Responsiveness and minimal clinically important difference of the EQ-5D-5L in cervical intraepithelial neoplasia: a longitudinal study

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Abstract

Background: With the application of the EQ-5D-5L in clinic, whether the questionnaire scores can responsive to changes in patients' health and how much changes in questionnaire scores represents the real health change are gradually concerned. So the aims of the study were to assess the responsiveness and estimate MCID of the EQ-5D-5L in surgically treated CIN patients, and to analyze the relationship between MCID and MDC.

Methods: This is a longitudinal observational study. Participants were CIN patients from the gynecology inpatient department of a Grade-A Tertiary Hospital in Shihezi, Xinjiang, China, which completed the EQ-5D-5L and the GRCQ at baseline and 1 month after the surgery. Wilcoxon signed-rank test was used to compare scores of the EQ-5D-5L before and after treatment. We calculated ES and SRM to assess the responsiveness quantitatively. Distribution-based, anchor-based and instrument-defined methods were used to estimate MCID. And ratios of MCID to MDC at individual and group levels were calculated.

Results: 50 CIN patients completed follow-up investigate with mean (SD): age 44.76 (8.72) years; follow-up time 32.28 (1.43) days. The UI and EQ VAS of the EQ-5D-5L improved by 0.025 and 6.92 (all $p < 0.05$) at follow-up compared baseline, respectively. ES and SRM of UI were 0.47 and 0.42, indicating small responsiveness, while ES and SRM of EQ VAS were 0.50 and 0.49, indicating small to medium responsiveness. The average (range) of MCIDs for UI and EQ VAS were 0.039 (0.023, 0.064) and 5.35 (3.12, 6.99), which can only be used for determing whether patients have experienced clinically meaningful improvement in health at group level.

Conclusion: The EQ-5D-5L has only small responsiveness in patients with CIN after surgery, and MCIDs developed in this study can be used for health assessment at group level. Further study is needed on MCID that can be used at individual level.

Keywords Responsiveness; MCID; EQ-5D-5L; CIN; MDC

Introduction

Cervical intraepithelial neoplasia (CIN) is a general term for cervical precancerous lesions, including low-grade squamous intraepithelial lesion (LSIL), and high-grade squamous intraepithelial lesion (HSIL) [1]. Studies have shown that the diagnosis of CIN would have a negative effect on patients' psychology [2, 3], and HSIL has 31.3% probability of progressing to invasive cervical cancer in natural state [4], which seriously endangers patients' health. The good news is that surgical treatment is a definitive treatment for CIN, and the cure rate is very high [5], so it as an effective measure to prevent the occurrence of invasive cervical cancer. Along with health-related quality of life (HRQoL) is increasing being concerned, patient-reported outcomes (PROs) are clinical endpoints other than survival, such as the EuroQol five-dimensional questionnaire (EQ-5D) [6].

The EQ-5D is a simple, generic and standardised instrument for HRQoL measurement [7]. A 5-digit code describing the health state obtained by EQ-5D descriptive system can be converted into an utility index (UI) through value set, which can be used to calculate quality-adjusted life-years (QALYs) and then used

for cost-utility analysis (CUA), and EQ-5D is the instrument that the National Institute for Health and Clinical Excellence (NICE) recommends for health economic evaluation [8–10]. The EQ-5D also includes a visual analogue scale (EQ VAS) for assessing overall current health [8]. There are two versions of the EQ-5D, of which three-level version of the EQ-5D (EQ-5D-3L) was launched in 1990 [7], but due to its obvious ceiling effect and insufficient capture of small changes [11–13], five-level version (EQ-5D-5L) was developed in 2011 [14]. Recently, the Chinese version of the EQ-5D-5L has been released, and the value set based on the preference of the Chinese population has been established [15].

In previous studies, clinical efficacy was generally judged on the basis of statistical differences in PROs, but it did not indicate whether they were clinically significant [16]. Mininal clinically important diference (MCID) is the smallest difference in score in the domain of interest which patients perceive as beneficial and which would mandate, in the absence of troublesome side effects and excessive cost, a change in the patient's management [17], which was proposed by Jaeschke et al. to solve the explanatory problem of questionnaire scores, and which helps clinicians explaining change in health through score change of the questionnaire [18]. Logically, MCID should be distinguished from the measurement error and therefore associated with the minimum detectable change (MDC). MDC represents the minimum change in the questionnaire scores required for truely health changes and is mathematically related to measurement error [19]. Moreover, MCID and MDC are related to the responsiveness, the former is clinically oriented and focuses on the individual level [20], while the latter is based on population. To our knowledge, there have been no study using EQ-5D-5L to estimate responsiveness and MCID in surgically treated CIN patients, and to analyze the relationship between MCID and MDC.

The purposes of this study were 1) to evaluate the responsiveness of the EQ-5D-5L in CIN patients underwent surgery; 2) to estimate MCID of the EQ-5D-5L; 3) to analyze the MCID and MDC relationship.

