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Feasibility of Telephone-Based Cognitive Assessments and Healthcare Utilization in US Medicare-Enrolled Older Adults Following Emergency Department Discharge

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ABSTRACT

Background: Wider screening and assessment for Alzheimer's disease and other related dementias (ADRD) may increase access to supportive care, improve allocation of medical care, and foster the use of interventions that prevent or delay disease progression. Yet, the effect of diagnostic timing on clinical and utilization outcomes is poorly understood. Community-based settings such as a hospital emergency department (ED) may be an underrecognized opportunity to assess cognition and impacts on individuals and health systems. This study assessed the feasibility of recruiting older adults for telephone-based trials following presentation to the ED and administering telephone based cognitive assessments over the phone in this population. **Methods:** Medicare-enrolled individuals 65+ years of age (n = 160) presenting to the Oregon Health & Science University Emergency Department (Portland, Oregon) between May 2022 and February 2023 were recruited by telephone. Participants were administered the Telephone Interview for Cognitive Status (TICS) Assessment and the Patient Reported Outcomes Measurement Information System (PROMIS) Cognitive Measure Questions on Mental Clarity via telephone 1-12 weeks post-discharge to evaluate cognition. Electronic medical records (EMR) were reviewed for medical care utilization including primary care provider (PCP) visits, hospital admissions, and ED visits for the 3 years prior to ED presentation.

Results: Twenty-six percent of eligible ED users contacted elected for study enrollment. The TICS Assessment score had a significant relationship with the three evaluated health care utilization measures (ED, PCP visits, or hospitalizations); the PROMIS Assessment had significant but weak correlations to ED and PCP visits.

Conclusions: Older adults 65+ years presenting to the ED are amenable to enroll in telephone-based cognition-focused trials and cognitive assessments can be carried out over the telephone in this population. The PROMIS Assessment may be a better cognition assessment tool when evaluating for cognition and care utilization in this population. In addition to the limits of the screening tools used in this study, a lack of a representative sample is a limitation of the study design. Future studies could use other validated cognitive assessment tools and utilize a study design with a recruitment strategy focused on obtaining a representative sample of older ED patients.

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Summary

- Cognitive assessments within community-based settings such as emergency departments (ED) are an important approach for reaching diverse populations whose access and engagement with the formal health care system may be limited.
- Older adults 65+ years of age presenting to the ED are amenable to enroll in telephone-based cognitionfocused trials and cognitive assessments can be carried out over the telephone.
- The TICS Assessment score was significantly correlated with the three evaluated health care utilization measures in this study (ED, primary care physician [PCP] visits, and hospitalizations); the PROMIS assessment of cognition was correlated with ED and PCP visits.
- Results provide preliminary evidence to support a focus on cognitive screening of older ED patients.

1 | Introduction

The global number of older adults with Alzheimer's disease and related dementias (ADRD) is projected to increase to approximately 152 million by 2050 [1]. Several organizations including the World Health Organization (WHO) have identified a timely and accurate diagnosis of ADRD as a top public health priority [2]; however, an estimated 59% of persons in the United States (US)with ADRD never receive a formal diagnosis [3]. The rates of ADRD underdiagnosis are higher for other regions of the world including Brazil at 77% and China with as much as 80% [4, 5]. Widespread underdiagnosis compromises the wellbeing of persons with ADRD and their care partners (CP) and increases health services utilization and costs of care including those borne by US public programs like Medicare and Medicaid. In 2024 alone, ADRD care cost Medicare and Medicaid over \$231 billion [6].

Wider and earlier screening and assessment for ADRD may increase access to supportive care, improve allocation of medical care resources, and foster the use of interventions that prevent or delay disease progression [7]. Barnett et al. (2014) projected implementing interventions 3-9 years earlier than the current average initiation of treatment would reduce care costs on average 17% per year [8]. An additional potential benefit is that as new disease modifying treatments become available, earlier screening may produce even greater savings to health systems and to programs that fund ADRD care, as well as increase the potential benefits of earlier treatment initiation for those with the disease [9, 10]. Zissimopoulos, Crimmins, and Clair (2014) showed delaying dementia onset by 5 years may increase life expectancy by 2.7 years and produces an average cost savings of \$511,208 per person [11]. Given the rate of inflation since 2014, the projected savings would be \$673,855 per person in June 2024 [12]. The clinical gains for people with ADRD alone would justify earlier and more frequent cognition screening and assessments. Early identification of decline allows for better care planning and disease management regardless of the impacts on costs. Further research is needed to better understand the effects of diagnostic timing.

