Brief Report

# Outcome Priorities for Older Persons With Sarcopenia

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## ABSTRACT

Keywords:
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*Objectives:* To evaluate patients' preferences for sarcopenia outcomes.

*Design:* Discrete-choice experiment (DCE)

*Setting and Participants:* Community-dwelling individuals older than 65 years suffering from sarcopenia recruited in Belgium, France, Germany, Italy, Spain, and Switzerland, who visited the clinic and were cognitively able to understand and fill out the survey.

*Methods:* In the DCE survey, participants were repetitively asked to choose which one of the 2 patients suffering from sarcopenia deserves treatment the most. The 2 patients presented different levels of risk for 5 preselected sarcopenia outcomes: quality of life, mobility, domestic activities, fatigue, and falls. The DCE included 12 choice sets. Mixed logit panel model was used to estimate patients' preferences and latent class model was conducted to identify profiles of responses.

*Results:* A total of 216 sarcopenic persons were included for the analysis (68% women; mean age 78 years). All 5 preselected sarcopenia outcomes were shown to be significant. Overall, the most important sarcopenia outcome was mobility (30%), followed by the ability to manage domestic activities (22%), the risk of falls (18%), fatigue (17%), and quality of life (14%). The latent class model identified 2 classes of respondents. In the first class (probability of 56%), participants valued mobility the most (42%), followed by the ability to manage domestic activities (23%) and risk of falls (17%). In the second class, fatigue was the most important outcome (27%) followed by domestic activities (19%) and risk of falls (19%). No statistically significant associations between the latent classes and sociodemographic characteristics were found.

*Conclusions and Implications:* This study suggests that all 5 preselected outcomes were important for sarcopenic older individuals. Overall, the most important outcomes were mobility and the ability to manage domestic activities, although variations in preferences were observed between respondents. This could help in incorporating patient preferences when designing appropriate solutions for individuals with sarcopenia.

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It is now largely acknowledged that sarcopenia represents an individual as well as a considerable public health burden[1−3] that can lead to a plethora of health consequences. Recently, a systematic review tried to provide a valid list of outcomes associated with sarcopenia identified through published studies.[4] Little is known, however, about how the patients themselves value these outcomes. Understanding which sarcopenia outcomes are the most important is highly relevant for clinicians when trying to understand patients' concerns. In addition, improved insights into patients' preferences on sarcopenia outcomes might and should have an impact on the design of future treatments and of the necessary clinical studies (eg, incorporation of primary endpoints). Product development and acceptance can benefit from knowledge about what patients value and what they prefer in the context of their disease and available treatment options.[5]

To gain insight into important sarcopenia outcomes, as a first step, we identified and prioritized the 5 most important outcomes for patients with sarcopenia based on, consecutively, a systematic review, focus groups with patients, and expert discussions.[6] As a next step, it is important to know how patients make trade-offs between these outcomes. This study aimed therefore to assess the preferences of participants across Europe for sarcopenia outcomes using a discrete-choice experiment (DCE).

## Methods

In the DCE survey, participants were presented with a series of choices and asked in each to select among 2 hypothetical patients suffering from sarcopenia the one who deserves treatment the most. The hypothetical patients were described by a set of attributes that were further specified by attribute levels. Good research practices for stated-preference studies were followed.[7,8]

### Attributes and Levels

The identification and prioritization of sarcopenia outcomes was conducted following a 4-step procedure: a literature review, an expert consultation, focus groups with participants having sarcopenia, and an expert meeting. More details about these 4 stages are presented in Beaudart et al.[6] The 5 sarcopenia outcomes included in the DCE were mobility, quality of life, ability to manage domestic activities, level of fatigue, and risk of falls (see Table 1).

### Experimental Design

A subset of choice sets to be presented to the respondents was selected based on efficient design using Ngene software (version 1.1.1, http://www.choice-metrics.com). A total of 24 choice tasks were designed and blocked into 2 versions of the questionnaire containing 12 choice tasks each. A dominance test—a choice set with 1 hypothetical patient who is clearly better than the other—was added to assess the reliability of respondents' choices.[9] An example of a choice task is shown in Figure 1.

### Questionnaire

The questionnaire was paper-based. Data on participants' demographics and socioeconomic characteristics were also collected. The English version of the questionnaire was pilot tested with 10 sarcopenia experts and clinicians and 20 older persons with sarcopenia to check interpretation problems, face validity and length of the questionnaire. Only minor changes to layout were made. The questionnaire was then translated into additional languages. The questionnaire is available on request from the corresponding author.

