Virtual frailty assessment for older adults with hematologic malignancies

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Abstract:

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To the Editor:

Oncologists cite limited time and resources in busy practices as major barriers to implementing geriatric and frailty assessments, which are now recommended for all older adults with cancer undergoing systemic treatment. The COVID-19 pandemic has further challenged implementation by reducing the number of in-person clinic visits during which frailty assessments might occur. To overcome these barriers to conducting geriatric and frailty assessments, clinicians and researchers have developed virtual assessments for use in videoconference or telephone visits. However, analyses regarding the feasibility of such assessments in older adults with blood cancers are sparse. Moreover, most virtual assessments consist of patient-reported measures without objective performance measures such as standardized tests of mobility and cognition. We and others have shown that these measures are important predictors of outcomes in this patient population. Accordingly, we developed and tested a virtual frailty assessment for older adults with hematologic malignancies that incorporates both patient-reported and objective performance measures.

Please see our Supplemental File for detailed methods and analysis plan. Briefly, this is an observational study of transplant ineligible patients with blood cancers who enrolled in the Older Adult Hematologic Malignancies Program after presenting for their initial consult at Dana-Farber Cancer Institute (DFCI, Boston, Massachusetts). We included separate cohorts of patients who were assessed in-person (age ≥ 75 years) and virtually (age ≥ 73 years). For our in-person cohort, those who consented to participate in the study underwent an in-person screening geriatric assessment administered by a research assistant on the same day as his/her initial hematologic oncology consultation, as described previously. The screening geriatric assessment includes patient-reported and objective measures, spanning the domains of comorbidity, functional status (e.g., instrumental activities of daily living, IADLs), physical performance (e.g., gait speed), and cognition (e.g., delayed recall and the Clock-in-the Box Test). All in-person measures collected are included in Supplemental Table 1, and detailed scoring of each measure is included in Supplemental Table 2. We enrolled patients from February 2015 to March 2020, after which observational studies at DFCI were placed on hold due to the COVID-19 pandemic, and resumed partial in-person enrollment in June of 2021. We included patients enrolled in-person through March of 2022, with the exception of a four-week pause in in-person enrollment in January of 2022 due to a rise in coronavirus cases.

From the results of the screening geriatric assessment, we derived frailty status using both phenotypic and deficit-accumulation approaches, two of the most widely-studied approaches to measuring frailty in aging research (see protocol in Supplemental Table 2 for...
further details regarding these approaches and their cut-off values that classified severity of frailty. For both in-person and virtual assessments, we classified patients as robust, pre-frail, or frail based on the phenotypic approach, the deficit accumulation approach, and overall by the more severe classification between both approaches.

To virtually adapt our screening geriatric assessment (Supplemental Table 1), patient-reported items were readily converted to administration over video- or teleconference by a research assistant. Our Supplemental File describes our adaptation of objective performance measures. We began enrolling patients for virtual frailty assessments in November of 2020 and included patients enrolled through March of 2022.

During the period of enrollment for virtual assessments, 254 eligible patients were contacted for recruitment into our study, and 185 (72.8%) patients consented to enroll (Supplemental Figure 1). Of those enrolled, 150 (81.1%) completed the virtual assessment. No falls or other safety events occurred during the virtual assessments. During the period of enrollment for in-person assessments, 1,017 patients were approached, of whom 876 (86.1%) enrolled and completed assessments. Table 2 presents the baseline characteristics of the population, restricted to age ≥ 75 years.

Among patients age ≥ 75 years, we did not find differences in the distributions of age, gender, disease type, and self-reported ECOG PS between in-person and virtual assessments (Table 1). Across frailty measures (overall frailty status, frailty phenotype, and frailty by deficit accumulation), we observed a slightly lower proportion of pre-frail and frail patients who completed virtual assessments compared to those who completed in-person assessments. In univariable ordinal regression models (Table 2), virtual assessments trended toward a lower odds of classifying patients as overall frail (odds ratio [OR] = 0.76; 95% confidence interval [CI] = 0.52-1.11), as frail by the phenotypic approach (OR = 0.66, 95% CI = 0.45-0.98), and as frail by the deficit accumulation approach (OR = 0.75, 95% CI = 0.51-1.11). These trends weakened in multivariable ordinal regression models adjusting for age, gender, disease type, and self-reported ECOG PS.

Our findings suggest that virtual frailty assessments entailing both patient-reported and objective performance measures are safe and feasible, but may be associated with less severe frailty classification when compared to in-person assessments. Given that this association weakened after adjustment for any differences between assessment types with respect to age, gender, disease type, and ECOG PS, the difference in frailty classification may be more explained by the differences in the populations completing each assessment rather than by differences inherent in the assessments themselves. A more ideal design to compare
differences between assessments would have been to measure both in the same individuals from one cohort; however, this design was not possible since many of our virtual assessments took place during surges of the pandemic when in-person assessments were high risk. Even if our virtual frailty assessment is less sensitive at detecting frailty, the degree of reduced sensitivity is small and must be balanced against the increased burden and risk of in-person assessments. In our example, our virtual frailty assessment allowed our research and clinical program for older adults with blood cancers to continue through several waves of the pandemic, and could allow for decentralization of assessments beyond the pandemic to potentially reach more older adults with blood cancers.

