailty syndrome and geriatric-specific anxiety among older adults admitted to educational hospitals in Ilam City in 2024. The research population consisted of 240 older adults referred to teaching hospitals in Ilam City.

The sample size was calculated using the formula for a 95% confidence interval, with a 19% prevalence rate for frailty syndrome (20) and a precision of 5%. The final sample size was determined to be 240.

$$N = \frac{z^2 \ pq}{d^2}$$

This study employed a simple random sampling method from the centers. After obtaining the ethics code, the researcher introduced himself to eligible older adults, explained the study's dimensions, and invited them to participate if they wished. The samples were then selected randomly, and the study's tools were administered through oral questioning. During data collection, all participants completed the questionnaires, resulting in a 100% response rate, with no participants excluded from the study.

Inclusion criteria were age 65 years or older, hospitalization for more than 12 hours, and a score of 23 or higher on the Mini-Mental Status Examination (MMSE) to ensure the absence of cognitive disorders and verbal communication ability. Exclusion criteria included unwillingness to participate and incomplete questionnaire responses. The tools used in this study included a demographic information questionnaire, the MMSE, the Groningen Frailty Index (GFI), and the Geriatric Anxiety Index (GAI).

Ethical concerns were addressed by adhering to ethics code IR.MEDILAM.REC.1403.002, ensuring honesty in data collection and reporting, obtaining written informed consent from all participants in accordance with the Declaration of Helsinki's guidelines, and following ethical principles for conducting research on human subjects.

Measurement & Validity and Reliability

1. Demographic Information Form

Demographic variables included age, gender, marital status, education, occupation, reason for admission, daily care requirements, daily activity status, and living arrangements.

2. Mini-Mental Status Examination (MMSE)

The MMSE, developed by Folstein et al., is a valid and widely used 17-question tool for assessing cognitive impairment. The maximum score is 30, with a cutoff point of 24. A score of 24 and above indicates no cognitive impairment, 18 to 23 indicates mild cognitive impairment, 10 to 17 indicates moderate cognitive impairment, and less than 10 indicates severe cognitive impairment. In the original version of this tool, the Content Validity Index (CVI), Content Validity Ratio (CVR), and internal consistency (Cronbach's alpha) were reported as 0.97, 0.91, and 0.96, respectively. In the Iranian version, tested on elderly individuals with cognitive dysfunction, the CVI, CVR, and internal consistency (Cronbach's alpha) were reported as 0.91, 0.90, and 0.93, respectively (21).

3. Groningen Frailty Index (GFI)

The GFI, developed by Peter and colleagues, is designed to assess frailty in older adults. It consists of 15 questions divided into four domains: physical, cognitive, social, and psychological. Scores range from 0 to 15, with each affirmative response scoring one point, partial affirmative responses scoring half a point, and negative responses scoring zero. A score of 4 or above indicates frailty syndrome. In the original version, the CVI, CVR, and internal consistency (Cronbach's alpha) were reported as

0.86, 0.82, and 0.87, respectively. In the Iranian version, tested on elderly individuals with frailty, the CVI, CVR, and internal consistency (Cronbach's alpha) were reported as 0.88, 0.87, and 0.76, respectively (13).

4. Geriatric Anxiety Index (GAI)

The Geriatric Anxiety Index, developed by Pachana et al., is specifically designed to assess anxiety in older adults. It consists of 20 questions, with a minimum score of zero and a maximum score of twenty. The overall score is categorized as follows: zero to three (normal anxiety), four to seven (tendency towards anxiety), eight to ten (mild anxiety), eleven to fifteen (moderate anxiety), and sixteen to twenty (severe anxiety). In the original version of this tool, the Content Validity Index (CVI), Content Validity Ratio (CVR), and internal consistency (Cronbach's alpha) were reported as 0.94, 0.91, and 0.92, respectively. In the Iranian version, tested on elderly individuals with anxiety, the CVI, CVR, and internal consistency (Cronbach's alpha) were reported as 0.92, 0.84, and 0.88, respectively (22).

