The Standardization of Frailty Phenotype Criteria Improves Its Predictive Ability: The Toledo Study for Healthy Aging

Cristina Alonso Bouzón MD a,*, Jose Antonio Carnicero PhD b, Jimmy Gonzáles Turín MD c, Francisco J. García-García MD, PhD b, Andrés Esteban MD, PhD d, Leocadio Rodríguez-Mañas MD, PhD a,c

a Geriatric Department, Hospital Universitario de, Getafe, Madrid, Spain
b Geriatric Department, Hospital Virgen del Valle, Toledo, Spain
c Biomedical Research Foundation, Hospital Universitario de, Getafe, Madrid, Spain
d CIBER de Enfermedades Respiratorias, Hospital Universitario de, Getafe, Madrid, Spain

Keywords:
Frailty
aging
prevention
disability
hospitalization
death

Abstract

Introduction: Several studies have assessed the performance of the original frailty phenotype criteria (FPC) and the standardized version according to the characteristics of the population. No studies exist, however, evaluating the impact of this standardization on its predictive ability.

Objective: To compare how the original FPC and the standardized-frailty phenotype criteria (S-FPC) estimate the prevalence of frailty and their ability to predict mortality, hospitalization, incident disability, and falls.

Methods: Data were taken from the Toledo Study for Healthy Aging, a population-based, community-dwelling study conducted on 1645 individuals over 65. Frailty was operationalized in two ways: FPC, using the cut-off estimated in the Cardiovascular Health Study and S-FPC, using cut-off points fitted to the phenotypic characteristics of our study sample. Frailty prevalences were compared using chi-square statistic. Cox proportional hazard models and logistic regressions evaluated the predictive ability of both tools. Lastly, survival tests were applied.

Results: Frailty and prefrailty prevalences varied according to the tool used: 24.12% and 66.40%, respectively when we used FPC and 6.68% and 47.81% when we used S-FPC (P < .01). Regarding their predictive ability, S-FPC, but not FPC, identified consistently the prefrail persons as an intermediate risk group between robust and frail people [death 1.57 (1.15-2.16); hospitalization 1.47 (1.16-1.85); and incident disability 1.96 (1.30-2.97); P < .005]. Furthermore S-FPC predicted death and hospitalization at shorter times than FPC (P < .05).

Conclusion: FPC should be standardized according to the characteristics of the population in order to improve its predictive ability.

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Frailty is a biologic syndrome characterized by a decreasing reserve and resistance to stressors that increases the vulnerability to adverse events. It follows a dynamic course with frequent transitions over time, modulated by several factors. Additionally, some interventions have been developed to improve clinical outcomes in frail patients, making frailty an important target to address in older adults. Therefore, there is an urgent need to find the most appropriate diagnostic tools.

Many instruments have been shown to identify frailty. Among them, the frailty phenotype is the most widely used tool in...
The literature. Some concerns have been raised however, when using these criteria in different settings and/or group of older persons, including large differences in the prevalence of frailty between countries and racial minorities. Some authors explain these issues pointing at economic or social factors, but others have suggested that these differences could be due to phenotypic diversity, which is predominantly expressed in that criteria linked to physical function: weakness, slowness, and physical activity. In this regard, it has been shown that when the assessed population is phenotypically different from the participants in the Cardiovascular Health Study (CHS), a misclassification of the frailty status may result simply because they differ significantly from the CHS group on the physical characteristics upon which the frailty phenotype criteria (FPC) were developed.

