"Operationalization of Frailty Using Eight Commonly Used Scales and Comparison of Their Ability to Predict All-Cause Mortality"

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Background
- Frailty is a multiply determined, increased vulnerability to a range of adverse health outcomes.
- It is associated with falls, CI, disability, hospitalization, institutionalization and death as well as adverse responses to chemotherapy and surgical intervention.
- Frailty was demonstrated to be the most common chronic condition leading to death in older adults.
- Researchers do not agree on what "frailty" means, or on how to measure it.
- Gold standard assessment – thoughtful clinician assessment
- Scale models vary based on definition of frailty that is used:
  - "Biological syndrome resulting from cumulative decline across multiple physiological systems" to "Multidimensional risk state that can be measured more by the quantity than by the nature of health problems"
- The assessment of frailty is important for clinical care, research, and policy planning.

Goals of the Study
- Compare eight proposed frailty scales for their content validity, feasibility, prevalence estimates, and ability to predict all cause mortality.
- Attempt to "operationalize" frailty so that it can be more accurately assessed/identified.

Methods Review
- Population chosen - Eleven European countries, individuals in the community age 50-104, mean of 65.3, N=27,527
- Study - Secondary analysis of SHARE data from 2004
- Mortality data were obtained from the 2nd (2007), 3rd (2009), and 4th (2011) waves of SHARE

Measurements
The SHARE data base was run on each of the following scales:
- Groningen Frailty Indicator, Tilburg Frailty Indicator, 70 item Frailty Index (FI), 44 item Frailty, Index based on a Comprehensive Geriatric Assessment (FI-CGA), Clinical Frailty Scale, Frailty phenotype (weighted and un-weighted versions), The Edmonton Frail Scale, The FRAIL scale
- The scales measure deficits in various domains including: mobility, nutrition, weight loss, mental health, ADLs, energy/exhaustion, strength, speed ,cognition, polypharmacy, social support, psychosocial, "health status" , self-rated health, behavioral risks
- Each scale was assigned a score threshold that would represent the "frailty" state or diagnosis

Missing Data/Changing Data
- Making pre-existing data base fit 8 different scales
- Different techniques used - exclusion of participants with >20% of missing scale items, imputation of 0's for missing data at total of less than 20% items
- Clinical Frailty Scale - participants were excluded if they had any missing scale item
- No substitution procedure was required for the FI and FI-CGA

Outcomes: Prevalence of Frailty and Prediction of All-cause Mortality
The prevalence of frailty was calculated for each scale based on score cut-points. Agreement among scales was examined using the Cohen Kappa statistic. The accuracy of each scale to predict all-cause mortality was assessed by comparing AUC (ROC curves). Calibration weights were used to reflect the size of the national population according to age and sex.

Results/Discussion

- All scales had fewer than 6% of cases with at least one missing item, except the Frailty phenotype (11.1%) and the Tilburg (12.2%)
- 9.7% of participants were missing data for the grip strength, 61% of whom had been unable to complete the test.
- In the Groningen, Tilburg, frailty phenotype, and FRACL scales, death rates were 3-5x as high in excluded cases as in included ones.
- Frailty prevalence estimates ranged from 6% (FRAIL) to 44% (Groningen).
- Approximately half of participants (51%) were categorized as frail or non-frail identically in all scales (49% non-frail and 2.4% frail).
- 6/8 scales identified 76% of participants consistently as non-frail and 9% consistently as frail.
- The lowest agreement was between the Groningen and FRAIL scales.
- The AUC for mortality ranged from 0.67 (FRAIL) and 0.77 (FI) and 0.79 (95% CI=0.77-0.81) (weighted frailty phenotype).
- Of un-weighted scales, the FI and Edmonton scales most accurately predicted mortality at 2 (FI AUC=0.77, 95% CI 0.75-0.79; Edmonton AUC=0.76, 95% CI = 0.74-0.79) and 5 (AUC=0.75, 95% CI = 0.74-0.77) years.

Conclusions

- Content validity was evaluated in relation to the multidimensionality that each instrument assayed.
- The feasibility of each scale was examined according to the number of excluded cases due to missing variables.
- Excluded case having higher mortality rate could be meaningful.
- Different scales estimated widely different values for the prevalence of frailty.
- These frailty scales capture related but distinct groups.
- The frailty index seems to be a feasible scale that captures the multidimensionality of frailty and has high predictive ability.
- Weighting items in frailty scales can improve their predictive ability, but the trade-off between specificity, predictive power, and generalizability requires additional evaluation.

Limitations

- Questionable if it accomplished goals of evaluating content validity and feasibility.
- Hard to understand where the frailty "cut point" comes from.
- Limited explanation of how data manipulation was done.
- Scales' criteria modified to fit data available from SHARE data
  - Some scales were closer to the original scales than others
  - Different exclusion criteria.
- Not sure all these scales should be compared.
- Frailty scales that are missing certain data, excluded participants frailer than the rest of the population, indicating a potential selection bias in the use of these scales.
- European population, low starting age, did not further break down prevalence/mortality by age.
- ?Conflicts of interest.

Practice implications

- Better understanding of the factors that are associated with frailty will improve clinical assessment of frailty.
- Strengthen decisions to encourage/discourage interventions.
- Frailty Index seems like a fairly easy scale to try on continuity patient - many of the components would be easily remembered or retrieved.