Most persons with ADRD are diagnosed by a primary care provider (PCP); yet 40%-76% of all people with ADRD go undiagnosed in primary care settings [13-15]. PCPs face several barriers to making a diagnosis including insufficient training in ADRD assessment and management, a shortage of use of cognitive screening tools, insufficient time in clinical visits, and the perception that nothing can be done to treat or cure the disease. The Medicare Annual Wellness Visit (AWV) is an opportunity to assess cognitive status amongst Medicare beneficiaries in a primary care setting, as this visit requires providers to perform a cognitive assessment. However, Medicare's AWV is more widely utilized by higher income, white, urban beneficiaries, while Medicare-Medicaid dual-eligible individuals have a lower rate of utilization than non-dual Medicare and Medicaid eligible beneficiaries [16]. Furthermore, a 2018 review found that the AWV's requirement of a cognitive status assessment fails to significantly increase the recognition of undetected ADRD amongst Medicare beneficiaries [17]. Thus, alternatives to relying primarily on primary care offices to test cognition that have wider application are warranted.

As an alternative to clinic-based assessments, cognitive assessment in a community-based setting accessible to persons of all income levels, races, and ethnicities, such as an emergency department (ED), may provide for earlier and wider cognitive screening. The ED admittedly can be a challenging environment to perform research, including an accurate assessment of cognition, due to the physical, emotional, and cognitive state of many individuals seeking care, space limitations, and the oftenchaotic nature of the ED. ED visits and admission to acute care hospitals have been shown to be an effective setting to obtain an assessment of cognitive status in a simple, relatively unintrusive manner [18-20]. A recent US study successfully implemented a brief and sensitive in-person cognitive screen in a large urban hospital ED, which resulted in 41.5% of screened adults 75+ years of age showing suspected cognitive impairment [21].

Up to 22% of Medicare enrollees have an ED visit each year [22]. This may be due to complex disease states that are more common in older adults, but also due to the increased utilization of these facilities by those of low socioeconomic status (SES) and non-white populations, for which healthcare plans that cover regular health maintenance may be cost prohibitive [23-25]. Further, the only formal interaction many individuals have with the medical system is at a time of crisis. Thus, an ED may offer better access to these populations and an opportunity for interventions including referral for full neurological and neuropsychological assessment. Community-based settings, such as an ED, may be an underrecognized opportunity to assess cognition and impacts on individuals and health systems including the costs of care. The costs of ED-based care for Medicare enrolled older adults are high [26, 27]. Augmenting the usual standard of care for older adults through the use of cognitive assessments may be cost-effective approach [28].

While remote cognitive assessments were used for years prior to the COVID-19 pandemic [29], the pandemic propelled their widespread use [30, 31]. Multiple options for remote assessment exist including the Telephone Interview for Cognitive Status (TICS), a validated tool for telephone-based assessments of cognition [32, 33]. Telephone-based cognitive assessments have been shown to be a suitable method for assessment of cognition [34]. The Patient Reported Outcomes Measurement Information System (PROMIS) Cognitive Measure Questions on Mental Clarity is also a validated tool [35]. Few, if any, studies have explored the use of the TICS or PROMIS among older adults utilizing the ED for care.

This pilot study aimed to (1) investigate the feasibility of using a telephone call after an ED visit to recruit participants into research trials, assessment of acceptability, and completion rates of all study components; (2) assess cognitive status; and (3) measure health care utilization among Medicare-enrolled older adults. To achieve these aims, this study approached Medicare-enrolled individuals 65+ years of age consecutively discharged from a large urban emergency department (ED) in Portland, OR. The study used the Telephone Interview for Cognitive Status (TICS) Assessment, and the Patient Reported Outcomes Measurement Information System (PROMIS) Cognitive Measure Questions on Mental Clarity. Participant electronic medical records (EMR) were reviewed to measure health care utilization including primary care provider (PCP) visits, hospital admissions, and ED visits for the 3 years prior to ED presentation.