### Subject Selection and Data Collection

The study was conducted in 6 European countries (between November 2017 and December 2018) in community-dwelling persons 65 years of age and older with sarcopenia and visiting the clinic. Sarcopenia was diagnosed according to valid published definitions [ie, those by the European Working Group on Sarcopenia in Older People (EWGSOP), Foundation for the National Institutes of Health (FNIH), and International Working Group on Sarcopenia (IWGS)].[10−12] Only participants who were cognitively able to understand and fill out the questionnaire were included. The questionnaire was completed by the participant at the clinic or at home. In line with common rules of thumb for minimum sample size,[13] a minimum of 200 respondents were targeted.

Approval for this study was obtained from the Medical Ethics Committee of the University of Liège, which coordinated the project, and in participating centers that required ethics approval for a DCE questionnaire study.

### Statistical Analyses

Data analysis was carried out using Nlogit software, version 5.0. Data of participants who failed the dominance test were excluded.

First, a panel mixed logit model (estimated using 1000 Halton draws) was used, which allows to capture heterogeneity by estimating the standard deviation of the parameter's distribution. A standard deviation significantly different from zero was interpreted as evidence of significant preference heterogeneity for the attributes and levels in the sample. Analyses were conducted for the whole sample as well as per country. All variables were included as effects-coded categorical variables that were normally distributed. Using effect coding, mean attributes are normalized to zero and preference weights are added relative to the mean effect of the different levels of the attribute.

Using the range method,[8] the relative importance of attributes was calculated by measuring the difference between the highest and the lowest coefficient for the levels of the respective attribute. The relative importance is then calculated by dividing the attribute-specific level range by the sum of all attributes' level ranges.

Second, a latent class model was used to determine preference profiles of respondents.[14] To determine the number of classes, we selected the model with the best fit based on the Akaike information criterion. To investigate if the latent classes differed according to patients' characteristics, chi-squared tests and multinomial logistic regression were used to test whether parameters significantly differed across latent classes. These analyses were conducted with IBM SPSS 24 (IBM Corp, Armonk, NY).

**Table 1**
Attributes and Levels Included in the DCE

| Attributes | Levels |
|---|---|
| Patient's mobility | Outdoor mobility without difficulties |
| | Outdoor mobility with difficulties |
| | Indoor mobility only |
| | Chairbound or bedbound |
| Patient's quality of life | Good |
| | Fair |
| | Poor |
| Patient's management of domestic activities | Manages without difficulties |
| | Manages with difficulty |
| | Unable |
| Patient's level of fatigue | Not at all tired |
| | Moderately tired |
| | Tired very easily |
| Frequency of falls | Never |
| | Occasional (once in the last 6 mo) |
| | Frequent (2 or more times in the last 6 mo) |

**Question 1**

|  | **Patient A** | **Patient B** |
|---|---|---|
| **Mobility** | Indoors only | Outdoor with difficulties |
| **Quality of life** | Poor | Good |
| **Domestic activities** *(such as cooking, cleaning, gardening)* | Manage without difficulty | Unable |
| **Fatigue** *(when doing daily activities)* | Not at all tired | Tired very easily |
| **Falls** | Occasional *(once in the last 6 mo)* | Never |

| Which of the 2 patients do you think deserves treatment the most? *(Tick one box only)* | Patient A ☐ | Patient B ☐ |
|---|---|---|

**Fig. 1.** Example choice set of the discrete choice experiment (DCE) questionnaire.

Finally, subgroup analyses were conducted to investigate potential differences between countries and sociodemographic variables. The mean age was used to create a dummy variable, and high education level included participants with a diploma from secondary school, college, or university. To assess if preferences are significantly different between subgroups, a joint model taking scale heterogeneity into account[15] was estimated using interaction terms to capture systematic differences in preference between subgroups.

## Results

### Participant Characteristics

A total of 245 questionnaires were completed and returned. Of those, 29 participants failed the dominance test and were excluded from the final analysis. Participants who failed the dominance test did not differ in age, gender, and education level, and inclusion of these patients in an additional analysis did not affect the results and conclusions. The final sample consisted of 216 participants (46 from Belgium, 30 from France, 18 from Germany, 50 from Italy, 39 from Spain, and 33 from Switzerland). The respondents had a mean age of 77.9 years, and 68% were female. Sample characteristics are shown in Supplementary Tables 1 and 2. On average, the task difficulty was seen as moderate with an average score of 4.22 (standard deviation 1.46), based on responses to a 7-point scale (1 for extremely easy).