Methods

Participants and investigate process

This is a longitudinal observational study. Participants were recruited from the gynecology inpatient department of a Grade-A tertiary hospital in Shihezi, Xinjiang, China between November 2018 and August 2019. Inclusion criteria of the study were: 1) a professional gynecologist combined positive cervical tissue biopsy result diagnosis of CIN as the primary diagnosis of admission for the first time; 2) age≥18 years; 3) Han nationality; 4) untreated before baseline investigate; 5) can express inner feelings clearly; 6) no severe comorbidities or mental illness or cognitive impairment; 7) willing to participate in this study. Exclusion criteria were the following: 1) no CIN-related surgical treatment during hospitalization; 2) pathological diagnosis on discharge was invasive cervical cancer.

The baseline investigation was conducted through a face-to-face interview with patients when they were admission, and the follow-up visit was performed 1 month after the surgery by telephone. The same investigator was responsible for two time points survey of each patient. Investigators were postgraduate with medical background and had been trained uniformly.

Measurement

Demographic and medical characteristics

Age, marital status, education level, body mass index (BMI), medical insurance, and household income were obtained through face-to-face interviews with patients. The disease duration, histopathological results, and surgical approach were collected by the electronic medical records.

EQ-5D-5L and Global Rating of Change Questionnaire (GRCQ)

The EQ-5D-5L consists of short descriptive system and EQ VAS. The descriptive system comprises five dimensions, each describing a different aspect of health: mobility, self-care, usual activities, pain/discomfort, anxiety/depression. Each dimension has five response levels of severity: no problems, slight problems, moderate problems, severe problems, unable to/extreme problems [8]. After responding to each dimension, a 5-digit code can be summarised to describe the health state, and which can be converted into a single number- UI through value set for China, the value is rang from -0.391 to 1.000, represent “the worst health state” and “the best health state” respectively [8, 15]. EQ VAS is a vertical scale for quantity the overall health, 0 and 100 are located at two ends of the scale, labelling “The worst health you can imagine” and “The best health you can imagine” [8]. The higher the UI and EQ VAS, the better the health.

The GRCQ is an external anchor for determining the MCID of questionnaire scores, which contains only one question [17]. The question is “How does your overall health change after treatment?”. Transition ratings of answer is based on the 5-point Likert scale: “Much better”, “A little better”, “About the same”, “A little worse”, “Much worse”.

Statistical analysis

Characteristics of patients were described by mean (SD) and N (%). Comparison of baseline and follow-up scores of the EQ-5D-5L using Wilcoxon signed-rank test. Effect size (ES) and standardized response mean (SRM) were used to evaluate the responsiveness, and which classified according to cohen's d standard [21]: <0.2, no responsiveness; 0.2 to 0.49, small; 0.5 to 0.79, moderate; ≥0.8, large .

MCID is estimated using distribution-based, anchor-based and instrument-defined methods. In the distribution-based method, 0.5SD and 1 standard error of measurement (SEM) for MCID calculation, where [16]. Based on previous study, the test-retest reliability was equal to 0.82 [22]. The anchor-based method used the GRCQ as an external anchor, and regarded the transition rating corresponding to “a little” changes as the MCID. Since no patient responded to the anchor question as “worse” in this study, MCID estimate was performed only for transition rating was “better”. Therefore, the MCID defined as the difference of the mean change scores of the EQ-5D-5L between transition rating of GRCQ that were “A little better” and “About the same” [23, 24].

Instrument-defined method is based on the average of UI differences in the descriptive system of the EQ-5D-5L between the baseline health state and single-level transitions to other health states [25]. MCID estimates can be classified into three categories according to the direction of single-level transitions of baseline health states: only transitions to a better state, only transitions to a worse state, all single-level transitions [25], and this study only for the first category. If the baseline health state was “11111”, we excluded it from the MCID estimate because it could no longer be improved [25]. In addition, the maximum-valued scoring parameter in Chinese value set, the conversion parameter between “moderate problems” and “severe problems”, was excluded from MCID estimation based on the instrument-defined method. The reason is that the conversion parameter among these two levels exceed other adjacent levels at least 1.39 times in all five dimensions, which has the risk of overestimating MCID [26]. The calculation method of MCID based on instrument-defined method was detailed in other published studies [26, 27].

At the 95% confidence level, MDC = SEM x $\sqrt{2}$ x 1.96, $MDC_{95\%(ind)}$, this means that the smallest detectable change of scores that beyond measurement error, at individual level [28]. According to the methodology of De Boer et al., the MDC in a group of people, $MDC_{95\%(group)}$, is equal to $MDC_{95\%(ind)}$ divided by $\sqrt{n}$, Where n is the sample size [29]. Ratios of MCID to $MDC_{95\%(ind)}$ and $MDC_{95\%(group)}$ were calculated to illustrate the relationship between MCID and MDC [29]. If the ratio is greater than 1, the MCID can be distinguished from the measurement error and used for determing the health changes at individual or group level [29].

