## Title

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**Assessing the Reliability of Telehealth Geriatric Screening in Older Adults Undergoing Surgery**

Short Title:Telehealth Geriatric Screening

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**Abbreviations:**

- POD: postoperative delirium
- CGAs:Comprehensive Geriatric Assessments
- CCI: Charlson Comorbidity Index
- NRS-2002: Nutritional Risk Screening 2002

- IADL: Instrumental Activities of Daily Living
- CFS: Clinical Frailty Scale
- ASA: American Society of Anesthesiologists
- AGS: American Geriatrics Society

In 2021, over 10 million Medicare recipients aged 65 and older utilized telehealth services[1]. Concurrently, older adults comprise an increasingly large proportion of surgical patients, with nearly 5 million undergoing surgery annually in the U.S., representing approximately 8–10% of all procedures and a substantially higher proportion of high-risk inpatient surgeries, a figure projected to double by 2060[2]. Older adults face unique perioperative challenges, including an increased risk of postoperative delirium (POD) and frailty, both associated with worse surgical outcomes, longer hospital stays, higher mortality rates, and increased likelihood of nursing home placement[3].

Comprehensive Geriatric Assessments (CGAs) are multidisciplinary tools that evaluate medical, psychological, and functional capabilities, and are associated with improved risk identification for perioperative planning[4]. Despite multidisciplinary society statements and guidelines supporting their use, CGAs remain underutilized in preoperative settings due to significant time and resource requirements[4]. Telehealth offers an opportunity to perform CGAs remotely, minimizing patient travel, reducing healthcare costs, and addressing access barriers[5]. However, evidence on the reliability of telehealth CGAs compared to in-person assessments remains limited.

We aimed to compare telehealth versus in-person preoperative CGAs and evaluate whether visit type was associated with postoperative outcomes. We hypothesized that telehealth CGAs would identify similar geriatric risk profiles and would not be associated with significantly different postoperative outcomes compared with in-person assessments.

After institutional review board approval and waiver of consent, we conducted an observational cohort study of older adults presenting in person or via telehealth to our preoperative clinic at a large academic center in Southern California. Adults aged ≥65 years undergoing non-cardiac, non-transplant elective surgery with expected postoperative hospitalization of ≥1 night were included. Patients scheduled for intracranial neurosurgery or outpatient procedures were excluded. We conducted CGAs and data were collected during preoperative visits conducted in-person or via telehealth between January 2021 and December 2023. All assessments were conducted by trained nursing staff (training by certified geriatric nurses with supervised practice to ensure competency) during preoperative clinic encounters.

CGAs included validated tools:

- Charlson Comorbidity Index (CCI): Assesses comorbid disease burden.
- Nutritional Risk Screening (NRS-2002): Evaluates nutritional status.
- Lawton-Brody Instrumental Activities of Daily Living (IADL) Scale: Measures functional independence.
- Morse Fall Risk Scale: Assesses fall risk.
- Sensory impairments for vision and hearing were identified by the documented use of corrective lenses and hearing aids.
- Clinical Frailty Scale (CFS): Categorizes frailty.
- Mini-Cog: Screens for cognitive impairment.

For telehealth visits, patients were guided through assessments remotely, including instructions for the Mini-Cog clock-draw exercise (Supplemental Digital Content). Primary outcomes were 30-day and 1-year all-cause mortality. Secondary outcomes included POD and non-home discharge disposition. POD was identified using the Confusion Assessment Method (CAM-original) and chart review. CAM assessments were conducted twice daily during hospitalization, and chart reviews supplemented CAM data to capture episodes of delirium that may have been missed due to its fluctuating nature. CAM is used system wide (except in the ICU) in older adults with training provided certified geriatric nurses with supervised practice to ensure competency.

Multivariable modified Poisson regression models with robust standard errors evaluated associations between visit type (telehealth vs in-person) and postoperative outcomes and were used to estimate adjusted relative risks. Covariates included age, sex, body mass index, American Society of Anesthesiology class, CCI, Mini-Cog status, ADL impairment, frailty, and surgical category. Absolute event rates and risk differences were also calculated for 30-day and 1-year mortality.

We enrolled 312 older adults (mean age 75.7 ± 7.0 years; 56% female). Baseline characteristics, including ASA class and surgical type, were similar between groups (Table 1). CGAs revealed comparable results for CCI, IADLs, nutritional risk, and fall risk. Sensory impairments were more frequently detected in telehealth visits (86.6% vs. 75.7%, p=0.013), while frailty was more common in in-person visits (27.9% vs. 14.0%, p=0.004). Delirium was detected in 27% of those who underwent in-person assessment and 22% in those with telehealth assessments (p=0.30)

Thirty-day mortality was 10.7% in-person versus 7.0% telehealth, and 1-year mortality was 15.0% versus 14.0%, respectively. Corresponding risk differences were 3.7 percentage points (95% CI, -2.6 to 10.1) and 1.0 percentage point (95% CI, -6.8 to 8.9). In adjusted analyses, visit type was not associated with 30-day mortality (adjusted RR 1.06, 95% CI 0.49–2.28) or 1-year mortality (adjusted RR 1.39, 95% CI 0.82–2.35) (Table 2).

We found that telehealth CGAs yielded similar geriatric assessment findings and were not associated with significantly different postoperative outcomes compared with in-person assessments. Thirty-day and 1-year mortality rates were similar between groups, and visit type was not significantly associated with either outcome in adjusted analyses. These findings support telehealth CGAs may serve as a feasible alternative for perioperative evaluation, particularly for older adults with mobility or access barriers. However, a key limitation of this study was that participants self-selected into in person versus telehealth assessment which may introduce selection bias. These results suggest that telehealth assessments may be integrated into perioperative workflows as a feasible alternative to in-person evaluations.

Telehealth CGAs offer several advantages, including reduced travel burdens, improved access for patients with mobility challenges, and increased convenience for caregivers. By enabling early identification of geriatric vulnerabilities, telehealth CGAs provide valuable time for prehabilitation and optimization, potentially improving surgical outcomes[6]. Professional societies such as the ASA and American Geriatrics Society (AGS) have recommended routine frailty and cognitive screenings for older surgical patients. However, these assessments remain underutilized in practice[7,8]. Telehealth-based CGAs could help overcome barriers to implementation, expanding access to comprehensive preoperative evaluations.

Telehealth-based CGAs may be comparable to in-person assessments for preoperative risk stratification in older adults. These findings support randomized trials testing the integration of telehealth CGAs into perioperative workflows as an alternative to traditional in-person assessments. Further studies are needed to validate these findings in broader populations and to assess the impact of telehealth-delivered CGAs on perioperative outcomes, patient experience, and healthcare utilization.

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**Supplemental Digital Content: Abnormal Clock Draw Assessment**