We bring specific data from patients with hematologic malignancies into the expanding literature on virtual assessment and care in older adults from other populations. The high percentage of our patients who completed virtual assessments is encouraging, especially given that other studies have identified lower uptake of telehealth among older adults compared to younger populations. Further education regarding the purpose and benefits of frailty assessment could increase our enrollment rate, which was lower than our in-person enrollment rate. This lower rate may in part be due to the fact that our virtual frailty assessments require an additional appointment in the days after initial contact and consent, whereas our in-person assessments occur at the same time we approach patients for consent while they are waiting for their appointment at DFCI.

Our adaptation of gait speed and cognitive assessment to virtual formats is of particular interest to clinical and research programs focused on older adults with hematologic malignancies. However, 29% of our virtual patients were unable to complete the clock draw test and 46% of patients were unable to complete the caregiver-administered gait speed test. The majority of patients who were unable to complete these tests cited a lack of access to or ability to operate videoconferencing technology or lack of an available caregiver to administer the test (gait speed). More engagement with caregivers and more technical assistance could increase the ability of older patients to complete the objective performance tests developed in our study. Technologic advances in patient wearables and passive monitoring devices offer promising ways of remotely measuring objective performance tests without need for videoconferencing with staff or for caregivers to administer. Such technology could facilitate home-based interventions that target mobility and cognition, such as virtual exercise programs for cancer survivors.
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Table 1: Baseline characteristics of in-person and virtually assessed patients age ≥ 75 years

| Variable                        | In-Person (870) | Virtual (110) | p-value* |
|---------------------------------|-----------------|---------------|----------|
| Age, mean (SD)                  | 79.57 (4.04)    | 79.45 (3.75)  | 0.763    |
| Age, n (%)                      |                 |               | 0.659    |
| 75-79                           | 508 (58.4)      | 64 (58.2)     |          |
| 80-84                           | 254 (29.2)      | 36 (32.7)     |          |
| 85-89                           | 89 (10.2)       | 9 (8.2)       |          |
| ≥90                             | 19 (2.2)        | 1 (0.9)       |          |
| Gender, n (%)                   |                 |               | 0.647    |
| Male                            | 546 (62.8)      | 66 (60.0)     |          |
| Female                          | 324 (37.2)      | 44 (40.0)     |          |
| Disease type n (%)              |                 |               | 0.407    |
| Leukemia                        | 271 (31.1)      | 34 (30.9)     |          |
| Lymphoma                        | 298 (34.3)      | 44 (40.0)     |          |
| Multiple Myeloma                | 301 (34.6)      | 32 (29.1)     |          |
| Self-Reported ECOG PS           |                 |               | 0.118    |
| 0                               | 495 (56.9)      | 63 (57.3)     |          |
| 1                               | 252 (29.0)      | 41 (37.3)     |          |
| 2                               | 66 (7.6)        | 5 (4.5)       |          |
| 3                               | 48 (5.5)        | 1 (0.9)       |          |
| 4                               | 5 (0.6)         | 0 (0.0)       |          |
| Missing                         | 4 (0.5)         | 0 (0.0)       |          |
| Frailty (overall), n (%)        |                 |               | 0.322    |
| Robust                          | 223 (25.6)      | 33 (30.0)     |          |
| Pre-frail                       | 500 (57.5)      | 64 (58.2)     |          |
| Frail                           | 147 (16.9)      | 13 (11.8)     |          |
| Frailty (phenotype), n (%)      |                 |               | 0.082    |
| Robust                          | 250 (28.7)      | 43 (39.1)     |          |
| Pre-frail                       | 527 (60.6)      | 57 (51.8)     |          |
| Frail                           | 93 (10.7)       | 10 (9.1)      |          |
| Frailty (deficit accumulation), n (%) |         |               | 0.455    |
| Robust                          | 453 (52.1)      | 64 (58.2)     |          |
| Pre-frail                       | 294 (33.8)      | 36 (32.7)     |          |
| Frail                           | 122 (14.0)      | 10 (9.1)      |          |
| Missing                         | 1 (0.1)         | 0 (0.0)       |          |

*A t-test was performed to assess for a difference between the mean ages of patients who completed in-person and virtual assessments. Chi-square tests were performed to assess for differences between in-person and virtual assessments in the distributions of age (as a categorical variable) and frailty status.
Table 2: Univariable and multivariable ordinal regression models assessing the association between virtual versus in-person frailty assessment and the odds of classifying patients as frail.

CI = Confidence Interval; ECOG PS = Eastern Oncology Group Performance Status (self-reported)

| Frailty Measure                  | In-Person Assessment | Virtual Assessment (Odds ratio [95% CI]) | P-value |
|---------------------------------|----------------------|-----------------------------------------|---------|
| Univariable models              |                      |                                         |         |
| Frailty (Overall)               | Reference            | 0.76 (0.52-1.11)                       | 0.155   |
| Frailty (Phenotype)             | Reference            | 0.66 (0.45-0.98)                       | 0.040   |
| Frailty (Deficit Accumulation)  | Reference            | 0.75 (0.51-1.11)                       | 0.154   |
| Multivariable models, adjusting for age, gender, disease type, and ECOG PS |                      |                                         |         |
| Frailty (Overall)               | Reference            | 0.86 (0.56-1.31)                       | 0.467   |
| Frailty (Phenotype)             | Reference            | 0.73 (0.48-1.11)                       | 0.139   |
| Frailty (Deficit Accumulation)  | Reference            | 0.88 (0.55-1.37)                       | 0.563   |