Statistical and Data analysis

Data were entered into SPSS V.16 for statistical analysis. Descriptive statistics, including percentages or means with 95% confidence intervals, were used to present the data. The t-test and ANOVA were employed to compare the means of GFI and GAI across different demographic variables. Simple linear regression was used to assess the association between the total and subscale scores of GFI and GAI. For model building, GAI was considered the outcome variable, while GFI was the independent variable, with age and sex included as covariates to adjust for their effects. The significance level was set at $p < 0.05$.

Results

The Kolmogorov-Smirnov test indicated that the data followed a normal distribution (table 1). The majority of participants were male, married, illiterate, and retired. Most were hospitalized due to metabolic diseases and required daily care ranging from 2 to 4 hours. Additionally, they had a daily activity level of less than 1 hour and lived with family members. Other demographic characteristics are detailed in Tables 1 and 2.

Table 1. Normal Distribution of Quantitative Variables Among Study Participants.

Variable	P Value (Kolmogorov-Smirnoff)
Age	0.057
GFI	0.401
GAI	0.783

Table 2. Distribution of Demographic and Outcome Variables Among Participants.

Variable		Frequency (Percent)	Effect size (95% CI)
Sexuality	Male	183 (76%)	76.25 (70.35 to 81.49)
	Female	57 (24%)	23.75 (18.51 to 29.65)
Marital Situation	Single	8 (4%)	3.33 (1.45 to 6.46)
	Married	193 (80%)	80.42 (74.82 to 85.24)
	Widow	25 (10%)	10.42 (6.86 to 14.99)
	Divorced	14 (6%)	5.83 (3.23 to 9.59)
Education	Illiterate	94 (39%)	39.17 (32.95 to 45.65)
	Elementary	56 (23%)	23.33 (18.13 to 29.20)

	Secondary	42 (17.5%)	17.5 (12.91 to 22.91)
	Diploma	33 (14%)	13.75 (9.66 to 18.76)
	Above Diploma	15 (6.5%)	6.25 (3.54 to 10.10)
Job	Employed	47 (19.5%)	19.58 (14.76 to 25.18)
	Retired	179 (74.5%)	74.58 (68.58 to 79.97)
	Free	14 (6%)	5.83 (3.23 to 9.59)
Reason of admission	Cardiovascular disease	79 (33%)	32.92 (27.01 to 39.25)
	Metabolic disease	84 (35%)	35.00 (28.98 to 41.40)
	Falling	44 (18%)	18.33 (13.65 to 23.82)
	Accident	24 (10%)	10.00 (6.51 to 14.51)
	Malignancy	9 (4%)	3.75 (1.73 to 7.01)
Daily care demand	Less than 2 hours	62 (26%)	25.83 (20.42 to 31.86)
	2 to 4 hours	106 (44%)	44.17 (37.78 to 50.70)
	More than 4 hours	72 (30%)	30.00 (24.27 to 36.23)
Daily activity status	Less than 1 hour	173 (72%)	72.08 (65.95 to 77.66)
	1 to 3 hours	43 (18%)	17.92 (13.28 to 23.36)
	More than 3 hours	24 (10%)	10.00 (6.51 to 14.51)
Type of living	Alone	14 (6%)	5.83 (3.23 to 9.59)
	With Family Members	149 (62%)	62.08 (55.62 to 68.25)
	Dwelling resident	77 (32%)	32.08 (26.22 to 38.39)

The mean and standard deviation of age, GFI and, GAI score were 72.44 ±5.19, 11.04±0.68 and 15.78±0.64, respectively (table 3).

Table 3. Mean and standard deviation of age, GFI and, GAI in the study's participants.

Variable	Mean	Standard Deviation
Age	72.44	5.19
GFI	11.04	0.68
GAI	15.78	0.64

The mean GFI and GAI scores, stratified by demographic variables, are presented in Table 4. For the GFI, significant differences were observed based on education level (P=0.007) and reason for admission (P=0.002). No significant differences were found for the remaining variables. For the GAI, significant differences were noted in relation to marital status (P=0.031) and daily care demand (P=0.009). No significant differences were found for the remaining variables (table 4).

