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PREFERENCE-BASED ASSESSMENT

Patient Utility Measurement for Managing Ureteral Stones: A Modified Standard Gamble Approach

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A B S T R A C T

Objectives: To measure the utility of patients with ureteral stones under various medical regimes and to identify significant factors affecting utility for various health states. **Methods:** A cross-sectional survey was conducted to measure the utility of 89 patients on each health state related to the clinical management of ureteral stones. Health states with respect to intervention and treatment modalities were classified into the acute phase (including medication, extracorporeal shock wave lithotripsy, ureterorenoscopic lithotripsy, and surgery) and the chronic phase (no specific intervention, lifestyle modification, maintenance with surveillance, and continued medication). Utility was measured by using the modified standard gamble. Demographic data and relevant history of treatment modalities and interventions for ureteral stones were collected by using a questionnaire. **Results:** Utility scores of health states in the acute phase (ranging from 0.914 [surgery] to 0.967 [extracorporeal shock wave lithotripsy]) were lower than those in the chronic phase (ranging from 0.955 [maintenance with surveillance] to 0.974 [lifestyle modification]). Utility for surgery was lower than for nonsurgical methods. Utilities for the two lithotripsy modalities were close to that for medication. The utility figures for health states in the chronic phase were the highest for lifestyle modification, but the differences across health states were trivial. Sex, history of ureterorenoscopic lithotripsy, education level, and employment were significant covariates in the final multiple linear regression model. **Conclusions:** A modified standard gamble chained method was applied to measure the utility for health states in relation to the clinical management of ureteral stones. Patients preferred nonsurgical treatment over surgical treatment and hemodialysis regardless of health states. We also found that sex, a history of ureterorenoscopic lithotripsy, education level, and employment affected utility for health states related to clinical management. Our findings provide an insight into patient preference for the choice of treatment of ureteral stones.

Keywords: extracorporeal shock wave lithotripsy, standard gamble approach, ureteral stones, ureterorenoscopic lithotripsy, utility.

Introduction

Clinical management of ureteral stone, an illness with a high likelihood of recurrence [1], was dominated by surgery before the advent of extracorporeal shock wave lithotripsy (ESWL) and ureterorenoscopic lithotripsy (URSL), which have been adopted as primary treatment modalities for removing ureteral stones [2]. These two treatments together with the high recurrence rate of ureteral stones leave patients in a dilemma regarding whether to undergo these treatments, particularly for prophylactic purposes for treating small silent renal stones. Although patient utility plays a crucial role in selecting the treatment plan for ureteral stones, few studies have been conducted to address this issue. To the best of our knowledge, only one pervious study measured patient utility in the treatment of upper urinary tract calculi [3]. However, several concerns have been raised in this study. The classification for health states corresponding to each utility measurement is too broad to reflect the complex of heath states involved in state-of-the-art clinical scenario of treating ureteral stones. Factors affecting patient preference have not been fully investigated. Because the patient preference may vary with time, place, and ethnic group, it is worthwhile to measure patient preference over the choice of treatment modality with refined classifications to adapt the updated treatment modalities and preventive strategies of ureteral stone and identify its associated factors.

Among three common direct eliciting methods—standard gamble [SG], time trade-off method, and visual analogue scale—for measuring the utility [4–12], each has strength and weakness in the aspects of practicality, reliability, and validity [4–14]. We prefer choice-based techniques (SG and time trade-off) to choice-less methods such as visual analogue scale [8,15]. Of the two choice-based methods, although the impact of three bias (probability weighting, loss aversion, and scale comparability) on utility curva-

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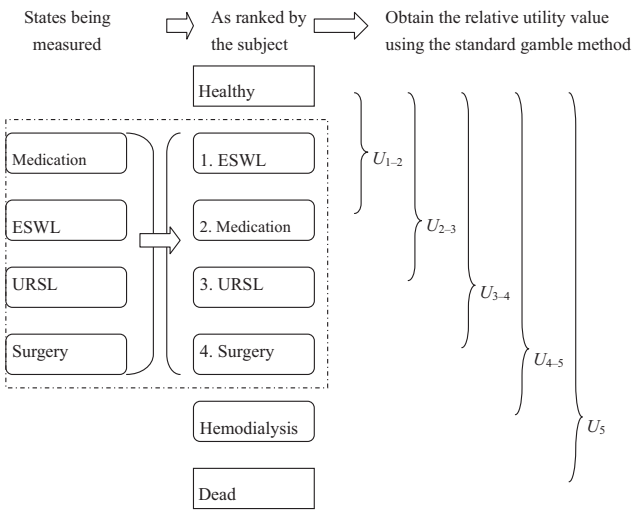

Fig. 1 – Flowchart for ranking and measuring the relative utility between reference states. ESWL, extracorporeal shock wave lithotripsy; URSL, ureterorenoscopic lithotripsy.

ture has pros and cons between the two methods [13,15,16], we selected the SG method as our method for measuring utility partly because it is not only tailored for the reflection of decision making under uncertainty of clinical management of ureteral stone in the light of the axiom of expected utility theory [17] but also dispenses with the assumption of linear utility for duration used in the time trade-off method that is a riskless property [13,15].

