The contingent valuation of pain: A systematic literature review

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ABSTRACT

The estimation of the monetary value of pain informs issues such as the cost-effectiveness of clinical interventions or the estimated compensation for injuries. However, there are various methodological approaches to assigning a monetary value to pain in which this study aims to address. This study conducted a systematic literature review of existing pain valuation cases and identified the common characteristics that defined these cases. A systematic search was conducted from July to August 2020 to identify monetary valuation cases in the area of pain from electronic databases. Pain valuation case study designs, instruments of quantifying pain, body parts, acute vs chronic conditions investigated, an average value to avoid pain, and valuation methods were extracted and analyzed according to their reporting frequency. Thirty-one cases were included in the systematic review after preliminary screening, the application of the exclusion criteria, and full-text assessment to determine relevance to the review. The Instruments used to measure pain fell into four major categories: Numeric Rating Scale (NRS), MIDAS, EQ-5D, and SF-36. Acute pain and postoperative pain were the most frequent pain that was assigned a monetary value. The Willingness-to-pay (WTP) method was used in every study as the valuation method used to assign a value to pain and prospective and cross-sectional studies were the most common study designs.

Key words: Willingness-to-pay, contingent valuation, subjective wellbeing, pain, monetary value, cost-benefit, cost-effectiveness.

INTRODUCTION

Although there are numerous strategies to estimate costs of lost productivity attributed to a plethora of diseases as well as methods to determine the costs of clinical treatments and interventions, the full economic burden of these diseases (that is, the monetary value of the pain and suffering experienced by patients) are much less explored (Chuck et al., 2009). To address this gap in knowledge and research in this area of healthcare, the stated preference (SP) approach was utilized to measure how much patients value a specific clinical outcome to a disease (van den Bosch et al., 2006) and perhaps the most widely utilized SP approach is the willingness to pay method (WTP) which improves on the existing valuation methods such as the existing contingent valuation method (CVM). WTP establishes patient preferences and measures how much patients value a specific clinical outcome by determining the amount patients are willing to pay for an intervention that alleviates the intangible dimensions of diseases, such as patient pain and suffering.

However, despite the widely used WTP and CVM to estimate the full economic burden of diseases, there is no definitive or universally accepted way to assign a value to physical pain. By estimating the monetary value of pain, researchers can address prevalent issues such as the cost-effectiveness of clinical interventions or the estimated compensation for injuries. To this end, this review seeks to cover the literature and to compile the various methodologies used in cases relevant to the monetary...
valuation of pain.

METHODS

A systematic literature search was conducted from July to August 2020 to identify monetary valuation cases in the area of pain from electronic databases. Literatures published in English were identified through three electronic databases: PubMed, Web of Science, and Google Scholar.

Throughout the search for literature on the monetary valuation of pain, search terms and research processes and methodology were documented. Preliminary screening for relevant literary study was conducted by searching the electronic databases with the search terms and those that included the designated search terms went through a full-text assessment to determine if they were relevant to the study. Specifically, search terms were broken down into two primary categories: 1) monetary valuation and 2) pain. Any study on the previously mentioned electronic databases that included “pain” alongside “preference,” “valuation,” “contingent valuation,” “subjective wellbeing,” “willingness to pay,” “cost-benefit analysis (CBA),” and “value” were incorporated. As previously stated literatures that included the search terms were then determined if they were relevant to the study through a full-text assessment.

Following the full-text assessment, two exclusion criteria were applied: first, studies which did not report the results of the valuation were excluded from the final selection of the literature. These studies did not report the valuation method used and instead addressed the concepts and theories regarding the monetary valuation of pain. Second, studies which did not reference health outcomes or interventions in their measurement of monetary valuation were also omitted from the review.

After duplicate results were removed, the remaining literature were analyzed and relevant information such as title, study design, instrument used to measure pain, acute/chronic, body parts, average value, and valuation method were extracted and documented on a spreadsheet. Information that was not reported by authors was marked as “not specified.”

RESULTS

The preliminary search using the search terms resulted in 75 literary studies and after the subsequent full-text assessments, application of the exclusion criteria mentioned, and the removal of duplicate findings, 30 cases were determined to be eligible for the review. Of the 30 monetary valuation cases found, 29 (97%) were full journal articles and 1 (3%) was an abstract.

