

# Health-related Quality of Life and Utilities in Gastric Premalignant Conditions and Malignant Lesions: a Multicentre Study in a High Prevalence Country

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Received: 25.07.2014

Accepted: 08.09.2014

## ABSTRACT

**Background & Aims:** A recent review of economic studies relating to gastric cancer revealed that authors use different tests to estimate utilities in patients with and without gastric cancer. Our aim was to determine the utilities of gastric premalignant conditions and adenocarcinoma with a single standardized health measure instrument.

**Methods:** Cross-sectional nationwide study of patients undergoing upper endoscopy (n=1,434) using the EQ-5D-5L quality of life (QoL) questionnaire.

**Results:** According to EQ-5D-5L, utilities in individuals without gastric lesions were 0.78 (95% confidence interval: 0.76-0.80), with gastric premalignant conditions 0.79 (0.77-0.81), previously treated for gastric cancer 0.77 (0.73-0.81) and with present cancer 0.68 (0.55-0.81). Self-reported QoL according to the visual analogue scale (VAS) for the same groups were 0.67 (0.66-0.69), 0.67 (0.66-0.69), 0.62 (0.59-0.65) and 0.62 (0.54-0.70) respectively. Utilities were consistently lower in women versus men (no lesions 0.71 vs. 0.78; premalignant conditions 0.70 vs. 0.82; treated for cancer 0.72 vs. 0.78 and present cancer 0.66 vs. 0.70).

**Conclusion:** The health-related QoL utilities of patients with premalignant conditions are similar to those without gastric diseases whereas patients with present cancer show decreased utilities. Moreover, women had consistently lower utilities than men. These results confirm that the use of a single standardized instrument such as the EQ-5D-5L for all stages of the gastric carcinogenesis cascade is feasible and that it captures differences between conditions and gender dissimilarities, being relevant information for authors pretending to conduct further cost-utility analysis.

**Key words:** gastrointestinal endoscopy – QoL – gastric cancer – intestinal metaplasia – atrophic gastritis.

**Abbreviations:** LYS: life-years saved, QALY: quality-adjusted life years, VAS: VAS, CI: confidence interval.

## INTRODUCTION

Gastric adenocarcinoma is a health problem worldwide due to its high incidence and mortality rates, being the fourth most common malignancy and the second leading cause of cancer death [1]. Its prognosis is highly dependent on the stage at diagnosis but usually presents at an advanced stage requiring demanding treatments and costs

and impairing quality of life (QoL), even for patients with a good prognosis [2].

In health economics studies, the clinical strategies adopted for a problem such as gastric cancer are compared by simultaneously addressing their differences in terms of both clinical benefits and the cost of achieving them [3]. Guidelines recommend conducting cost-utility analysis where the use of clinical benefits should be adjusted to patient preferences. Thus, life-years saved (LYS) may be adjusted to utilities in terms of QoL, quality adjusted life years (QALYs), meaning that 1 year of life is multiplied by a utility factor between 1 and 0, providing different values for each single year of life, resulting in an utility value that will vary between 1 QALY (one year with perfect

QoL) and 0 (death, by definition). These guidelines also suggest that community preferences should be used instead of patient preferences [4-6].

In a recent systematic review of the literature on economic studies relating to gastric cancer our group found that authors mostly used patient preferences instead of the recommended community preferences and that utilities were obtained by using several measurement instruments, including questionnaires that were specifically created for comparing gastric cancer treatments that should not be compared to utilities in the general population. Also, models tend to use utilities reported in other studies, usually conducted in countries different from the population in the model, where health valuations might have given different results [7]. Utilities obtained in a population with a single questionnaire could be very suitable for conducting cost-utility analysis on the gastric cancer problem since they would provide comparative utilities for all stages of the gastric cancer cascade from an asymptomatic population to gastric cancer patients [8].