2 | Methods

This study was conducted in accordance with the Declaration of Helsinki and approved by the Oregon Health & Science University (OHSU) Institutional Review Board (IRB) (IRB # 23042: date of approval: 9/8/2021). Target enrollment was 160 people over 12 months. All Medicare-enrolled individuals 65+ years of age consecutively discharged from the OHSU ED (Portland, Oregon) between May 2022 and February 2023 were assessed for study eligibility. Inclusion criteria were recent discharge from the OHSU ED, a minimum of 65 years of age, Medicare enrolled, and receiving primary care services through the OHSU health system or affiliated sites to allow for electronic medical record (EMR) review for study outcomes. Our sampling strategy was based on general population screening of adults 65 years of age or older due to a higher risk of cognitive impairment and dementia among older adults [36, 37]. Eligible participants were contacted by telephone within 12 weeks following discharge from the ED. After providing informed consent over the telephone, participants were administered the TICS Assessment [32, 33]. Demographics, comorbidity burden using the Modified Cumulative Illness Rating Scale (M-CIRS), and perceptions of personal cognitive health via the PROMIS Cognitive Measure Questions on Mental Clarity were also collected over the telephone by the study coordinator [38-40]. Care utilization including PCP visits, hospital admissions, and ED visits for the 3 years prior to presenting to the ED (triggering event) was collected via the EMR by a clinician with expertise in EMR review. All available records in the OHSU EMR, including services at OHSU and services delivered outside of OHSU but included in the OHSU EMR through the Care Everywhere feature, were assessed for the three utilization categories. Due to the concurrent COVID-19 pandemic, PCP visits in person and via telehealth were counted as a PCP visit. Brief phone calls, EMR messages, and medication refill requests were excluded. Hospital admissions were identified as any time the participant had an overnight stay or was admitted to a hospital for a procedure, such as an outpatient surgery. ED visits were identified as any visit to an ED or urgent care setting for immediate treatment. All records identified to fit into the utilization categories were evaluated for any diagnostic code for cognitive impairment or dementia. These ICD-10 categories include G31, G30, R41 and F02 codes. The records were reviewed to identify the first utilization of any cognitive impairment diagnosis to determine where the participant received their first diagnosis.

2.1 | Statistical Analysis

Participant characteristics were summarized among those with and without a diagnosis of cognitive impairment. Multivariate logistic regression models were used to examine the relationship between cognitive assessments, TICS and PROMIS scores, and diagnosis of cognitive impairment controlling for age, sex, education, and total number of healthcare visits. Spearman's nonparametric correlations were used to evaluate the relationship between cognitive assessments, (TICS and PROMIS), comorbidity (M-CIRS) and four measures of healthcare utilization in the last 3 years (total visits, PCP visits, ED visits, hospital admissions). Analyses were performed using R software (version 4.4.1).

3 | Results

Between May 2022 and February 2023, EMRs of 2380 Medicareenrolled adults 65+ years old who presented to the OHSU ED were reviewed (Table 1). Of those, 607 (26%) were determined to be eligible, of which 160 (26%) were ultimately enrolled. Target enrollment was reached. Of those who declined participation, 247 declined due to lack of interest (40.7%), 94 declined due to cognitive and health concerns (15.5%), 26 were lost to contact (4.3%), and 82 were deceased before telephone contact (13.5%).

During the enrollment period, the enrollment rate was 4.1 enrollments per week, although in four of these weeks the study team did not actively recruit (4.5 enrollment rate/35 weeks). The

TABLE 1 | Enrollment outcomes for medicare-enrolled older adultspresenting to the OHSU ED.

Recruitment Status	Count	%
Older adults presenting to ED	2380	100
Ineligible	1773	74
Eligible ^a	607	26
Enrolled	160	26.4
Declined	449	73.6
Not interested in study	247	40.7
Cognition/health concerns	94	15.5
Unable to reach/lost to follow-up	26	4.3
Deceased before contact	82	13.5

 $^{a}1\%$ (82 people) were deceased prior to contact that otherwise would have been eligible.

mean time between the triggering ED visit and study enrollment was 33 days (min = 21, max = 115). The average time to first contact was 33 ± 23 days (min = 0, max = 148) The time to administer the consenting and study assessments over the phone ranged between 26 and 33 min. Out of the 160 who enrolled, 159 participants completed all components of the study including the TICS and PROMIS.