Table 4. Examination of the Relationship Between Groningen Frailty Index (GFI) and Geriatric Anxiety Index (GAI) Across Demographic Variables.

Variable			Mean	Standard Deviation	P Value
GFI	Sexuality	Male	12.09	1.84	0.071[a]
		Female	11.47	2.59	
	Marital Situation	Single	13.24	1.41	0.079[b]
		Married	10.63	1.02	
		Widow	12.72	0.56	
		Divorced	14.11	0.88	
	Education	Illiterate	13.28	0.73	0.007[b]
		Elementary	12.94	0.22	
		Secondary	12.48	0.51	
		Diploma	11.64	0.47	
		Above Diploma	10.36	0.96	
	Job	Employed	9.84	0.47	0.296[b]
		Retired	11.27	2.14	
		Free	10.16	1.36	
	Reason of admission	Cardiovascular disease	13.55	0.33	0.002[b]
		Metabolic disease	12.87	1.71	
		Falling	14.36	0.39	
		Accident	12.22	1.16	
		Malignancy	14.17	0.26	
	Daily care demand	Less than 2 hours	12.77	1.03	0.069[b]
		2 to 4 hours	13.29	0.86	
		More than 4 hours	13.61	0.45	
	Daily activity status	Less than 1 hour	12.38	2.16	0.316[b]
		1 to 3 hours	11.94	1.71	
		More than 3 hours	10.18	0.62	
	Type of living	Alone	13.71	0.79	0.277[b]
		With Family Members	12.86	0.86	
		Dwelling resident	13.97	0.29	
GAI	Sexuality	Male	16.27	1.74	0.058[a]
		Female	17.11	0.83	
	Marital Situation	Single	15.28	1.64	0.031[b]
		Married	14.58	2.73	
		Widow	16.07	2.35	
		Divorced	17.32	0.61	
	Education	Illiterate	15.79	1.87	0.088[b]
		Elementary	15.02	0.47	
		Secondary	15.63	1.32	
		Diploma	14.81	1.31	
		Above Diploma	14.23	0.27	

	Job	Employed	1746	0.62	0.067[b]
		Retired	16.19	1.43	
		Free	14.95	0.78	
	Reason of admission	Cardiovascular disease	17.37	1.18	0.124[b]
		Metabolic disease	16.41	1.44	
		Falling	18.39	1.09	
		Accident	18.71	0.14	
		Malignancy	17.04	1.81	
	Daily care demand	Less than 2 hours	14.39	0.51	0.009[b]
		2 to 4 hours	15.84	1.77	
		More than 4 hours	16.69	2.02	
	Daily activity status	Less than 1 hour	15.23	0.34	0.094[b]
		1 to 3 hours	14.71	1.36	
		More than 3 hours	12.38	1.55	
	Type of living	Alone	18.07	1.16	0.509[b]
		With Family Members	15.57	2.08	
		Dwelling resident	18.64	0.84	

a: t-test b: ANOVA

According to the linear regression analysis results, a significant positive relationship was found between the physical dimension of the Groningen Frailty Index (GFI) and mild (b=0.113, P=0.025) and moderate (b=0.162, P=0.006) anxiety in older adults. Additionally, the social dimension of the GFI showed a positive relationship with severe (b=0.148, P=0.022) and total (b=0.409, P=0.008) anxiety in older adults. Conversely, there was a significant negative relationship between the social dimension of the GFI and moderate anxiety (b=-0.731, P=0.002). The psychological dimension of the GFI had a significant positive relationship with a predisposition to anxiety (b=0.535, P=0.032). Finally, a positive and significant relationship was observed between the total GFI score and both severe (b=0.259, P=0.020) and total (b=0.487, P=0.001) anxiety in older adults (table 5).

Table 5. Regression Coefficients for the Relationships Between Geriatric Anxiety Index (GAI) Total Score and Subscales with Groningen Frailty Index (GFI) Total Score and Subscales Using Linear Regression Analysis.