SPSS (version 24.0) and RStudio were used for statistical analysis, and 0.05 was considered as the significant level.

Results

A total of 110 patients were invited to participate in the study, of which 68 met the inclusion criteria and accomplished the baseline investigation. 50 (73.53%) completed the follow-up visit on average (SD) 32.28 (1.43) days after surgery. The reasons for non-completion were: n=1: no CIN-related surgical treatment during hospitalization; n=9: discharged diagnosis of cervical invasive cancer; n=5: not contacted; n=3: rejected (Fig.1). The average (SD) age and disease duration of patients who completed the follow-up survey was 44.76 (8.72) years and 0.66 (0.92) months. The majority of patients were married (92%), with a junior school and above education level (88%), BMI was in normal range (52%), had medical insurance (98%), but only 4% patients had moderate household income. 94% patients were HSIL, of which carcinoma in situ accounts for 23.40%, and cervical cone resection was the main surgical approach (98%) (Table 1).

Responsiveness of the EQ-5D-5L

Table 2 showed scores of each dimension in the descriptive system. The result demonstrated that scores of self-care and usual activities did not change before and after treatment, while scores of mobility, pain/discomfort, anxiety/depression decreased by 0.003 (p=0.317), 0.004 (p=0.405), 0.018 (p=0.010) , which indicatd an improvement of these dimensions at follow-up point.

Among the analysis of all patients, UI and EQ VAS increased by 0.025 and 6.92 (all p<0.05) after treatment. ES and SRM of UI were 0.47 and 0.42, indicating small responsiveness, and ES and SRM of EQ VAS were 0.50 and 0.49, which could be considered as small to moderate responsiveness. In patients who responded to GRCQ transition rating as “improvement” (including “A little better” and “Much better”), the UI change was positive (△UI=0.039, p=0.004), it means that ameliorate of HRQoL. And ES and SRM were 0.59 and 0.67, suggesting moderate effect size. EQ VAS presented similar results to UI. At follow-up, EQ VAS exceeded baseline 9.27 (p=0.001) on average, and had moderate responsiveness (ES=0.70, SRM=0.71). As for patients with “About the same”, the change in UI and EQ VAS were 0.010 and 4.37, but all of which were not statistically difference (all p>0.05), and both were small even no responsiveness (UI: ES=0.29, SRM=0.17; EQ VAS: ES=0.29, SRM=0.30). The detailes were seen in Table 3.

Estimation of MCID and MDC

Table 4 displays MCIDs estimated by three methods. The MCID range of UI obtained by the distribution-based method was 0.023 to 0.027, and the MCID range of EQ VAS was 5.93 to 6.99. The result of MCID estimated by the anchor-based method was that UI=0.041 and EQ VAS=3.12. The MCID of UI based on instrument-defined method was 0.064. Fig.2 and Fig.3 show the scatter plot of score change of EQ-5D-5L in accordance with transition rating of GRCQ. As shown, there were 26 (52.00%) patients had a transition rating was “improvement”, of whom △UI of 14 patients and △EQ VAS of 16 patients were not less than MCID, accounting for 53.85% and 61.54% respectively.

The horizontal solid line represents the MCID of UI obtained by the anchor-based method

The horizontal solid line represents the MCID of EQ VAS obtained by the anchor-based method

UI and EQ VAS have $MDC_{95\%\ (ind)}$ of 0.064 and 16.44 and $MDC_{95\%\ (group)}$ of 0.009 and 2.32 (data not shown). Table 5 shows ratios of MCID to $MDC_{95\%(ind)}$ and $MDC_{95\%(group)}$. The result pointed that ratios of MCID to $MDC_{95\%(ind)}$ of UI and EQ VAS were all less than 1. This illustrated that MCID cannot discriminate the score change of the EQ-5D-5L from measurement error at individual level. Nevertheless, ratios of MCID to $MDC_{95\%(group)}$ for UI and EQ VAS were greater than 1, symbolizing that we have 95% of the confidence believing that 50 patients in this study have experienced the smallest significant improvement.

Discussion

The longitudinal study of patients with CIN has shown that the EQ-5D-5L was responsive to change in health after surgery, but the effect size was small. And the enhance of UI and EQ VAS after treatment were

at least 0.039 and 5.35 which can be considered an improvement in health from patients' perspective. However, the MCID estimated in this study can only represent truly meaningful change of HRQoL score at group level instead of at individual level.

As results shown, the anxiety/depression dimension was the one with the most improvement in scores after surgery, and the only one with statistically significant of score change. This is similar to the results of longitudinal HRQoL assessment of CIN patients by Xie et al. 1 month after treatment, the average improvement in mental component summary scores (MCS) measured by SF-36 qustionnaire was higher than that of physical component summary scores (PCS) (△MCS:7.05 vs. △PCS:1.47) [30]. A possible explanation is that, in general, CIN does not produce symptoms or signs that affect patients' ability to perform, whereas the CIN diagnosis has a negative psychological impact [2, 3]. Howbeit, the psychological support of doctors, examples of good prognosis of patients after treatment, and increased patient awareness of disease may ameliorate psychological.