Thus, the aim of our study was to perform a cross-sectional study to obtain utilities from a population that would include patients without gastric lesions and also with all kinds of upper gastrointestinal diseases, including patients with all ranges of gastric premalignant conditions, patients submitted to endoscopic treatments and patients with gastric cancer submitted to all available treatments [9-11].

## METHODS

This cross-sectional study was performed in 8 Portuguese hospitals over 6 months, between 2012 and 2013, by delivering a QoL related questionnaire to patients already scheduled for routine upper gastrointestinal endoscopic examinations. The questionnaire was the Portuguese version of the EQ-5D-5L and the reference test for the diagnosis was the gastroenterology diagnosis, including the histopathology result when applicable. The planning, development and report of the study are in accordance with the STROBE statement for reports on observational studies [12, 13].

Portugal is considered to have a high-incidence of gastric cancer according to the GLOBOCAN definition by presenting an age-standardized incidence rate of 13.7 per 100,000 [14]. From all over the country, including north, centre, south of Portugal and the two major cities of Lisbon and Porto, 8 gastroenterology departments in 8 different hospitals comprising 2 academic hospitals, 3 oncology centers and 3 regional hospitals, were invited and agreed to participate. Consecutive patients were included in each hospital for 3 months and each patient scheduled for an upper endoscopy procedure was invited to complete a questionnaire before the examination to self-report their QoL on the day of the examination.

The outcomes obtained were the self-reported answers to the questionnaire, providing a measure of QoL on the day of the upper endoscopy procedure, plus the diagnosis provided by the attending gastroenterologist, which can be based on the endoscopic diagnosis, pathology result or known medical history, as applicable. To allow for generalization of results, a selection of hospitals was made in order to obtain a

heterogeneous population in terms of both geographic location and hospital setting.

The only inclusion criteria were the completion of an already scheduled upper endoscopy along with a voluntary signed informed consent specific to the study. Exclusion criteria were emergency examinations, failure to provide informed consent or any contraindication for upper endoscopy.

The study was approved by the Portuguese Data Protection Authority (Authorization 4982/2012) after granting permission for the compilation of multicenter national data, and also by each hospital Ethics Committee. Confidentiality of all records was ensured by removing the names of patients, doctors and nurses from the reports before they were sent to the main investigator.

Selection bias was minimized by asking all institutions for a consecutive sample, having a very broad inclusion criteria setting and carrying out the study in the whole country in hospitals with very different population characteristics, for at least 3 months in order to allow the inclusion of most types of upper gastrointestinal diseases.

### QoL questionnaire

The questionnaire used was the EQ-5D-5L developed by the EuroQol Group which is a standardized measure to provide utilities for clinical and economic appraisal [15]. This questionnaire was chosen because it can be applied to a wide range of health conditions and treatments, provides a simple descriptive profile and a single index value for each health status, has been validated over many years in a number of populations and settings, is the most recent version of the EuroQol EQ-5D questionnaire and is available in several translations, including an already validated and reliable Portuguese version [16].

The EQ-5D-5L questionnaire comprises a descriptive system and a visual analogue scale (VAS). The descriptive system has 5 dimensions: mobility, self care, usual activities, pain/discomfort and anxiety/depression, and each dimension has 5 levels: no problems, slight problems, moderate problems, severe problems, and extreme problems (the former EQ-5D had only 3 choices per question, being called EQ-5D-3L). Respondents are asked to indicate their health state by marking the box against the most appropriate statement in each of the 5 dimensions. The digits for the 5 dimensions can be combined in a 5-digit number describing the respondent's health state. Health states defined by the EQ-5D-5L descriptive system were converted into a single index value to calculate utilities, according to the recommendations of the EuroQol Group [17].

The similar EQ-5D-3L system was only recently validated in the Portuguese population, by setting preferences for the general population using the time trade-off technique and also developing population norms [18, 19]. Because currently there is no validated method to transform utilities from the EQ-5D-3L to the EQ-5D-5L systems, we used the Spanish EQ-5D-5L utilities. From the available options, the Spanish utilities are the most similar, providing a Pearson's correlation coefficient of  $r=0.946$  for both EQ-5D-3L population norms [18].