### Mixed Logit Models

The panel mixed logit model results are presented in Table 2. All 5 preselected sarcopenia outcomes were significant and thus important for respondents. All coefficients had the expected sign. Overall, the most important sarcopenia outcome was mobility (30%), followed by the ability to manage domestic activities (22%), the risk of falls (18%), fatigue (17%), and quality of life (14%). Given the significant standard deviation for most coefficients (with the exception of quality of life), variations in preferences between participants were observed for all attributes.

The relative importance of attributes per country is shown in Supplementary Figure 1. Mobility was the most important sarcopenia outcome in 5 of the 6 countries. In Spain, the ability to manage domestic activities was the most important outcome, followed by risk of falls and mobility. In all countries, all 5 preselected sarcopenia outcomes were significant and some variations in preferences between respondents were observed, especially for mobility.

### Latent Class Model

The latent class model identified 2 classes of respondents with class probabilities of 56% and 44%, respectively (see Table 3). In the first class, participants valued mobility the most (42%), whereas fatigue was the most important outcome (27%) in the second class. When assessing the differences of the individual patient characteristics between the latent classes, no statistical significant differences were found.

### Subgroup Analyses

Some significant differences between countries and subgroups were observed (see Supplementary Table 2). In comparison with Belgium (the reference country), respondents from France, Germany, and Spain has a significantly lower preference for the ability to manage domestic activities. Quality of life was significantly more important in Switzerland than in Belgium. Age and gender did not have a significant effect on respondents' preferences. Participants with a high education level gave more importance to the ability to manage domestic activities.

## Discussion

This study suggests that all 5 preselected sarcopenia outcomes included in the DCE were important for participants. As older persons with sarcopenia are affected with regard to their muscle mass, muscle strength, and physical performance, mobility is often restricted in these patients. In a previous work dedicated to develop a health-related quality of life questionnaire in individuals with sarcopenia, 18 of the 55 items of the scale were targeting mobility.[16] It is therefore not surprising that this outcome is of huge importance in our study. The second most important outcome is "ability to manage domestic activities." The loss of muscle strength can impact several activities of daily living such as household tasks (like opening a bottle or jar, carrying and storing heavy objects), and older adults know that not being able to manage domestic activity may eventually mean admission to nursing home. The latent class model also identified a profile of respondents with a preference for the outcome "fatigue." In our previous publication aiming to identify the attributes to include

**Table 2**
Results From the Panel Mixed Logit Model

| Attributes and Levels | Estimate (95% CI) | Standard Deviation | Relative Importance, % |
|---|---|---|---|
| Constant | | | |
| Patient's mobility | | | 29.9 |
| Outdoor mobility without difficulties | −1.1532*** (−0.94, 1.37) | 0.9327*** | |
| Outdoor mobility with difficulties | 0.0246 (−0.13, 0.18) | 0.6002*** | |
| Indoor mobility only | 0.1702* (−0.01, 0.35) | 0.6120*** | |
| Chairbound or bedbound | 0.9584*** (0.64, 1.27) | — | |
| Patient's quality of life | | | 13.7 |
| Good | −0.4732*** (−0.59, 0.35) | 0.0271 | |
| Fair | −0.0213 (−0.11, 0.07) | — | |
| Poor | 0.4945*** (0.37, 0.62) | 0.1413 | |
| Patient's management of domestic activities | | | 21.7 |
| Managed without difficulties | −0.8571*** (−1.01, 0.71) | 0.2275** | |
| Managed with difficulty | 0.1811** (0.07, 0.29) | — | |
| Unable | 0.6760*** (0.53, 0.82) | 0.2424*** | |
| Patient's level of fatigue | | | 16.6 |
| Not at all tired | −0.5233*** (−0.65, −0.40) | 0.2258*** | |
| Moderately tired | −0.1253** (−0.22, −0.03) | — | |
| Tired very easily | 0.6486*** (0.51, 0.79) | 0.2419** | |
| Frequency of falls | | | 18.1 |
| Never | −0.6711*** (−0.80, −0.54) | 0.0828*** | |
| Occasional (once in the last 6 mo) | 0.0627 (−0.03, 0.16) | — | |
| Frequent (≥2 in the last 6 mo) | 0.6083*** (0.47, 0.75) | 0.3428*** | |