In all patients, the positive changes in UI and EQ VAS were also found in other studies. A prospective study in Chinese CIN patients conducted by Zhao et al. expressed that the EQ-5D scores of 1 month after treatment was significantly better than the baseline [31]. Therefore, we considered that changes in health of CIN patients caused by surgical treatment can be qualitatively judged by the score change of the EQ-5D-5L. Interestingly, the UI and EQ VAS of patients whose response to GRCQ were "improvement" increasing by 0.039 and 9.27, and were statistically significant. Different result was presented in patients of "About the same", UI and EQ VAS raised 0.010 and 4.37, but not significant. Bilbao et al. found that the mean change of the EQ-5D-5L score was positive in "improved" hip or knee osteoarthritis patients who underwent surgery [32]. It can be seen that the judgment result of health change from the patient's point of view through GRCQ was consistent with score change of the EQ-5D-5L, a multi-dimensional and multi-attribute questionnaire, even if the GRCQ has only one question. Thence GRCQ is a simple and credible choice for determining whether or not the health change when multiple items questionnaire cannot be used.

In this study, two of the most commonly used indicators of responsiveness, ES and SRM, were used to estimate the degree of change in patient health [33–35]. The result denoted that the effect size of the EQ-5D-5L in the total sample was only between small and moderate. Similar results have appeared in previous studies. Chen et al. assessed the responsiveness of the EQ-5D-5L in 65 Taiwanese patients with stroke underwent rehabilitation, and the effect size ranged from 0.40 to 0.63 for UI and 0.30 to 0.34 for EQ VAS, which suggested small to moderate responsiveness [36]. Furthermore, the effect size of UI was only 0.20 in patients with cataract surgery [37]. Another study in the obese patients showed that UI and EQ VAS had only small responsiveness to bariatric surgery [38]. These findings suggest that the EQ-5D-5L is responsive to various disease conditions, which can explain that changes in health were clinically relevant, rather than random errors, but small responsiveness was noteworthiness. The reason may be that the study population with chronic diseases. The loss of health in patients with chronic disease is a slow and long-term process compared to that patients with acute disease and recovery rapidly, their

perception of changes in health may not be as strong as in acute illness, so the small responsiveness they have.

Some researchers believe that the responsiveness may depend on the direction of changes in health states and the health states at baseline [39], and this theory was supported by the results of this study. When we evaluated the responsiveness in different change directions of health states, we found that the moderate responsiveness of UI and EQ VAS in patients with improved health states, while low or no responsiveness was found in patients with no change. In addition, the baseline scores of UI and EQ VAS in “improvement” surgical patients were lower than those with “About the same”, while score change was higher than latter. Statistically, the responsiveness of patients with improved health states must be better than that of “About the same” patients.

Responsiveness of the EQ-5D-5L in patients with improved health states was also studied in other populations, but results were inconsistent. In acute asthmatics patients who underwent 1 month of treatment and self-reported improvement in health states, the UI had moderate to large responsiveness with effct size of 0.63 to 0.95 [40]. Golicki et al. revealed that the EQ-5D-5L was consistently responsive in stroke patients with improved health 4 months after treatment, which UI showing moderate ES (0.51–0.71) and moderate to large SRM (0.69–0.86), and EQ VAS range from 0.51 to 0.65 for ES and 0.59 to 0.69 for SRM [41]. Another study in patients with osteoarthritis 6 months after surgery showed that patients with improved health states had 1.48 of ES and SRM in UI, 0.82 of ES and 0.90 of SRM in EQ VAS [32]. Through the above, we found that although the responsiveness of “improvement” patients was good, at least moderate, the effect size of each study was quite different. The source of the difference may be different characteristics of subjects or different time intervals for two measurements [36]. Because longer time intervals allows sufficient time to respond to the physical condition, this is reflected in larger score change, resulting in larger effect size to reflect the degree of change in health upon full recovery, and vice versa [22].

MCID, as a clinically significant score change threshold of questionnaire, has become a key issue in questionnaire application. There is still no consensus on best method for estimating MCID [42], but the distribution-based and anchor-based methods are commonly used [43, 44]. As known, the anchor-based method can provide professional explanation of clinical significance for MCID, while the distribution-based method estimates MCID based on the sample variation and the precision index of the instrument, which makes the estimation greatly affected by the measurement characteristics of instrument itself and the sample size, so that the former is preferred, and the latter is used as a supported method [39, 45]. Previous studies taken the mean change of scores as MCID of the anchor-based method [46, 47], but it does not take into account the possible impact of the HRQoL score over time on MCID in patients who reported no change of health during follow-up [24]. However, the absolute value of score change of the person with “A little better” minus the score change of the person with “About the same” was used as the MCID in this study, eliminating the potential impact of the time on the MCID estimation.