### Table 1
Criteria Used to Define Original FPC and S-FPC

<table>
<thead>
<tr>
<th></th>
<th>FPC</th>
<th>S-FPC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight loss</strong></td>
<td>In the last year, have you lost more than 10 pounds (4.54 kg) unintentionally?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No □ Yes □ Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Exhaustion</strong></td>
<td>Using the CES-D, the following two statements are read asking how often in the last week did you feel this way?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• I felt that everything I did was an effort</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• I could not get going</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 – rarely or none time (&lt;1 day)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 – some or little time (1–2 days)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – a moderate amount of the time (3–4 days)</td>
<td></td>
</tr>
<tr>
<td><strong>Slowness</strong></td>
<td>Gait speed stratified by gender and height</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>Height &lt; 173 cm...&lt; 0.76 m/s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Height &gt; 173 cm...&lt; 0.65 m/s</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>Height &lt; 159 cm...&lt; 0.76 m/s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Height &gt; 159 cm...&lt; 0.65 m/s</td>
<td></td>
</tr>
<tr>
<td><strong>Weakness</strong></td>
<td>Grip strength stratified by gender and BMI quartiles:</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>BMI &lt; 24...&lt; 29 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI 24.1–26...&lt; 30 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI 26.1–28...&lt; 30 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI &gt; 28...&lt; 32 kg</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>BMI &lt; 23...&lt; 17 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI 23.1–26...&lt; 17 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI 26.1–29...&lt; 18 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI &gt; 29...&lt; 21 kg</td>
<td></td>
</tr>
<tr>
<td><strong>Low activity</strong></td>
<td>Kcal of leisure physical activity stratified by gender:</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>Men</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI &lt; 25.5...&lt; 19.1 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI 26.4–28...&lt; 22.9 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI 28.1–30...&lt; 22.9 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI &gt; 30.8...&lt; 22.9 kg</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>Women</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI &lt; 26.4...&lt; 11 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI 26.5–29...&lt; 12 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI 29.6–32...&lt; 12 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI &gt; 33...&lt; 12 kg</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2
Descriptive Analysis: Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>All (n = 1645)</th>
<th>Frailty Phenotype Criteria</th>
<th>Standardized-Frailty Phenotype Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Robust (n = 157)</td>
<td>Prefrail (n = 1078)</td>
<td>Frail (n = 401)</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td>74 (70–78)</td>
<td>70 (68–74)</td>
<td>74 (70–77)</td>
</tr>
<tr>
<td><strong>Sex (% men)</strong></td>
<td>44.38</td>
<td>64.33</td>
<td>48.79</td>
</tr>
<tr>
<td><strong>Height (cm)</strong></td>
<td>157 (151–164)</td>
<td>162 (155–168)</td>
<td>158 (152–165)</td>
</tr>
<tr>
<td><strong>BMI (kg/m²)</strong></td>
<td>28.83 (26.06–31.99)</td>
<td>27.33</td>
<td>28.65</td>
</tr>
<tr>
<td><strong>Ch. Index (%)</strong></td>
<td>0 46.82</td>
<td>51.59</td>
<td>49.91</td>
</tr>
<tr>
<td></td>
<td>1 25.25</td>
<td>28.66</td>
<td>24.86</td>
</tr>
<tr>
<td></td>
<td>2 15.22</td>
<td>12.74</td>
<td>13.54</td>
</tr>
<tr>
<td></td>
<td>≥3 12.71</td>
<td>7.01</td>
<td>11.69</td>
</tr>
<tr>
<td><strong>Disability (%)</strong></td>
<td>0 92.12</td>
<td>99.36</td>
<td>96.45</td>
</tr>
<tr>
<td></td>
<td>1 5.36</td>
<td>0</td>
<td>2.81</td>
</tr>
<tr>
<td></td>
<td>≥2 2.52</td>
<td>0.64</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Cognitive st (%)</strong></td>
<td>≥24 57.05</td>
<td>83.69</td>
<td>60.08</td>
</tr>
<tr>
<td></td>
<td>19–23 33.14</td>
<td>15.60</td>
<td>33.26</td>
</tr>
<tr>
<td></td>
<td>≤18 9.81</td>
<td>0.71</td>
<td>6.65</td>
</tr>
<tr>
<td></td>
<td>Depression (%)</td>
<td>10.03</td>
<td>7.09</td>
</tr>
</tbody>
</table>

BMI, body mass index; Ch. Index, Charlson Index; disability, self-reported disability in basic activities of daily living (bathing or showering, dressing, eating, getting in and out of bed, using the toilet); cognitive st, cognitive status (MMSE 0-30); depression, Geriatric Depression Scale ≥5. Data are medians (25th, 75th percentile).
In fact, striking differences have resulted from large studies assessing the performance of the original FPC, as validated in CHS and the standardized version related to the characteristics of the population. But this misclassification will be truly worthy if it results in changes in the assessment of the risk for adverse outcomes. At present, however, no study has evaluated the impact of this misclassification on the predictive ability of the FPC.