Of the 160 older adults enrolled, 55% were female and 96% were non-Hispanic white, mean age 74.6 \pm 6.6 years (Table 2). Twenty-five (16%) had a diagnosis of cognitive impairment (CI) per EMR abstraction. Those with CI were significantly older than those with no CI (79.1 vs. 73.8 years). Those with CI did not have significantly different TICS scores than those with no CI (33.4 vs. 34.1). However, those with CI did have significantly lower PROMIS scores (13.1 vs. 15.1) compared to those with no CI. Participants with a diagnosis of CI had higher numbers of healthcare visits overall in the past 3 years, however this did not reach statistical significance (21.8 vs. 16.4).

We ran logistic regression models to examine the relationship between the two baseline cognitive assessments, TICS and PROMIS scores, and diagnosis of CI controlling for age, education, sex, and total healthcare visits in last 3 years (Table 3). Again, TICS score was not significantly associated with CI (p = 0.79). Additionally, older age and more healthcare visits were associated with CI (p < 0.001 and p = 0.03 respectively).

TABLE 2	Participant characteristic with and without cognitive
impairment.	

	No cognitive impairment diagnosis	Cognitive impairment diagnosis	<i>p</i> - value		
Ν	135	25			
	Mean (SD) or <i>N</i> (%)	Mean (SD) or <i>N</i> (%)			
Female	74 (55%)	13 (52%)	0.70		
Non-Hispanic white	130 (96.3%)	25 (100%)	0.97		
	Mean (SD)	Mean (SD)			
Age at ED visit	73.8 (6.4)	79.1 (6.1)	< 0.001**		
Education, yrs	16.3 (2.6)	16.1 (2.7)	0.70		
M-CIRS	24.3 (4.5)	25.1 (4.9)	0.40		
TICS score	34.1 (3.2)	33.4 (3.6)	0.40		
PROMIS score	15.1 (3.8)	13.1 (3.6)	0.01*		
Number of healthcare visits in the last 3 years					
Total	16.4 (13.0)	21.8 (14.0)	0.05		
PCP	10.6 (8.8)	14.0 (9.3)	0.05		
Hospital	2.5 (2.9)	3.0 (2.5)	0.20		
ED	3.3* (4.0)	4.8 (5.0)	0.12		

Abbreviations: ED = Emergency Department; M-CIRS = Modified Cumulative Illness Rating Scale; PCP = Primary Care Provider; PROMIS = Patient Reported Outcomes Measurement Information System; TICS = Telephone Interview for Cognitive Status.

 p^* -value < 0.05.

****p*-value < 0.01.

However, lower PROMIS scores were significantly associated with CI (p = 0.02).

Higher TICS total score was significantly correlated with fewer total healthcare visits, ED visits, and hospitalizations. Higher PROMIS total score was significantly correlated with fewer total number of healthcare visits, ED, and PCP visits. Higher M-CIRS, a measure of comorbidity, was positively correlated with all measures of healthcare utilization (Table 4).

4 | Discussion

The goals of this study were to assess the feasibility of enrolling older adults in a research trial following an ED visit, conduct cognitive assessments in this population over the telephone, utilize electronic medical records (EMR) to assess health care utilization within this population, and assess for relationships between cognition diagnosis, telephone cognitive measures, and health care utilization. We found that approximately 25% of eligible Medicare-enrolled adults 65+ years of age recently discharged from an ED were amenable to participation in research and cognitive assessment by telephone. We also found that the prevalence of cognitive impairment (16%) in our sample was aligned with prevalence rates among the general population of older adults in their mid-seventies. We encountered barriers to enrollment due to the language of the consent forms provided to prospective participants. Some potential participants noted the consent forms made them wary of participation, including a few participants who ultimately did enroll in this study after discussion with the study coordinator. With the complex nature of cognitive impairment, we were unable to recruit persons with more advanced stages of cognitive decline. This is likely due to enrollment bias among healthier participants due to the need

TABLE 3 | Multivariate models of cognitive assessments and prior diagnosis of cognitive impairment.