Besides the distribution-based and anchor-based methods, the instrument-defined method also used to triangulate the MCID. The instrument-defined method is only relevant to preference-based measurements, such as the EQ-5D-5L, and the MCID estimation is completed on the basis of the simulated transition of health states [27]. The greatest advantage of this approach is that a single-level transition of each baseline health states can act as a reference point or standard for minimally important change, resulting in MCID based on multiple internal anchors [27]. Luo et al. used the instrument-defined method to estimate the MCID for the EQ-5D-3L, and the result was parallel to the published estimate, so the instrument-defined method was regarded as an effective method for MCID estimation [27]. As shown in our results, the MCID obtained by the instrument-defined method differs from the anchor-based method by 0.023, and the difference between the distribution-based method and the anchor-based method was 0.014 to 0.018. So we deem that the instrument-defined method can be used for the MCID estimation of the EQ-5D-5L in CIN patients.

The result of the study on the relationship between MCID and MDC demonstrated that the MCID estimated for UI and EQ VAS by the three methods can at group level explain that score change was owing to change in health rather than measurement error. However, MCID of UI and EQ VAS both can not account for the health change of individual at 95% confidence level, possibly due to the inclusion of patients with different histopathological. In this study, the proportion of patients with carcinoma in situ was 22.00%, although it belongs to CIN [1], compared with other pathological grades, it was at higher risk of progression to invasive cancer [48], and patients had lower psychological expectation of changes in health, so the different criteria for patients to judge health change may cause this result. Another possible explanation may be that, although patients included were all first diagnosed, the HRQoL scores at baseline of some patients with disease duration of more than 0 may be improved compared to those at the beginning of the diagnosis, resulting in the baseline score of the entire sample being raise. Therefore, the possibility of underestimating MCID in this study leads to its being less than $MDC_{95\%(ind)}$. The result of the study could be further validated in patients with the same pathological grade and the same disease duration.

This study has some advantages. Firstly, using combination of qualitative and quantitative approaches to assess responsiveness increases the credibility of the results. Secondly, in addition to the distribution-based and anchor-based methods, using of the instrument-defined method for MCID estimation would helpful for obtaining reasonable result. Next, we analyzed whether the MCID estimated by each method can reflect the true health change in patients with individual and group levels to determine the reliability of MCID and avoid the wrong application and interpretation of MCID. Although judging whether the MCID is different from the measurement error is considered a logical next step after MCID estimation [29], only a few studies have been performed [49, 50]. Finally, there were no measurement biase from investigator because of two time points survey for each patient were performed by the same investigator.

There are also several limitations. The disease-specific questionnaire was commonly used anchor besides the GRCQ in previous studies [23, 51]. This study did not simultaneously perform the measurement of the disease-specific questionnire, FACIT-CD, of CIN, since there is no chinese version so

far [52]. Although GRCQ has only one question, it is the accepted anchor for MCID estimation at this stage [16]. Studies have shown that if health state changes in different directions, the MCID may also be different [53], whereas because there were no patients who responsed to GRCQ with “worsen” in this study, MCID could not be estimated for this group of patients. Future studies could develop MCID for CIN patients with worsen health states to determine whether it is differ from patients with improvement. It is well known that MCID changes on account of demographic characteristics, interventions and so on [44, 54], so the results of the study cannot be generalized to other clinical settings. Furthermore, small sample size may affect the accuracy of MCID, though it has met the basic requirements for MCID estimation [55].

Conclusion

The EQ-5D-5L was responsive to surgically treated CIN patients but presents small to moderate effect size. The result of the first MCID estimation of UI and EQ VAS in CIN patients by various methods was that UI and EQ VAS were about 0.039, 5.35. The analysis of the relationship between MCID and MDC revealed that the MCID developed for UI and EQ VAS can only determine whether the patient has actually experienced meaningful health change at group level. Further study is needed to develop the MCID that can be used for health states judgment at individual level.

Declarations

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (Medical Ethics Committee of the First Affiliated Hospital of Shihezi University School of Medicine, 2013-028-01) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

XH involved in the study design, data analysis and interpretation and was the main contributor to manuscript writing. MXJ involved in the study design, data collection and revised the manuscript. MZ participated in the study design and data collection. PY and XLY participated in the data collection and interpreted the results . All authors read and approved the final manuscript.