CI, confidence interval.
Standard deviations correspond to the random component of the model coefficients.
* $P < .1$.
** $P < .05$.
*** $P < .01$.

into this DCE,[6] the outcome "fatigue" was not identified based on literature review and expert opinion, but only during focus groups with older persons with sarcopenia. Amelioration of fatigue should thus be considered as a very important therapy outcome for patients with sarcopenia, as also found in patients with rheumatoid arthritis.[17] This finding further highlights the need and importance to

**Table 3**
Latent Class Analysis and Association Between Patients' Characteristics and Latent Class Membership

| | Latent Class 1 (56%)*, % | Latent Class 2 (44%)†, % |
|---|---|---|
| Belgium | 20 | 22 |
| France | 14 | 14 |
| Germany | 7 | 9 |
| Italy | 32 | 18 |
| Spain | 18 | 18 |
| Switzerland | 9 | 19 |
| Older age | 46 | 53 |
| High education | 47 | 50 |
| Women | 62 | 71 |

*Mobility, 42%; quality of life, 10%; domestic activities, 23%; fatigue, 9%; falls, 17%.
†Mobility, 18%; quality of life, 17%; domestic activities, 19%; fatigue, 27%; falls, 19%.

involve patients in research planning and to investigate patients' preferences.

Although this study attempted to follow good research practices, some potential limitations exist. First, patients in this survey are younger on average than the typical patient with sarcopenia. Given that we were collecting data from the patient's perspective, we had to make sure that they were cognitively intact and reliable, so the selection of a younger cohort could be partially explained by these factors. Despite the fact that patients need to be able to understand the questionnaire, they were otherwise absolutely typical to our sarcopenia population. Selection bias and limitations in generalizability of our results can therefore not be excluded. On the other hand, older patients with sarcopenia are usually disabled and that disability, in many cases due to multimorbidity, may have an impact on the results that does not reflect sarcopenia but other conditions. Second, the different numbers and gender of participants in the samples from each country could also limit the generalizability. Exclusion and refusals were also not systematically collected. Third, back-and-forward translations of the questionnaire were not done, and a pilot study was not conducted in all countries. Fourth, although a sound methodology was used to select and define attributes, it cannot be excluded that additional attributes may play a role, at least in some countries. To maintain consistency across countries, the same list of attributes as well as levels and the same design was used in all countries. In addition, other important covariates should also be acknowledged, such as the severity of sarcopenia in each participant, that were not systematically collected in our study. Fifth, we were unable to understand the causes of the differences between countries. Finally, although DCEs are widely used, an inherent limitation is that respondents are evaluating hypothetical options. Therefore, what respondents declare they will do may differ from what they would actually do if faced with the choice in real life.

## Conclusion and Implications

In conclusion, this study suggests that all 5 preselected sarcopenia outcomes were highly relevant for patients with sarcopenia and that the most important outcomes were mobility and the ability to manage domestic activities, although variations in preferences were observed between respondents. Assessing patients' preferences offers support to health professionals who want to improve sarcopenia management, to facilitate shared decision making, and finally, those outcomes could further be useful when designing and evaluating appropriate health care programs.

## Acknowledgments

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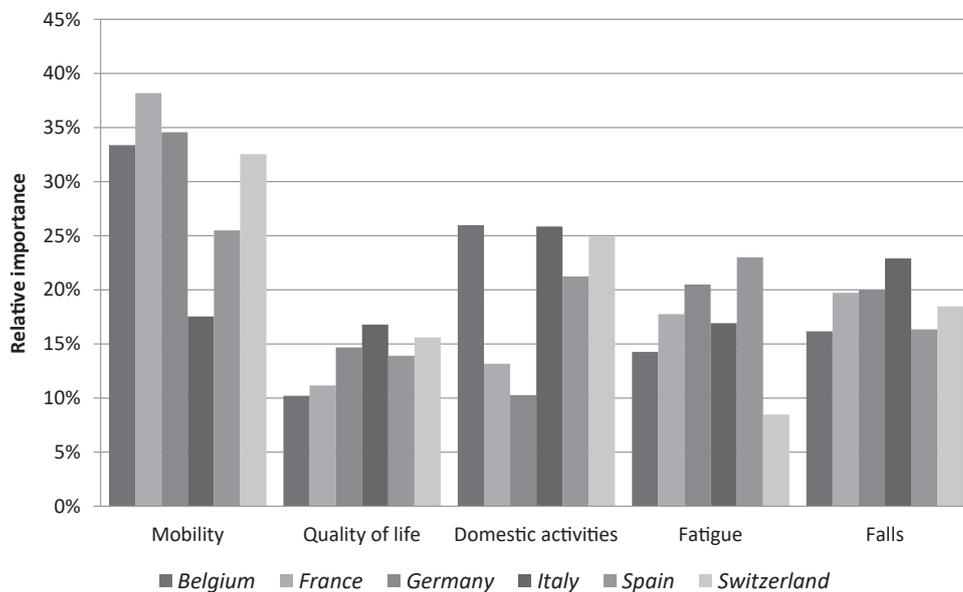
**Supplementary Figure 1.** Relative importance of included attributes per country.