	Odds		
Variables	ratio	95% CI	<i>p</i> -value
TICS total score	1.02	0.88-1.19	0.79
Age, yrs	1.13	1.05-1.21	< 0.001**
Education, yrs	0.94	0.78-1.12	0.48
Female sex	0.72	0.26-1.99	0.52
Health care visits in last	1.05	1.01-1.09	0.03*
3 years			
	Odds		
Variables	Odds ratio	95% CI	<i>p</i> -value
Variables PROMIS total score	Odds ratio 0.86	95% CI 0.76–0.98	<i>p</i> -value 0.02*
Variables PROMIS total score Age, yrs	Odds ratio 0.86 1.15	95% CI 0.76-0.98 1.06-1.23	<i>p</i> -value 0.02* < 0.001**
Variables PROMIS total score Age, yrs Education, yrs	Odds ratio 0.86 1.15 0.96	95% CI 0.76–0.98 1.06–1.23 0.80–1.15	<i>p</i> -value 0.02* < 0.001** 0.63
Variables PROMIS total score Age, yrs Education, yrs Female sex	Odds ratio 0.86 1.15 0.96 0.68	95% CI 0.76-0.98 1.06-1.23 0.80-1.15 0.24-1.93	p-value 0.02* < 0.001***
Variables PROMIS total score Age, yrs Education, yrs Female sex Health care visits in last	Odds ratio 0.86 1.15 0.96 0.68 1.03	95% CI 0.76–0.98 1.06–1.23 0.80–1.15 0.24–1.93 0.99–1.08	p-value 0.02* < 0.001***

Abbreviations: PROMIS = Patient Reported Outcomes Measurement Information System; TICS = Telephone Interview for Cognitive Status. **p-value < 0.05. **p-value < 0.01.

TABLE 4 | Spearman correlation coefficients between cognition, comorbidity and healthcare utilization counts in past 3 years.

Assessment	Total healthcare visits	ED visits	Hospital visits	PCP visits
TICS score	-0.17*	-0.18*	-0.16*	-0.12
PROMIS score	-0.23**	-0.19*	-0.14	-0.22**
M-CIRS score	0.45***	0.34***	0.46***	0.31***

Abbreviations: ED = Emergency Department; M-CIRS = Modified Cumulative Illness Rating Scale; PCP = Primary Care Provider; PROMIS = Patient Reported Outcomes Measurement Information System; TICS = Telephone Interview for Cognitive Status.

 $p^* \le 0.05.$

 $p^{**} p < 0.01.$ $p^{***} p < 0.0001.$

1

for sufficient time and attention to complete the consenting process in addition to telephone-based questionnaires.

Due to the demographics of the Portland, Oregon metropolitan area, we were unable to recruit a diverse sample necessitating future studies in locations with a more diverse demographic. This study was also unable to recruit many individuals living in rural areas or of lower socioeconomic status (SES). There are several possible reasons for this including the study design focusing on individuals who received their primary care through the OHSU health system, which limited the participant pool. This was necessary to be able to utilize an EMR for health care utilization assessments. Pivoting from an in-person to a telephone-based approach due to COVID-19 pandemic related restrictions in this population may have limited our engagement with diverse communities, socioeconomically disadvantaged individuals, and several difficult to reach populations including the unhoused who are less likely to be reachable post discharge from a healthcare setting [41, 42]. Participants who ultimately enrolled were more likely to have higher levels of educational attainment, be white non-Hispanic, and be in better overall physical (as measured by the M-CIRS) and cognitive health. Very few individuals dually eligible for Medicare and Medicaid enrolled suggesting a higher SES sample. To obtain a more representative sample, several approaches could be taken when designing future research on administering cognitive assessments with the ED population 65+. Future studies might focus recruitment efforts on diverse populations, add a recruitment site based within a rural community, translate study-related documents (e.g., consent forms, recruitment materials) into multiple languages, partner with community-based organizations who routinely work with specific populations to recruit participants, involve community stakeholders in the study design including the development of recruitment materials in partnership with a community advisory board, and recruit bilingual and bicultural study team members to lead outreach recruitment efforts among populations whose primary language is not English [43–45].