In this study, we will evaluate if the standardized-frailty phenotype criteria (S-FPC, according to the local characteristic of Spanish population) change the classification of community-dwelling older adults according to their frailty status and their ability to predict mortality, hospitalization, incident disability, and falls compared with the original FPC.

Methods

Population

The Toledo Study for Healthy Aging (TSHA) is a Spanish longitudinal population-based study, designed for evaluating the determinants of physical frailty in individuals older than 65 years of age, living in the Spanish city of Toledo. The used methodology has been reported previously. All participants were selected by a two-stage random sampling from the municipal census of Toledo, covering institutionalized (1.9%) and community-dwelling (98.1%) people from rural and urban settings. They underwent identical baseline evaluations and follow-up.

The study protocol was approved by the Clinical Research Ethics Committee of the Toledo Hospital (Complejo Hospitalario de Toledo), Spain. Participants gave a signed informed consent prior to their inclusion in the cohort. People with available data on all the variables pertinent for the purposes of the present study were included (n = 1645 persons).

Operationalization of Frailty

Frailty phenotype was operationalized in two ways: FPC, using the cut-offs estimated in the CHS and the S-FPC, using the same methodology as Fried and colleagues used in their original article where slowness, weakness, and physical activity were positive if the values are included in the lowest quintile of the study sample distribution. FPC and S-FPC cut-off values are presented in Table 1.

Slowness was defined using the 3-meter walking speed test. Individuals were asked to walk 3 meters at their usual pace twice. The best time was chosen; sex and height adjusted time points were used. Weakness was measured by grip strength using a Jamar hydraulic dynamometer in the dominant hand. After three repetitions, the best result was selected and adjusted by the person’s body mass index. Weight loss was considered positive for reporting more than 4.54 kg of unintentional weight loss in the previous year. Poor endurance and energy was assessed by self-report of exhaustion using two questions (“How many days during the last week have you felt that anything you did was a big effort?” and “How many times during the last week have you felt that you could not keep on doing things?”). Answers were scored between 0 and 4 depending on symptom frequency; if any question was answered at a score of 2 or higher, this criterion was considered positive. Physical activity was assessed using the Physical Activity Scale for the Elderly (PASE) instead of the Minnesota Leisure Time Activity questionnaire used on CHS. The adjustment has been made taking into account the amount of calories used for leisure activities.

Outcomes

Main outcomes were all causes of death, hospitalization, incident disability, and falls. To detect deaths, we used information from the National Mortality Database provided by the National Institute of Statistics along the follow-up period (mean, 5.5 years; range, 0.30–6.79 years). The hospital’s database and telephone follow-up were used to detect hospitalizations at a mean follow-up of 3.5 years (range, 0.3–4.79 years). Incident disability was defined as the self-reported loss of at least one of the activities of daily living (ADL) during a mean follow-up period of 5.02 years (range, 4.8–5.2 years). The presence of falls was defined as referring at least one fall in the last year before the interview (mean follow-up, 5.02 years; range, 4.8–5.2 years).

Statistical Analysis

Descriptive statistics were used to summarize the data and raising the cut-off points for the S-FPC. For each instrument, frailty prevalence was compared by chi-square statistic. Cox proportional hazard models and logistic regression models were used to assess the association between frailty and mortality, hospital admissions, incident disability, and falls. Kaplan-Meier curves and log-rank test were estimated to evaluate the differences between frailty states (frail and prefrail) and robustness.