Therefore, this study applied the modified SG approach to measure the utility of patients with ureteral stones under various medical treatment regimes. Significant factors affecting the utility of different health states included in the management were also identified to estimate patient utility.

Methods

Study subjects

A cross-sectional survey was conducted in 267 patients aged 20 to 65 years from the Department of Urology of Min-Sheng General Hospital, Tayouan, Taiwan, who sought medical treatment for different types of ureteral stones between March and May 2007. Of the 267, 118 were outpatients who did not require further therapy, 96 were being treated with ESWL, and 53 were being treated with URSL. Fifty-two patients were randomly selected to represent 118 outpatients. All patients treated with ESWL or URSL were enrolled. Finally, a total of 201 outpatients were invited to attend this study. We used a questionnaire to collect demographic data, including age, sex, education level, employment, and history of ureteral stone treatment. The medical terms, particularly for surgical treatment, contained in the scenario were explained to patients with explicit Chinese language by the interviewer.

Health state of patients with ureteral stones

Utility measured in our study was for patients undergoing different treatments for acute and chronic ureteral stones. Treatments in the acute phase were subdivided into four categories: medication, ESWL, URSL, and surgery. Those in the chronic phase were classified as no specific intervention, lifestyle modification, maintenance with surveillance, and continued medication.

The modified SG method

Step 1: Measuring the absolute utility for hemodialysis

Because hemodialysis was the most serious complication in patients with ureteral stones in this study and is common in Taiwan, we assume it is the worst state for the subject alive but better than death. We used the SG method to estimate the absolute utility for hemodialysis, defined as U_5 (Fig. 1), by using healthy and dead as reference states with two extreme states of utility as "1" and "0," respectively. To measure utility for a chronic health state, say state *i*, a scenario was described as follows: "A male diagnosed with end-stage renal disease has been treated with conventional treatment-hemodialysis three times per week-for a long time. A new treatment is available that may render him completely healthy with probability *p*, but he also runs the risk of dying if the treatment fails." Whether he accepts a new treatment depends on his preference over the utility of undergoing this new treatment determined by the degree of chance that makes him consider the new treatment as indifferent to the conventional method, one accepting the new treatment with probability *p* of attaining the best state (healthy) and with failure probability $(1-p)$ of becoming worse, or rejecting the new treatment and receiving the conventional treatment given the current state *i* being measured. We used an iterative bidding process to identify *p*, which is utility for hemodialysis according to the expected utility theory [17], which indicates that the utility for state *i* for the above scenario is equivalent to

$$U_i = pU_b + (1-p)U_w$$

where $U_b = 1$ and U_w represent the utility values of the best (healthy = 1) and the worst states (dead = 0), respectively.

Step 2: Ranking the states in the same phase

In our case, healthy status was always regarded as the best reference state (score 1), whereas the worse state depended on each subject's ranking sequence. We used the four states in the acute phase for ureteral stone management as an example (see Fig. 1).

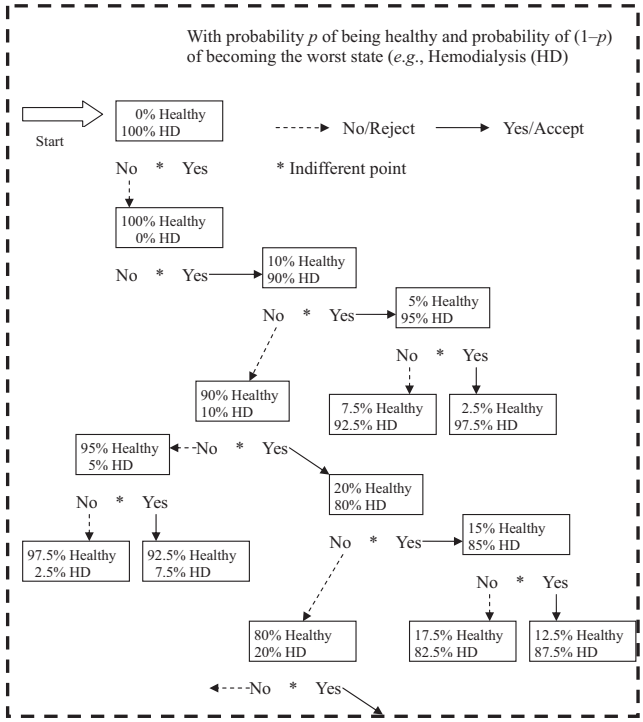

Fig. 2 – Flowchart of the standard gamble method for measuring utility.