Future studies focused on recently ED discharged older adults may consider using the modified TICS Assessment (M-TICS), which has been validated for use to detect dementia, or the Montreal Cognitive Assessment (MoCA), which may be more effective at isolating mild cognitive impairment (MCI) when delivered remotely [46–48]. When administered remotely, the MoCA has been shown to be as effective in cognitive assessment as when administered face-to-face [49, 50]. The PROMIS Questions of Mental Clarity, however, was a more effective screening measure in this study, and as a brief, patient-reported

cognitive assessment, it may offer advantages over the TICS, which takes longer to administer. The flexibility afforded by how and when the PROMIS Questions of Mental Clarity are administered may also offer a way to easily attain data on cognition within community-based settings which may be particularly well-suited for use with older adults post-discharge from the ED [51–53]. Further, the standardization and general ease of interpretation of PROMIS scores may facilitate simple documentation within patient medical records, allowing for the monitoring of longitudinal changes in cognition [54, 55].

We found that older age and more total healthcare visits were associated with cognitive impairment. This is expected as advanced age is a well-established risk factor for cognitive impairment [56]. We also found a higher TICS total score to be significantly correlated with fewer total healthcare visits, ED visits, and hospitalizations. Individuals with a diagnosis of dementia also have higher rates of healthcare utilization as compared to those without [57, 58]. This is important for evaluating the role of the ED in the continuum of care for older adults. Moreover, it is important for reevaluating the usual standard of care of older adults in the ED, particularly given a high rate of underdiagnosed dementia among the general population [3]. We also found a higher M-CIRS score was positively correlated with all measures of healthcare utilization. This is also expected as comorbidity and multimorbidity often results in increased utilization of health care among older adults [59].

Future research might include long-term follow-up of participants to assess the ongoing benefits of cognitive assessments as this may offer a way to provide effective care planning, interventions to support of care partners, and monitor disease progression [60, 61]. Future work may also include measuring the cost-effectiveness of assessments with visitors 65+ years to the ED adding evidence for whether earlier detection of ADRD produces a cost savings to health systems and the public programs that fund care. This would facilitate the determination if a meaningful difference in healthcare costs exists between older adults with a diagnosis of ADRD versus those who do not but have suspected cognitive impairment based on their TICS score. Additional analyses are also needed to confirm whether older adults in the ED population are appropriate for broadly implemented cognitive screening and assessment. Taking an inperson approach to cognitive screening and assessment within the ED may be warranted in future follow-up studies; however, additional assessment of remote options is also warranted given widespread adoption of and preference for telehealth after the COVID-19 pandemic and to improve access to more rural and diverse populations [62-64]. These remote approaches are not

without limitations including reimbursement concerns related to Medicare or limitations with their efficacy when used with individuals with severe ADRD [65, 66]. More broadly, the use of telehealth-based cognitive assessments may be limited with older adults due to a lack of desire to use telehealth, a high prevalence of hearing impairment among this population, and a perceived lack of support to navigate the process [67, 68]. These barriers to the wider use of telehealth among older adults are exacerbated by socioeconomic disparities and language barriers.

5 | Conclusions

We found that it is feasible to recruit cognitively intact or mildly impaired older adults discharged from the ED into remote research and that it is possible to administer cognitive assessments over the phone with this population. This study provides preliminary evidence supporting a focus on older ED patients to administer cognitive assessments, with the aim of linking outcomes to the EMR and ultimately providing a platform for future research on the impact of under-diagnosed ADRD on health outcomes and healthcare utilization. This study provides vital background data regarding further development of this model for assessing at a population level the impact and outcomes of under-diagnosed ADRD. These findings can also help inform clinicians, as well as policymakers, about the impact of earlier detection efforts on reducing the burden of ADRD through disease symptom management and advanced care planning. This approach within a community-based setting like an ED is especially important for reaching diverse populations of low SES, ethnic and racial minority populations, and military veterans whose access and engagement with the formal health care system may be particularly limited. Future research should consider ongoing follow up and a study design with a focus on recruitment efforts with diverse populations to achieve a more representative sample of the older adult population utilizing the ED.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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