Regarding the study design the cases utilized to conduct the valuation of pain, 20 (67%) were prospective studies, 4 (13%) were cross-sectional, 3 (10%) were randomized-controlled trials and 1 (3%) each for experimental, retrospective, and observational study designs. Of the 4 cross-sectional studies, 3 were randomized and 1 was non-randomized. Instruments used to measure pain were also extracted and recorded. Moreover, the instrumental categories are not mutually exclusive as studies could employ several instruments to measure pain. In terms of what instruments were used, the majority of cases utilized a unidimensional scale which includes the Numerical Rating Scale (NRS) and the Visual Analog Scale (VAS). Specifically, 7 (23%) of the cases utilized NRS, 4 (13%) VAS, 2 (7%) EuroQol-5-Dimension Questionnaire (EQ-5D), 2 (7%) Short-Form Pain Scale, and 8 (27%) of cases did not specify the instrument(s) used. Aside from the unidimensional scales mentioned, some multidimensional scales were used such as the Migraine Disability Assessment Test (MIDAS) and the Pain Disability Index. Regarding the nature of the pain studied, 12 (40%) of the cases measured acute pain, 17 (57%) measured chronic pain, and 1 (3%) case studied both acute and chronic pain.

All the cases were found to utilize the WTP method to assign a monetary value on pain. Details of the body part studied and average value assigned to the pain are summarized in Table 1.

DISCUSSION

The WTP method was unsurprisingly used in all the cases studied. Previous studies identified the WTP method to have several key advantages over other methods pertaining to studies in healthcare. The key advantages are as follows:

1) WTP is founded in welfare economics.
2) WTP allows for a more thorough approach to valuation than quality-adjusted life-years (QALYs) which are based on preferences for health outcomes only instead of the intangible dimensions of diseases.
3) WTP enables the analysis of allocative efficiency (Olsen and Smith, 2001). Given the overwhelming preference for the WTP over other contingent valuation methods in the cases included, as well as the key advantages the WTP has over other methods as mentioned previously, this study suggests prospective researchers to utilize the WTP questionnaire to measure the monetary valuation of pain. While numerous treatments and interventions are known to be cost-effective, limited funding in healthcare calls for critical resource allocation decisions by policy makers (Cross et al., 2000). It is in this regard that this literature review serves to inform researchers and policy makers on the methodologies and the study designs that can assist in measuring the full economic burden attributable to various diseases to result in more comprehensive and holistic
**Table 1:** Overview of the cases included.