The VAS records the respondent's self-rated health on a 20 cm vertical VAS, with endpoints labeled "the best health you can imagine" and "the worst health you can imagine".

A correctly completed questionnaire was defined as a questionnaire with each of the 5 multiple choice questions for the descriptive system completed with a single cross and a clear and readable number in the VAS.

### Endoscopic procedure

For each questionnaire the corresponding diagnosis was obtained from the upper endoscopy result. Upper endoscopy is considered the ideal procedure for the diagnosis of upper gastrointestinal diseases due to its widespread availability, improved accuracy for most diseases, relatively minor invasiveness and possibility of performing diagnostic and/or therapeutic procedures [20-24]. There were no specific inclusion or exclusion criteria based on patient diagnosis, endoscopists' experience, type of endoscopic facility or scope. Biopsies were done as deemed necessary, but not specifically for participation in the study.

### Sample size and statistical analysis

For the sample size calculation, an estimate of at least 44 patients per group would be needed for a level of significance

of 0.05 and a power of 0.80, based on previous reports that for normal patients the utility score was 0.90, for patients with premalignant conditions 0.70 and for patients with gastric cancer 0.50. We aimed at obtaining 100 patients for each of these groups, to ensure that confidence intervals would not be wider than  $\pm 0.10$ , in order to achieve statistically significant differences between utilities [25].

Results are reported as means and 95% confidence interval (CI) for continuous variables and percentages for proportions. For comparative analysis the Student's *t*-test was used for continuous variables according to their normal distribution and the Pearson chi-square test for dichotomous variables. A two-sided *p* value  $< 0.05$  was considered to be statistically significant. Results were analyzed in subgroups for confounding factors such as age or gender but not for co-morbidities. No data was missing from the retrieved questionnaires.

## RESULTS

All subjects scheduled for an upper endoscopy were invited and after exclusions for several factors such as refusing to

**Table I.** Main patient characteristics and utilities according to stages of the gastric carcinogenesis cascade and most relevant upper gastrointestinal diseases

	n (%)	EQ-5D-5L mean (95% CI)	VAS mean (95% CI)
Patients	1,434		
Male gender	755 (52.6)		
Age $\geq$ 50 years	1,063 (74.1)		
Participating hospital: n (% global), (% gastric cancer)			
Portuguese Oncology Institute of Coimbra	353 (24.6), (20.7)		
Portuguese Oncology Institute of Lisbon	294 (20.5), (9.5)		
Santa Luzia Hospital, Viana do Castelo	205 (14.3), (4.4)		
Santo António General Hospital, Porto	168 (11.7), (1.8)		
Hospital Unit of Portimão	142 (9.9), (4.9)		
Coimbra's University and Hospital Center	134 (9.3), (8.9)		
Portuguese Oncology Institute of Porto	69 (4.8), (20.3)		
West Lisbon Hospital Centre	69 (4.8), (2.9)		
No gastric lesions	678 (47.3)	0.78 (0.76-0.80)	0.67 (0.66-0.69)
Gastric premalignant conditions (gastritis, atrophy, intestinal metaplasia)	391 (27.3)	0.79 (0.77-0.81)	0.67 (0.66-0.69)
Gastric adenocarcinoma	148 (10.3)	0.77 (0.73-0.81)	0.62 (0.59-0.65)
Treated by:			
- Mucosectomy	17 (1.2)	0.78 (0.63-0.92)	0.62 (0.54-0.70)
- Surgery	69 (4.8)	0.77 (0.71-0.82)	0.62 (0.57-0.67)
- Chemo/Radiotherapy	38 (2.6)	0.83 (0.77-0.89)	0.63 (0.57-0.70)
Present carcinoma	24 (1.7)	0.68 (0.55-0.81)	0.62 (0.54-0.70)
Other lesions*			
Hiatal hernia	155 (10.8)	0.77 (0.73-0.80)	0.66 (0.63-0.69)
Esophagitis	83 (5.8)	0.79 (0.74-0.74)	0.69 (0.65-0.73)
Peptic ulcer	36 (2.5)	0.78 (0.72-0.84)	0.62 (0.56-0.69)
Barrett's esophagus	28 (1.9)	0.79 (0.67-0.90)	0.74 (0.66-0.80)