Variables		Not- Standard Coefficient		Statistical T	P Value
		B	Standard Error		
Physical	Consistent amount	8.571	1.671	5.13	<0.001
	Normal	0.413	0.209	1.98	0.056
	Prone	-0.211	0.1	-1.176	0.333
	Mild	0.113	0.098	4.293	0.025
	Moderate	0.162	0.058	3.972	0.006
	Severe	0.317	0.080	1.516	0.325
	Total	0.468	0.274	1.704	0.164
Cognitive	Consistent amount	6.029	1.232	4.548	<0.001
	Normal	-0.816	0.272	-1.949	0.069

	Prone	-0.618	0.324	-1.902	0.067
	Mild	0.748	0.402	1.860	0.074
	Moderate	0.319	0.208	1.531	0.345
	Severe	-0.297	0.171	-1.732	0.110
	Total	0.259	0.128	2.01	0.025
Social	Consistent amount	9.384	1.749	5.603	<0.001
	Normal	0.121	0.409	1.838	0.089
	Prone	0.247	0.187	1.318	0.257
	Mild	-0.691	0.436	-1.691	0.108
	Moderate	-0.731	0.246	-3.758	0.002
	Severe	0.148	0.551	2.547	0.022
	Total	0.409	0.141	2.917	0.008
Psychological	Consistent amount	8.131	1.372	5.920	<0.001
	Normal	0.223	0.651	1.214	0.243
	Prone	0.535	0.399	2.361	0.032
	Mild	-0.257	0.327	-1.293	0.263
	Moderate	0.788	0.086	1.497	0.153
	Severe	0.174	0.049	1.105	0.322
	Total	0.096	0.053	-1.788	0.090
Total	Consistent amount	8.118	1.309	6.201	<0.001
	Normal	0.928	0.603	1.538	0.318
	Prone	0.442	0.229	1.903	0.067
	Mild	-0.374	0.251	-1.486	0.183
	Moderate	0.933	0.597	1.562	0.311
	Severe	0.259	0.098	2.61	0.020
	Total	0.487	0.117	4.09	0.001

All coefficients were adjusted for age and sexuality

Discussion

This study aimed to explore the relationship between frailty syndrome and geriatric anxiety among hospitalized older adults in educational hospitals in Ilam City in 2024. A significant relationship was found between literacy level and the Groningen Frailty Index (GFI). Review articles suggest that literacy is an empowering factor, as it enhances a person's cognitive ability to understand and interpret health information, leading to better self-care. Cognitive skills such as searching, interpreting, and critically evaluating health information are crucial for lifelong learning and play a significant role in the physical, mental, and social development of older adults, ultimately improving their living conditions and citizenship (23).

A significant relationship was also observed between the reasons for hospitalization and the GFI. Specifically, falls as a reason for hospitalization were significantly associated with the GFI. Frailty syndrome is linked to disability, dependence, increased mortality, social isolation, frequent hospitalizations, and limitations in physical performance (24). Older adults in hospitals may have chronic diseases or anxiety. Research by Bastani et al. found a connection between anxiety and falls, as well as a history of chronic diseases (18). Additionally, Francesco et al.'s epidemiological study at a major trauma center in Italy identified head injuries and falls as leading causes of trauma-related death in older adults (19).

The findings of this study revealed a relationship between marital status and geriatric anxiety, with older adults who had lost their spouses showing higher mean anxiety scores. The loss of a spouse can lead to feelings of loneliness, which, according to Bergman et al., is positively correlated with anxiety and depression symptoms among older adults (25). A systematic review and meta-analysis by Kojima et al. highlighted the link between loneliness and frailty in community-dwelling older adults. Besides losing a spouse, the loss of family, relatives, friends, economic resources, and physical or motor functions also contribute to feelings of loneliness. The multidimensional nature of frailty exacerbates the vulnerability of lonely older adults (26).