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Purpose</th>
<th>Methodology</th>
<th>Sample Characteristics</th>
<th>Endpoints</th>
<th>Service Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Willingness to pay for reductions in angina pectoris attacks</td>
<td>Prospective</td>
<td>Attributes and levels were selected based on the literature and in collaboration with clinicians based on the side effects and severity levels commonly seen in clinical practice when treating MBC patients.</td>
<td>Acute, Plate loss, diarrhea, fatigue, nausea, tingling, pain, infection</td>
<td>SEK 2,500 for 50% reduction in the attack rate for three months with binary approach and about SEK 2,100 using bidding-game technique</td>
</tr>
<tr>
<td>25</td>
<td>Willingness to pay to avoid metastatic breast cancer treatment side effects: Results from a conjoint analysis</td>
<td>Prospective</td>
<td>Not specified</td>
<td>Acute</td>
<td>WTP</td>
</tr>
<tr>
<td>26</td>
<td>Willingness to pay to avoid the time spent and discomfort associated with screening colonoscopy</td>
<td>Prospective</td>
<td>Not specified</td>
<td>Acute</td>
<td>WTP</td>
</tr>
<tr>
<td>27</td>
<td>Consistency of assessments and willingness to pay for a reduction in morning symptoms over time in patients with rheumatoid arthritis</td>
<td>Prospective</td>
<td>Numerical rating scale</td>
<td>Chronic</td>
<td>43.3 Euros daily (first assessment) 38.4 Euros daily (second assessment)</td>
</tr>
<tr>
<td>28</td>
<td>Patient preferences for treatment of Achilles tendon pain: Results from a discrete-choice experiment</td>
<td>Randomized Clinical Trial</td>
<td>Not specified</td>
<td>Chronic, Achilles Tendon</td>
<td>238 Australian Dollars for a 10% increase in the chance of treatment success</td>
</tr>
<tr>
<td>29</td>
<td>Will (or can) people pay for headache care in a poor country?</td>
<td>Retrospective</td>
<td>MIGAS, SF-36</td>
<td>Acute</td>
<td>8 USD per month</td>
</tr>
<tr>
<td>30</td>
<td>Assessing parents preferences for the avoidance of undesirable anesthesia side effects in their children undergoing surgical procedures.</td>
<td>Observational</td>
<td>Numerical rating scale</td>
<td>Acute, PONV and side effects of anesthesia</td>
<td>WTP</td>
</tr>
<tr>
<td>Number</td>
<td>Title</td>
<td>Study Design</td>
<td>Instrument to Measure Pain</td>
<td>Acute/Chronic Pain</td>
<td>Body Part</td>
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</tr>
<tr>
<td>1</td>
<td>Heart Disease: Patients’ Weighting Behavior, Costs of Illness, and Willingness to Pay to Avoid Angina Episodes</td>
<td>Prospective</td>
<td>Numerical Rating Scale</td>
<td>Chronic</td>
<td>Heart</td>
</tr>
<tr>
<td>2</td>
<td>Assessing the Willingness of Parents to Pay for Reducing Postoperative Nausea and Vomiting for Reducing Pain and Pain-Related Disability</td>
<td>Cross-sectional randomized design</td>
<td>Faces pain scale, pain disability index</td>
<td>Acute and Chronic</td>
<td>Not specified</td>
</tr>
<tr>
<td>3</td>
<td>Assessing the Willingness of Parents to Pay for Reducing Postoperative Nausea and Vomiting in Children</td>
<td>Prospective</td>
<td>Not specified</td>
<td>Acute</td>
<td>PONV</td>
</tr>
<tr>
<td>4</td>
<td>Effect of Swarm Experiences on Willingness to Pay to Avoid Postoperative Nausea, Headache, and Vomiting</td>
<td>Randomized controlled trial</td>
<td>Numerical Rating Scale</td>
<td>Acute</td>
<td>PONV</td>
</tr>
<tr>
<td>5</td>
<td>Assessing the Willingness to Pay for Reducing Postoperative Nausea and Vomiting for Reducing Pain and Pain-Related Disability</td>
<td>Prospective</td>
<td>Visual Analog Scale</td>
<td>Acute</td>
<td>Postoperative nausea, headache, sore throat</td>
</tr>
<tr>
<td>6</td>
<td>Assessing the Willingness to Pay for Reducing Postoperative Nausea and Vomiting for Reducing Pain and Pain-Related Disability</td>
<td>Randomized controlled trial</td>
<td>Not specified</td>
<td>Chronic</td>
<td>Elbow</td>
</tr>
<tr>
<td>7</td>
<td>Assessing the Willingness to Pay for Reducing Postoperative Nausea and Vomiting for Reducing Pain and Pain-Related Disability</td>
<td>Prospective</td>
<td>Visual Analog Scale</td>
<td>Chronic</td>
<td>Joints</td>
</tr>
<tr>
<td>8</td>
<td>Assessing the Willingness to Pay for Reducing Postoperative Nausea and Vomiting for Reducing Pain and Pain-Related Disability</td>