Table 3

Comparison of the Individual Classification According to the Scale Used

<table>
<thead>
<tr>
<th></th>
<th>Standardized-Frailty Phenotype Criteria</th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frailty Phenotype Criteria</td>
<td>Robusts (n = 157)</td>
<td>S-FPC (n = 780)</td>
<td>Frailty Phenotype Criteria</td>
<td>Robusts (n = 1078)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(n = 729)</td>
<td></td>
<td>Frail (n = 401)</td>
<td></td>
</tr>
<tr>
<td>Robusts (n = 159)</td>
<td>159</td>
<td>0</td>
<td>0</td>
<td>Frail (n = 131)</td>
<td>253</td>
</tr>
<tr>
<td>Prefails (n = 1086)</td>
<td>610</td>
<td>476</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frails (n = 401)</td>
<td>17</td>
<td>253</td>
<td>131</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4

Percentage of Different Outcomes According to the Frailty State. Comparison of Both Instruments

<table>
<thead>
<tr>
<th></th>
<th>FPC (n: 157)</th>
<th>S-FPC (n: 780)</th>
<th>FPC (n: 1078)</th>
<th>S-FPC (n: 725)</th>
<th>FPC (n: 401)</th>
<th>S-FPC (n: 131)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>70 (68–74)</td>
<td>72 (69–76)*</td>
<td>74 (70–77)</td>
<td>75 (72–79)*</td>
<td>77 (73–81)</td>
<td>79 (75–83)*</td>
</tr>
<tr>
<td>Sex (% men)</td>
<td>64.33</td>
<td>47.31*</td>
<td>48.79</td>
<td>43.45</td>
<td>24.69</td>
<td>32.06</td>
</tr>
<tr>
<td>Death (%)</td>
<td>4.46</td>
<td>7.56</td>
<td>12.15</td>
<td>19.31*</td>
<td>26.43</td>
<td>34.35*</td>
</tr>
<tr>
<td>Hospitalizations (%)</td>
<td>12.10</td>
<td>16.67</td>
<td>20.96</td>
<td>26.21*</td>
<td>28.43</td>
<td>29.77</td>
</tr>
<tr>
<td>Incident disability (%)</td>
<td>1.27</td>
<td>5.26</td>
<td>8.81</td>
<td>12.97*</td>
<td>15.46</td>
<td>18.32</td>
</tr>
<tr>
<td>Falls (%)</td>
<td>15.29</td>
<td>16.67</td>
<td>17.44</td>
<td>17.38</td>
<td>15.46</td>
<td>13.74</td>
</tr>
</tbody>
</table>

FPC, frailty phenotype criteria; S-FPC, standardized-frailty phenotype criteria. Data are medians (25th, 75th percentile). *P < .005 S-FPC vs FPC.
Table 2 shows the baseline characteristics of the 1645 participants included in the analysis. Of them, 729 (44.38%) were men, and median age was 74 years old (interquartile range, 70–78 years). The prevalence of frailty and prefrailty using the FPC was 24.12% and 66.4%, respectively, and 6.68% and 47.81%, when we used the S-FPC (*P < .01). When we observed the classification of individuals depending on the instrument, there were differences in 880 persons (Table 3). FPC showed a clear tendency to classify individuals in a more severe condition of frailty than S-FPC did. Among those individuals classified as robust according to S-FPC, only 20.23% (159/786) remained in the same category as FPC. In this same regard, just one-third of frail FPC individuals (32.66%; 131/401) remained in the same category when assessed using S-FPC.

During the follow-up, 244 participants (14.83%) died, 359 (21.8%) were admitted to hospitals, 274 (16.65%) suffered incident disability, and 159 (9.66%) reported at least having fallen once during the last year. When we compared the distribution of these outcomes by both frailty status and instrument, there were statistical differences depending on the instrument used between individuals classified as prefrail for death, hospitalization, and incident disability and between those classified as frail for death (Table 4). No differences were detected for individuals classified as robust for any outcome.

In this same regard, logistic regression (Table 5) showed a higher hazard ratio for prefrailty and frailty compared with robustness for death, hospitalization, and incident disability when we used S-FPC, but only for frailty when we used FPC. Neither FPC nor S-FPC found any significant difference for the risk of falling.