\*Other lesions stand for all lesions in the esophagus, stomach or duodenum except for gastric premalignant conditions or gastric adenocarcinoma. Only the most frequent reported are presented.

Legend: EQ-5D-5L: EuroQol EQ-5D-5L questionnaire; VAS scale: visual analogue scale of the EQ-5D-5L questionnaire; CI: confidence interval.

**Table II.** Utilities according to stages of the gastric carcinogenesis cascade in patients aged 50 or over, by gender

Scale	Age ≥ 50 years		p	Age ≥ 50 years		p
	EQ-5D-5L mean (95% CI)			VAS mean (95% CI)		
	Male	Female		Male	Female	
No gastric lesions	0.78 (0.76-0.81)	0.71 (0.67-0.75)	0.01	0.65 (0.63-0.68)	0.63 (0.60-0.66)	0.19
Gastric premalignant conditions	0.82 (0.79-0.85)	0.70 (0.66-0.74)	0.01	0.69 (0.66-0.73)	0.60 (0.57-0.63)	0.01
Gastric adenocarcinoma	0.78 (0.73-0.83)	0.72 (0.65-0.79)	0.15	0.62 (0.58-0.67)	0.59 (0.54-0.64)	0.33
Treated by:						
Mucosectomy	0.77 (0.50-1.00)	0.70 (0.33-1.00)	0.69	0.61 (0.48-0.73)	0.52 (0.42-0.62)	0.25
Surgery	0.79 (0.72-0.87)	0.71 (0.62-0.80)	0.18	0.63 (0.55-0.70)	0.58 (0.51-0.66)	0.42
Chemo/Radiotherapy	0.85 (0.79-0.91)	0.76 (0.60-0.92)	0.19	0.64 (0.55-0.72)	0.60 (0.50-0.70)	0.59
Present carcinoma	0.70 (0.42-0.97)	0.66 (0.49-0.83)	0.79	0.66 (0.48-0.84)	0.60 (0.50-0.71)	0.52

Legend: EQ-5D-5L: EuroQol EQ-5D-5L questionnaire; VAS: visual analogue scale of the EQ-5D-5L questionnaire; CI: confidence interval; \*: Student's *t*-test.

participate, endoscopy not performed, declined to complete questionnaire or incomplete data, 1,434 questionnaires out of 1,886 were completed correctly achieving a participation rate of 76%. The characteristics of patients with incomplete questionnaires were not possible to access because in most cases the main data missing were the clinical issues such as age, gender or diagnosis and not the fulfilling of the EQ-5D-5L questionnaire.

The main patient characteristics and results for the most relevant upper gastrointestinal diseases, including all stages of the gastric carcinogenesis cascade, are reported in Table I. Participants were 53% male with a mean age of 59 years. The examination was considered normal in only 24% of cases, and most relevant abnormalities detected were gastric premalignant conditions such as gastritis, atrophy or intestinal metaplasia and esophageal conditions such as hiatal hernia or esophagitis. There were no relevant differences between participating institutions in terms of patients' diseases, except for there being more cancer patients in the Oncology Centers, as expected (13.7% vs. 4.7%,  $p=0.01$ ).

In terms of the 5 dimensions of the EQ-5D-5L questionnaire, 75% to 93% of participants said they had no or only slight problems in all five dimensions with better score for self-care such as washing or dressing themselves and only 2.2% to 6.1% reported severe to extreme problems with worst score for usual activities such as work, study, housework, family or leisure. Anxiety was moderate to extreme in 21% of patients without relevant differences among groups (no lesions 21%, premalignant conditions 23%, gastric cancer 18%).