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Abbreviations

CIN: Cervical intraepithelial neoplasia; LSIL: low-grade squamous intraepithelial lesion; HSIL: high-grade squamous intraepithelial lesion; HRQoL: health-related quality of life; PROs: patient-reported outcomes; EQ-5D: EuroQol five-dimensional questionnaire; UI: utility index; QALYs: quality-adjusted life-years; CUA: cost-utility analysis; NICE: the National Institute for Health and Clinical Excellence; EQ VAS: visual analogue scale; EQ-5D-3L: three-level version of the EQ-5D; EQ-5D-5L: five-level version of the EQ-5D; MCID: Mininal clinically important diference; MDC: minimum detectable change; BMI: body mass index; GRCQ: Global Rating of Change Questionnaire; ES: Effect size; SRM: standardized response mean; SEM: standard error of measurement; MCS: mental component summary scores; PCS: physical component summary scores

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Tables

Table 1 Demographic and medical characteristics of CIN patients

Characteristics	N	%
Age, years (mean ± SD)	44.76 ± 8.72	
Marital status		
Married	46	92.00
Other	4	8.00
Education level		
Primary school and below	6	12.00
Junior school	18	36.00
Senior school	9	18.00
University and above	17	34.00
BMI, kg/m^2		
<18.5	2	4.00
18.5-24	26	52.00
24-28	16	32.00
≥28	6	12.00
Medical insurance		
Yes	49	98.00
No	1	2.00
Household income, yuan		
≤30,000	5	10.00
30,000-80,000	23	46.00
80,000-150,000	20	40.00
>150,000	2	4.00
Disease duration, month (mean ± SD)	0.66 ± 0.92	
Histopathological		
CIN1	3	6.00
CIN2	14	28.00
CIN3	22	44.00
Carcinoma in situ	11	22.00
Surgical approach		
Cervical cone resection	49	98.00
Total hysterectomy	1	2.00

Table 2 Comparison of scores before and after treatment in each dimension of descriptive system

Dimensions	Baseline	Follow-up	Difference	*p* value
Mobility	0.003 ± 0.022	0.000 ± 0.000	-0.003 ± 0.022	0.317
Self-care	0.000 ± 0.000	0.000 ± 0.000	0.000 ± 0.000	1.000
Usual activities	0.000 ± 0.000	0.000 ± 0.000	0.000 ± 0.000	1.000
Pain/discomfort	0.010 ± 0.027	0.006 ± 0.018	-0.004 ± 0.032	0.405
Anxiety/depression	0.027 ± 0.039	0.010 ± 0.027	-0.018 ± 0.046	0.010

Table 3 Responsive to GRCQ of the EQ-5D-5L at 1 month and comparison of scores before and after treament

Variables	UI			EQ VAS		
	All	Improvement	About the same	All	Improvement	About the same
Baseline score	0.960 ± 0.053	0.953 ± 0.066	0.967 ± 0.035	83.80 ± 13.98	83.65 ± 13.16	83.96 ± 15.11
Follow-up score	0.985 ± 0.034	0.992 ± 0.020	0.977 ± 0.044	90.72 ± 8.70	92.92 ± 7.39	88.33 ± 9.52
Score change	0.025 ± 0.060	0.039 ± 0.058	0.010 ± 0.059	6.92 ± 14.01	9.27 ± 13.13	4.37 ± 14.77
p value	0.034	0.004	0.774	0.001	0.001	0.150
ES	0.47	0.59	0.29	0.50	0.70	0.29
SRM	0.42	0.67	0.17	0.49	0.71	0.30

Table 4 Estimation results of MCIDs of the EQ-5D-5L through three methods

Variables	Distribution-based method		Anchor-based method	Instrument-defined method
	0.5SD	1SEM		
UI	0.027	0.023	0.041	0.064
EQ VAS	6.99	5.93	3.12	na

na: not applicable

Table 5 The ratios of MCID to MDC at individual and group level

Variables	UI				EQ VAS		
	0.5SD	1SEM	Anchor-based method	Instrument-defined method	0.5SD	1SEM	Anchor-based method
$Ratio_{(ind)}$	0.42	0.36	0.64	1	0.43	0.36	0.19
$Ratio_{(group)}$	3	2.56	4.56	7.11	3.01	2.55	1.34