Because time framework is an important factor when older people are the target for prediction, we assessed the time when the difference between categories reaches clinical significance. Thus, unadjusted Kaplan-Meier curves were created for the variables where time to event was available: death and hospitalization (Figure 1). For both versions of the criteria, frailty status predicted death and hospitalization (*P < .01). Furthermore, we analyzed the minimum time of

<table>
<thead>
<tr>
<th>Table 5</th>
<th>Risk of Death, Hospitalization, Incident Disability, and Falls Using Both Instruments: FPC and S-FPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frailty Phenotype Criteria</td>
<td>Standardized-Frailty Phenotype Criteria</td>
</tr>
<tr>
<td></td>
<td>Robust</td>
</tr>
<tr>
<td>Death HR</td>
<td>1</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>1</td>
</tr>
<tr>
<td>Incident disability</td>
<td>1</td>
</tr>
<tr>
<td>Falls</td>
<td>1</td>
</tr>
</tbody>
</table>

FPC, frailty phenotype criteria; HR, hazard ratio, the ratio of risk of frailty group (frail or prefrail) relative to the robust group with regards to the event of interest; S-FPC, standardized-frailty phenotype criteria.

*P value ≤ .005.
†P value ≤ .01. All analyses are adjusted by age, sex, and comorbidity.

Results

Table 2 shows the baseline characteristics of the 1645 participants included in the analysis. Of them, 729 (44.38%) were men, and median age was 74 years old (interquartile range, 70–78 years). The prevalence of frailty and prefrailty using the FPC was 24.12% and 66.4%, respectively, and 6.68% and 47.81%, when we used the S-FPC (*P < .01). When we observed the classification of individuals depending on the instrument, there were differences in 880 persons (Table 3). FPC showed a clear tendency to classify individuals in a more severe condition of frailty than S-FPC did. Among those individuals classified as robust according to S-FPC, only 20.23% (159/786) remained in the same category as FPC. In this same regard, just one-third of frail FPC individuals (32.66%; 131/401) remained in the same category when assessed using S-FPC.

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follow-up necessary to obtain statistically significant differences between the robust, prefrail, and frail people (Figure 2). It was noted that using S-FPC for predicting death and hospitalization for frail individuals compared with robust people, the statistical significance was reached at week 26 and week 3, respectively while at week 49 and week 24 for those classified as prefrail. On the contrary, FPC needed longer time periods: 56 and 10 weeks for frail individuals and 209 and 32 weeks for those considered prefrail.

Discussion

In this study, we show for the first time that FPC improve their predictive ability if they are standardized according to the physical characteristics of the evaluated population. This improvement embraces two main issues: First, when we used the nonstandardized instrument, the identification of prefrailty as an intermediate status is lost, mainly due to the misclassification of robust people as prefrail. When we standardized according to the phenotypic characteristics of the sample, this bias is overcome, and prefrail individuals emerge in a consistent way, a group with an intermediate risk for adverse events between robust and frail individuals, as they were identified in the original work by Fried and colleagues. Second, the standardization makes this prediction timelier, as the hazard ratios reach statistical significance in a shorter time. This is of utmost importance when managing older people who, as one of their main characteristics, show a limited life expectancy. In these persons, prediction of events to happen in the shortest term becomes a clinical priority. As a whole, those arguments reinforce the relevance of using S-FPC as the tool of choice for detecting frailty.

The first article about physical phenotype criteria was developed in the original cohort of the CHS, recruited from US communities and a second cohort of African Americans. Then, it was found that the prevalence of frailty among both subgroups was statistically different. After that, subsequent works evaluated the association between race and frailty and found ethnic disparity, suggesting that the socioeconomic status, genetics, or body mass index were causes of the excess of frailty prevalence. This disparity disappeared, however, when FPC were adapted to the physical characteristics of the study population. This fact reinforced the differences in body composition as the responsible factor of this disparity. Please note that body composition is strongly dependent on ethnicity, not just body mass index but especially in fat distribution and muscularity. In consequence, great differences have been observed between races in performance-based measures, (eg, gait speed and grip strength). Based on this, some authors have proposed adjusting the cut-off values of these parameters to the specific characteristics of each population. In the same manner, and because body composition varies systematically according to ethnic group, FPC should be applied with an ethnic-specific adaptation.