Although the numbers of included questionnaires vary and are related to a diverse prevalence of these diseases in the general population, VAS scores were consistently lower than the EQ-5D-5L utilities, regardless of organ or severity of disease, in all conditions analyzed.

Utilities for all stages of the gastric cancer cascade of carcinogenesis, with subgroup analysis by gender and including

only patients aged 50 or over are summarized in Table II. This subgroup analysis is justified by the fact that this is the population ( $\geq 50$  years) which is usually considered to be cost-effective to offer endoscopic screening or surveillance strategies [26]. No comparison between  $< 50$  and  $\geq 50$  years was made due to the huge differences between groups in terms of available questionnaires 371 vs. 1063 and gastric cancer cases 11 vs. 137.

Overall scores demonstrated that the two scales provided similar results for patients without gastric lesions or with gastric premalignant conditions with utilities lower for patients who had present gastric cancer than for patients without gastric lesions or those with premalignant conditions (0.68 versus  $\geq 0.77$ ,  $p=0.09$ ).

When adjusting for gender and including only patients aged 50 or above, the results consistently show that utilities were lower for women than for men. This dissimilar scoring for males and females achieves a statistically significant difference in some normal or premalignant conditions in both scales.

## DISCUSSION

This cross-sectional study of patients scheduled for an upper endoscopy procedure provided utilities and self-reported QoL data for a nationwide population with a validated questionnaire in a sample of patients embracing all stages of the carcinogenic cascade for gastric adenocarcinoma. These results, although specific to the studied population, might be relevant to further cost-utility studies in gastric cancer as a recent systematic review showed that utilities were relevant in several studies for the final results of the economic analysis, namely QoL in diseased patients and also after treatments for cancer [7, 8].

Utilities measured by the EQ-5D-5L questionnaire showed similar scores for patients without gastric lesions (0.78), patients with premalignant conditions (0.82) and patients with previously treated gastric cancer (0.77-0.79) but lower values

**Table III.** Comparison of the current study with published cost-utility studies on gastric cancer and respective references used for utilities valuation