Additionally, a significant relationship was found between the amount of daily care required and geriatric anxiety. Older adults who needed more than 4 hours of care per day had higher mean anxiety scores. The anxiety of older adults can impact their caregivers. Vrettos et al. identified an indirect effect of frailty in dependent older adults on the anxiety of their informal caregivers, with abnormal anxiety symptoms reported among 92 caregivers (16).

This study also found a significant relationship between the Groningen Frailty Index (GFI) and the Geriatric Anxiety Index (GAI). Tan et al., in a systematic review of 20 cross-sectional and longitudinal studies, demonstrated a clear association between pre-frailty and anxiety in older adults, although the data were heterogeneous. The heterogeneity was attributed not to varying criteria or cut-off values for frailty but to the selection of appropriate anxiety assessment tools and underlying health conditions (27). In the present study, the anxiety assessment tool used was specifically designed for older adults.

There was a significant positive relationship between the physical dimension of the Groningen Frailty Index (GFI) and mild Geriatric Anxiety Index (GAI). Mild anxiety in older adults with frailty syndrome may be linked to difficulties in performing daily activities. Chronic diseases, comorbidities, and the unique conditions of old age can contribute to physical frailty. Hosseini et al. investigated the relationship between chronic diseases and the inability to perform daily activities in older adults, identifying stroke, cancer, and hearing loss as major contributors to disability in men, and stroke, cancer, and vision loss in women (28). Khulud Alharbi et al. found that age, physical inactivity, specific comorbidities (cardiovascular, osteoarticular, sensory), and polypharmacy, as well as Instrumental Activities of Daily Living (IADL) and performance-based tests, are effective in diagnosing frailty (29).

There was a significant positive relationship between the cognitive dimension of the GFI and moderate GAI. Comorbidities are associated with frailty and anxiety in older adults, with cognition being affected by these conditions and vice versa. Rivan et al., in a community-based longitudinal study, demonstrated synergistic effects of cognitive frailty and comorbidities, including osteoarthritis, heart diseases, diabetes mellitus, and depressive symptoms, on disability in older adults (30).

A significant positive relationship was observed between the psychological dimension of the GFI and severe GAI. Reynolds et al. conducted an observational study on the mental health burden in frail older adults, finding that anxiety and depression levels increased with the severity of frailty (17).

Additionally, a significant positive relationship was found between susceptibility to GAI and the social dimension of the GFI. Demographic, socio-economic, and health-related variables can influence the social dimension of the GFI. Frailty leads to individual vulnerability, which is linked to social vulnerability. Zhao et al. investigated the mutual effects of anxiety and outdoor activity on frailty among nursing home residents, finding that anxiety and outdoor activity interacted to affect frailty (31). Andrew et al. showed that while social vulnerability is related to individual vulnerability, it is distinct

from it, and social vulnerability is more strongly associated with mortality in older adults (32).

One of the limitations of this study was the reliance on a questionnaire for data collection. Additionally, the research participants were older adults who were hospitalized for medical reasons and may not have been in optimal physical or mental condition to respond to the questionnaires, especially during hospitalization. Efforts were made to collect accurate data by explaining the study to participants, administering the questionnaire under appropriate conditions, and allowing sufficient time for completion.

Strengths of this study include the use of a sufficiently large sample size and the employment of specialized tools tailored to assess frailty and anxiety in older adults.

Conclusion

The results indicate a relationship between the physical, cognitive, and psychological dimensions of the Groningen Frailty Index (GFI) and mild, moderate, and severe Geriatric Anxiety Index (GAI) scores, respectively. Additionally, sensitivity to GAI was associated with the social dimension of GFI. Therefore, it is recommended to address the physical, cognitive, psychological, and social needs of frail older adults to reduce anxiety. Enhancing self-care, providing proper education, implementing psychological interventions to mitigate anxiety, and offering social support from family, friends, and institutions are suggested strategies.

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Conflict of interest

The authors declare no conflict of interest.

Authors' contributions

AV: Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Writing – Original Draft Preparation, Project Administration

MO: Validation, Resources, Writing – Review & Editing, Visualization, Supervision, Funding Acquisition.

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