**Supplementary Table 1**
Patients' Characteristics (n = 216)

| | |
|---|---|
| Age, Mean (SD), y | 77.93 (±6.26) |
| Female gender, % | 68 |
| Quality of life (VAS; 1-100), mean (SD) | 65.53 (±17.20) |
| Country, n (%) | |
|   Belgium | 46 (21) |
|   France | 30 (14) |
|   Germany | 18 (8) |
|   Italy | 50 (23) |
|   Spain | 39 (18) |
|   Switzerland | 33 (15) |
| Education, n (%) | |
|   Primary school | 37 (17) |
|   Some high school | 72 (34) |
|   Secondary school | 60 (28) |
|   College or university | 44 (21) |

SD, standard deviation; VAS, visual analog scale.

**Supplementary Table 2**
Patients' Characteristics per Country

|  | Belgium | Germany | France | Italy | Spain | Switzerland |
|---|---|---|---|---|---|---|
| N included | 46 | 18 | 30 | 51 | 39 | 33 |
| Age, mean (SD), y | 76.65 (±5.90) | 81.28 (±7.05) | 81.13 (±6.42) | 78.42 (±5.62) | 79.46 (±5.65) | 72.48 (±2.40) |
| Female gender, % | 61 | 56 | 73 | 54 | 79 | 87 |
| Quality of life, mean | 63.83 | 54.44 | 66.13 | 64.20 | 63.03 | 78.27 |
| Education, % |  |  |  |  |  |  |
| Primary school | 14 | 6 | 20 | 18 | 31 | 9 |
| Some high school | 39 | 61 | 33 | 32 | 28 | 22 |
| Secondary school | 29 | 28 | 17 | 28 | 33 | 31 |
| College or university | 18 | 6 | 30 | 22 | 8 | 37 |
| Failed dominance test, n (%) | 2 (4) | 5 (14) | 2 (10) | 10 (17) | 9 (19) | 1 (3) |

**Supplementary Table 3**
Interaction Models to Assess Differences Between Countries and Subgroups

| Attributes and Levels | Countries (Reference = Belgium) | | | | | Age | Female | Higher Education |
|---|---|---|---|---|---|---|---|---|
|  | France | Germany | Italy | Spain | Switzerland |  |  |  |
| Patient's mobility |  |  |  |  |  |  |  |  |
| Outdoor mobility without difficulties |  |  | +* |  |  |  |  |  |
| Outdoor mobility with difficulties |  |  | +* |  |  |  |  |  |
| Indoor mobility only |  |  |  |  |  |  |  |  |
| Chairbound or bedbound |  |  |  |  |  |  |  |  |
| Patient's quality of life |  |  |  |  |  |  |  |  |
| Good |  |  |  |  | − |  |  |  |
| Fair |  |  |  |  |  |  |  |  |
| Poor |  |  |  |  | + |  |  | +* |
| Patient's management of domestic activities |  |  |  |  |  |  |  |  |
| Managed without difficulties | + | + | +* | + |  | +* |  | − |
| Managed with difficulty |  |  |  |  |  |  |  |  |
| Unable | − | − |  | −* | −* |  |  |  |
| Patient's level of fatigue |  |  |  |  |  |  |  |  |
| Not at all tired |  |  |  |  |  |  |  |  |
| Moderately tired |  |  |  |  |  |  |  |  |
| Tired very easily |  |  |  |  |  |  |  |  |
| Frequency of falls |  |  |  |  |  |  |  |  |
| Never |  |  |  |  |  |  |  |  |
| Occasional (once in the last 6 mo) |  |  |  |  |  |  |  |  |
| Frequent (≥2 in the last 6 mo) |  |  |  |  | + |  |  | +* |

*P value < .10; a positive sign means that the level is more important in the country compared to the reference country, a negative sign means less important.