Other studies (1st author, year, country)	Intervention	Utilities references	Utility values from references	Comment on references used
Present study	1. Values for the asymptomatic population 2. Normal is different from 1 3. Values for all gastric premalignant conditions (gastritis, atrophy, intestinal metaplasia and dysplasia) 4. Values for endoscopic treatment (mucosectomy) 5. Values for gastric cancer patients in 3 different stages of treatment (surgery, chemotherapy and/or radiotherapy and best supportive care) 6. Different evaluations for men and women			
Xie, 2008 [31] Xie, 2008 [32] Singapore	Screening (serology) and treat <i>H. pylori</i> or Screening (UBT) and treat <i>H. pylori</i>	Wang Q, et al. 2003 [38]	<i>H. pylori</i> non-infected 1.00 (0.95-1.00) <i>H. pylori</i> infected 0.90 (0.80-1.00) Gastric cancer 0.38 (0.13-0.65)	Normal is 1 No values for population No values for premalignant gastric conditions Just one value for gastric cancer
Xie, 2009 [33] Canada	Screening (Stool Ag) or Screening (serology) or Screening (UBT+)	Delaney BC, et al. 2008 [39] Ajani JA, et al. 2007 [40]	<i>H. pylori</i> uninfected 0.83 (0.80-0.86) <i>H. pylori</i> infected 0.83 (0.80-0.86) Gastric cancer 0.55 (0.47-0.63)	No values for population No values for premalignant gastric conditions Same value for uninfected and infected patients Just one value for gastric cancer
Yeh, 2009 [37] China	Screening (serology) and treat <i>H. pylori</i> or Universal treatment	Mathers CD, et al. 2000 [41] Gold MR, et al. 1998 [25]	Normal gastric mucosa 0.56-0.94 Gastritis 0.56-0.94 Atrophy 0.56-0.94 Intestinal metaplasia 0.56-0.94 Dysplasia 0.56-0.94 Symptomatic gastric cancer 0.49 (0.17-0.79)	No values for population Same value for all premalignant lesions Just one value for gastric cancer
Dan, 2006 [35] Singapore	Endoscopy every 2 years	Glimelius B, et al. 1995 [42] Blazeby JM, et al. 2004 [43]	Stages I and II (surgery) 0.65 Stage III (chemo radiotherapy) 0.4 Stage IV (palliative care) 0.5	No values for population No values for premalignant gastric conditions
Gupta, 2011 [30] USA	Endoscopy + Barrett's surveillance or Endoscopy	Inadomi JM, et al. 2003 [44] Rubenstein JH, et al. 2007 [45] Inadomi JM, et al. 2009 [46]	Cancer 0.5-0.75 Post-gastrectomy state 0.97 (0.8-1)	No values for population No values for premalignant gastric conditions Value for cancer as a whole
Zhou, 2011 [34] China	Serum pepsinogens + Endoscopy	World Health Organization QoL (WHOQOL)- BREF questionnaire [47]	Healthy residents 1.00 Gastric cancer patients 0.68-0.66	Normal is 1 No values for premalignant gastric conditions Just one value for gastric cancer
Dinis-Ribeiro, 2007 [29] Portugal	Yearly magnification chromoendoscopy + Serum Pepsinogens	Kaptein AA, et al. 2005 [48]	Death 0 Chemotherapy 0.1-0.3 Surgery 0.4-0.8 Mucosectomy 0.8-0.95	No values for population No values for premalignant gastric conditions
Yeh, 2010 [36] USA	Endoscopic surveillance every 1, 5 or 10 years	Hanmer J, et al. 2006 [49] Gold MR, et al. 1998 [25]	Age-related quality weight 0.78-0.93 Gastric cancer 0.49 (0.17-0.79)	No values for population No values for premalignant gastric conditions Just one value for gastric cancer

Legend: UBT: Urea Breath Test; Ag: Antigen.

for patients with present carcinoma (0.66) and for the same clinical situations the EQ-5D-5L scores were always lower for female than for male.

To the best of our knowledge this study is the first providing utilities for all stages of the gastric cancer cascade using a single health utilities measurement instrument. The study provides very useful information for authors conducting cost-utility analysis by incorporating utilities in their Markov models [8].

Our main conclusion and contribution to the actual medical practice is that the use of a single standardized instrument like EQ-5D-5L for all stages of disease is feasible, that it captures

differences among stages (no lesions vs. premalignant conditions vs. present cancer) and adjustments by gender are relevant when incorporating utilities in economic models.

A second relevant conclusion is that the utilities varied between different stages of disease in a much narrower set of values (around 0.6 for cancer vs. 0.8 for no cancer) than previously reported in other models (around 0.3 vs. 0.9 for the same groups), raising the concern that utilities valuation by using different questionnaires for different stages of disease, as has been done in other models, might overvalue real differences and overestimate the final economic conclusions among strategies.



Advantages of this study is that it includes patients on a nationwide basis, from general and teaching hospitals, and oncology centers, it covers more than 1400 reports, providing more than 100 patients in each subgroup (no lesions vs. premalignant lesions vs. gastric cancer) and utilities are linked to a medical diagnosis confirmed by a doctor after performing an endoscopy with biopsies when needed. In addition, by including a range of upper gastrointestinal diseases it means that utilities of the general population with the same background are comparable.

To prevent selection bias as possible, a variety of hospitals from all over the country were selected, participants were consecutive and unselected, no change in routine practice was necessary and the analysis of the results was blinded. Also, anxiety caused by endoscopy that could influence the results in terms of utilities was consistently similar among groups.