Figures

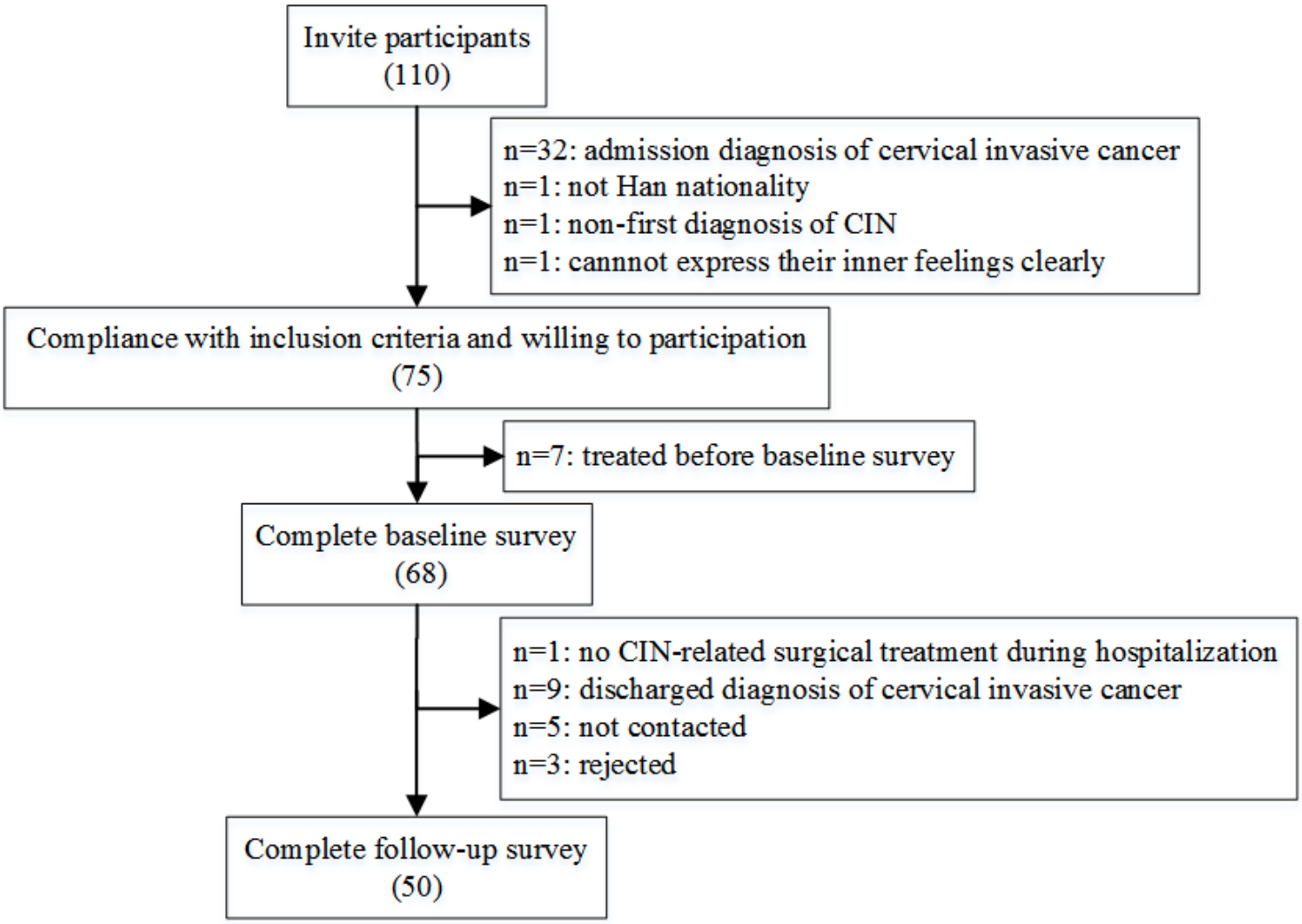

Figure 1

Flow chart of participants recruitment and follow-up

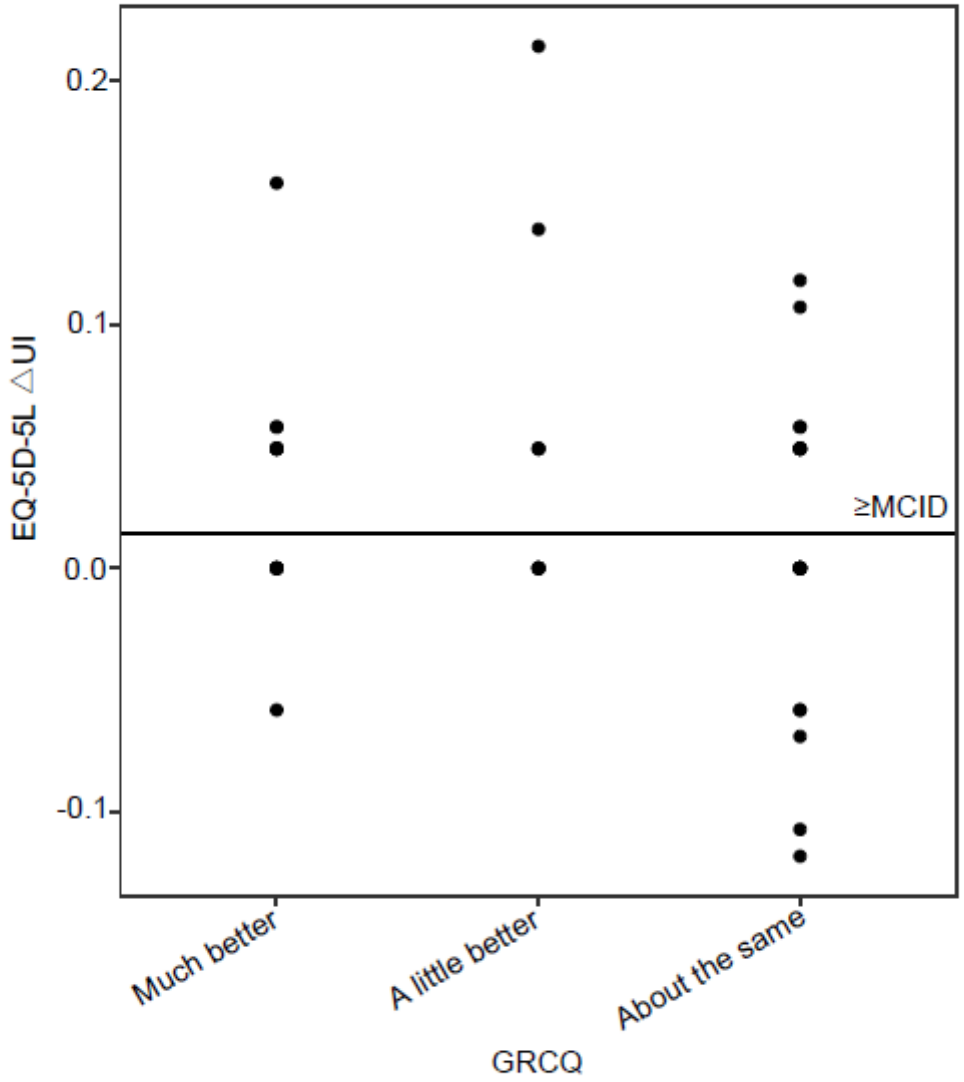

Figure 2