<td>Prospective</td>
<td>Visual Analog Scale</td>
<td>Acute</td>
<td>PONV</td>
</tr>
<tr>
<td>9</td>
<td>Assessing the Willingness to Pay for Reducing Postoperative Nausea and Vomiting for Reducing Pain and Pain-Related Disability</td>
<td>Prospective</td>
<td>Visual Analog Scale</td>
<td>Acute</td>
<td>Head</td>
</tr>
<tr>
<td>Title</td>
<td>Design</td>
<td>Measure</td>
<td>Intervention</td>
<td>Outcomes</td>
<td>WTP</td>
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<td>----------------------------------------------------------------------</td>
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<tr>
<td>11. Stated preferences for the removal of physical pain resulting from permanently disabling occupational injuries: A contingent valuation study of Taiwan</td>
<td>Prospective</td>
<td>Not specific</td>
<td>Chronic</td>
<td>General occupational injuries: 60 USD to a day under log-normal distribution, 60 USD a day under Weibull distribution</td>
<td>WTP</td>
</tr>
<tr>
<td>12. Use of willingness to pay to study values of various pharmacotherapies for irritable bowel syndrome</td>
<td>Prospective</td>
<td>Per Protocol</td>
<td>Acute</td>
<td>Head</td>
<td>WTP</td>
</tr>
<tr>
<td>13. Willingness to pay for a daily based on community member and patient preferences for temporary health states associated with herpes zoster</td>
<td>Prospective</td>
<td>Numerical rating scale</td>
<td>Chronic</td>
<td>Skin</td>
<td>WTP</td>
</tr>
<tr>
<td>14. Measuring heart patients' willingness to pay for changes in angina symptoms</td>
<td>Prospective</td>
<td>Likert scale</td>
<td>Chronic</td>
<td>Chest</td>
<td>WTP</td>
</tr>
<tr>
<td>15. Monetary Value of Quality-Adjusted Life Years (QALY) among Patients with Cardiovascular Disease: A Willingness to Pay Study (WTP)</td>
<td>Cross-sectional</td>
<td>EQ-SD, Visual Analog Scale</td>
<td>Chronic</td>
<td>Heart</td>
<td>WTP</td>
</tr>
<tr>
<td>16. Uges Inconvenience, Quality of Life and patients' evaluation of symptom reduction</td>
<td>Prospective</td>
<td>SF-36 Pain</td>
<td>Chronic</td>
<td>Bladder</td>
<td>WTP</td>
</tr>
<tr>
<td>17. Parents' willingness to pay for diminishing children's pain during blood sampling</td>
<td>Prospective</td>
<td>Not specified</td>
<td>Acute</td>
<td>Site of blood sampling and vasopressure</td>
<td>WTP</td>
</tr>
<tr>
<td>18. Gender differences in willingness to pay to avoid pain and their correlation with risk. Prospective</td>
<td>Duration of cold pressor test (2 minutes of cold water immersion is equivalent to 3 pain doses)</td>
<td>Acute</td>
<td>Fingers</td>
<td>Female WTP median for one pain dose (K1,230) and two pain doses (K1,530); Male WTP median for one pain dose (K1,130) and five pain doses (K1,550)</td>
<td>WTP</td>
</tr>
<tr>
<td>19. Patient preference and willingness to pay for knee osteoarthritis treatments. Experimental</td>
<td>Numerical rating scale</td>
<td>Chronic</td>
<td>Knee</td>
<td>€55 and €64 more to co-pay for eperone and viscosupplement injections, respectively</td>
<td>WTP</td>
</tr>
<tr>
<td>20. Willingness to pay for arthritis symptom alleviation. Comparison of closed-ended questions with and without follow-up. Experimental</td>
<td>Numerical rating scale</td>
<td>Chronic</td>
<td>Joints</td>
<td>£10.6 x with follow up and £6.1 x without follow up</td>
<td>WTP</td>
</tr>
<tr>
<td>21. Feasibility of willingness to pay for arthritis symptom alleviation by Chronic Arthritis. Prospective</td>
<td>Not specified</td>
<td>Chronic</td>
<td>Joint</td>
<td>50 USD per week</td>
<td>WTP</td>
</tr>
<tr>
<td>22. Treatment satisfaction, willingness to pay and quality of life in Japanese patients with psoriasis. Cross-sectional</td>
<td>EQ-SD, PHQ</td>
<td>Chronic</td>
<td>Skin</td>
<td>Less than 8,000 per month</td>
<td>WTP</td>
</tr>
<tr>
<td>23. Willingness to Pay for Complete Symptom Relief of Gastroesophageal Reflux Disease</td>
<td>Cross-sectional</td>
<td>Gastroesophageal severity rating scale</td>
<td>Chronic</td>
<td>Gastroesophageal</td>
<td>WTP</td>
</tr>
</tbody>
</table>
reviews when considering the expansion of certain intervention programs or the preferential funding of an intervention over another.

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