When comparing our study results to the study by Gold et al used for the sample size calculation, utilities values in other diseases returned similar results to ours: for esophageal problems 0.70 vs. 0.69 and for peptic ulcer 0.66 vs. 0.62. Also, in a study performed in our country using the same EQ-5D questionnaire in gastrointestinal patients (n=125), utilities for gastric cancer (n=5) ranged between 50 and 70, including our result of 0.62 [27].

The finding of different utilities between male and female is in accordance with a similar study in Portugal and also in other countries, confirming that this consistent result should be incorporated in cost-utility models [19, 28].

The relevance of the present study to the already available literature comes from the existence of several problems within the methodology of cost-utility studies published. We think these problems might have been overcome with the present study (see Table III) [25, 29-49]. Xie et al, Dan et al, Gupta et al, Zhou et al, Dinis-Ribeiro et al did not use values for the asymptomatic population; Xie et al and Zhou et al used 1 as the value for the normal population; only Yeh et al had values for premalignant gastric conditions; only Dinis-Ribeiro et al had values for the post mucosectomy stage; only Dan et al and Dinis-Ribeiro et al presented more than a single value for all gastric cancer patients, irrespective of the type of treatment performed and only two authors used a single reference to obtain the utilities for their models: the study by Wang Q et al that is in Chinese and not available to most clinicians, and the study by Dinis-Ribeiro et al that used a systematic review of studies embracing several different questionnaires on patients with diagnosed or treated gastric cancer. Finally, not a single model evaluated differently the male and female utilities.

We think that it is very important to use a single validated instrument for all stages of disease so that utilities among different stages are not overestimated by the use of different and not comparable questionnaires. Also, as suggested by the guidelines, utilities valuation should come from community preferences as ours did and not only from diseased patients [4].

The results of our study have implications on the interpretation of previous models on endoscopic surveillance of gastric premalignant conditions because the wider utilities' values used by others could result from using different questionnaires for different clinical situations, thereby

overestimating differences in utilities and the final model outcome between strategies.

This study has some limitations that need to be addressed: in one hospital the questionnaires were completed after performing upper endoscopy while in all the others this was done before the examination and, although it is expected that answers to items such as mobility, self-care, usual activities and pain or discomfort are not influenced by the examination, the item on anxiety might be influenced by whether the questionnaire was completed before or after the endoscopy. Also, in the absence of standard health values for the Portuguese population for the validated questionnaire used (EQ-5D-5L) we used values for the Spanish population. Although the populations are different and their valuation of QoL will be dissimilar, the closest possible proximity and geographic location should provide some degree of similarity.

## CONCLUSIONS

Our results confirm the applicability of using a single standardized instrument such as EQ-5D-5L for all stages of disease as it captures differences in utilities among stages and gender and wider differences among stages reported in previous models might result from the use of different instruments and overestimate real dissimilarities. These conclusions may be relevant to further cost-utility analysis in gastric cancer and should be incorporated by authors in their models.

**Conflicts of interest:** No conflicts to declare for all authors.

**Authors' contribution:** M.A., F. R.G. and M.D-R. planned and conducted the study, interpreted data and drafted the manuscript. All the authors included patients, provided a critical revision of the manuscript and approved the final manuscript version.

**Acknowledgements:** The authors would like to thank Jean Burrows and Ana Cláudia Jorge for the linguistic revision of the manuscript and many nurses and administrative staff for their participation, namely: Conceição Craveiro, Cristina França, Ana Cristina Ferreira, Marina Pedrosa, Filipe Santos, Sara Baptista, Mónica Moreira, Anabela Oliveira, Paula Paixão, Cidália Soares, Rui Caturrinho, Anabela Parente, Florbela Pinto, Sandra Aires, Celeste Peixoto, Paulo Sousa, Joaquim Correia, Patrícia Nicolau, Cláudia Cavaco, Eunice Sequeira, Suzana Carreira, Eulália Cunha, Sara Antunes, Teresa José, Suzel Grade, Alexandra Luís.

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