From a geographical prospective, large differences have been shown in the prevalence of frailty between countries. Using the phenotype model, the weighted average prevalence was 9.9% [95%
confidence interval (CI), 9.6–10.2) for frailty and 44.2% (95% CI, 44.2–44.7) for prefrailty. In some areas of Central and South America, a potentially higher prevalence was suggested for example, in Mexico, Cuba, and Peru where 27.8% of the population has fulfilled the frailty criteria. In Europe, on the other hand, data from the Survey of Health, Aging, and Retirement in Europe (SHARE) showed high variations on prevalence of frailty across the European countries (tending to increase from northern to southern Europe). According to these previous data, the prevalence of frailty in Spain for the population over 65 years of age is 27.3% (23.0%–31.0%) and 50.9% (46.8%–55.1%) for prefrailty. In our study, after using the original criteria, the frailty prevalence was 24.12% for frailty and 66.4% for prefrailty (comparable to SHARE results). However, when the cut-offs were adjusted to the phenotypic characteristics of the population (S-FPC), the prevalence of frailty reduced to 6.68% and to 47.81% for prefrailty. Actually, these data are comparable to the prevalence in the north of Europe (in Sweden, frailty prevalence is 8.6% and prefrailty prevalence is 45.3%; in Switzerland, the figures are 5.8% and 46.3%, respectively) and the United States (frailty, 6.9%; prefrailty, 46.6%). Therefore, our findings are that the first longitudinal data that raise the possibility that the higher prevalence of frailty observed in ethnic minority groups using original FPC may be related in large part to ethnic differences in body composition because they disappear when frailty criteria are standardized to body composition characteristics. Thus, this higher prevalence may not represent a truly higher vulnerability to stress and functional decline. In fact, there are two additional issues of interest in our findings. First, misclassification embraces a loss of discriminatory power between the categories of the frailty status that is recovered when the criteria are standardized. Second, in a tight association with the previous issue, there are substantial changes between the risks of the categories depending on the instrument used. In this regard, to be classified as prefrail does not provide any additional risk when people are classified according to the nonstandardized criteria, but they show a higher risk when the standardized ones are used. In this same regard, it must be underscored that the range of the hazard ratio for prefrail individuals regarding outcomes is larger when we used FPC instead of S-FPC, suggesting a higher heterogeneity in the conditions of the participants included in the category of prefrail in the first case.

Comparing our results with previous studies, any of the tools predicted falls. These results could be justified because they are based on a question about an event (the majority of times without consequence) in the last year. The lack of awareness besides a high percentage of participants with cognitive impairment (42.95% of the total population had cognitive impairment, especially in the prefrail and frail groups) could be the cause of a report bias. In fact, just 9.66% of participants suffered at least a fall during last year, a figure lower than that reported in the literature (30% of persons over 65 years). At least two potential limitations of this study should be considered. First, gait speed was measured using a 3-meter distance instead of 15 feet as in the CHS. However, there is enough evidence supporting that there are not statistically significant differences when the distance to measure walking speed is performed using different lengths. Second, physical activity was assessed using leisure activities registered on the Physical Activity Scale for the Elderly (PASE) instead of the Minnesota Leisure Time Activity questionnaire used on CHS. The adjustment has been made taking into account the amount of calories used for leisure activities, thus minimizing the potential for bias. In fact, the prevalence of frailty for our cohort when the S-FPC was used was similar to that found in CHS.

Conclusions

Finally, in conclusion, these findings suggest that for the characterization of older people according to their frailty status, it should be worthy to standardize the criteria to the phenotypic characteristics of the population. This suggestion is based on two main facts: (i) the risk of misclassification and, more important, (ii) the possibility of conferring wrong risks that in clinical practice would promote the use of inappropriate preventive and therapeutic measures in these persons, excluding them from the benefits of the proper management of frailty. This misclassification is especially relevant for those classified as pre-frail. Clinicians, public health professionals, policy makers, and researchers should be aware of the unadjusted tool limitations. Further research to refine the instruments and tools to assess frailty is needed, in order to improve their accuracy, their feasibility and their usefulness in the characterization of the population in different settings of care.

References