Scatter plot of changes in UI and GRCQ transition ratings

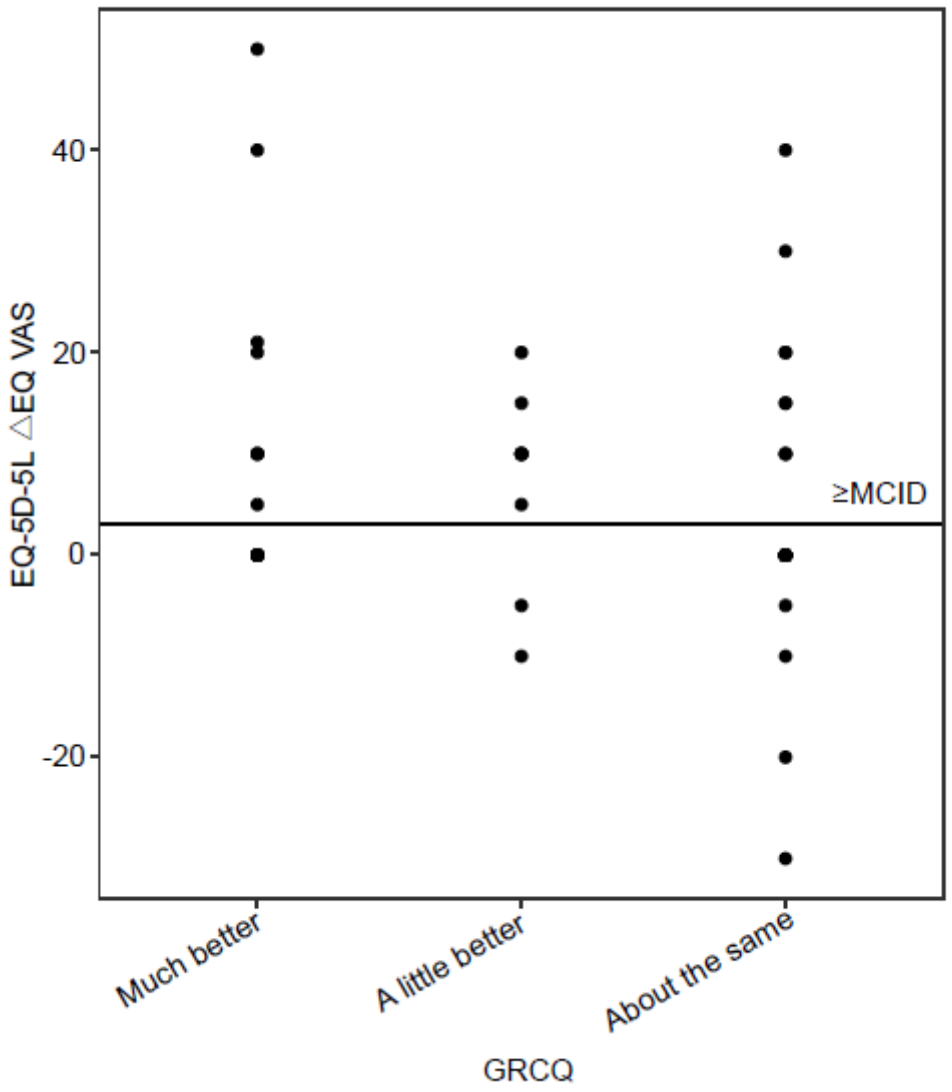

Figure 3

Scatter plot of changes in EQ VAS and GRCQ transition ratings