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Patient-Reported Outcomes

Development of the Treatment Inventory of Costs in Psychiatric Patients: TIC-P Mini and Midi



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ABSTRACT

Background: Medical costs of (psychiatric) illness can be validly measured with patient report questionnaires. These questionnaires comprise many detailed items resulting in lengthy administrations. **Objectives:** We set out to find the minimal number of items needed to retrieve 80% and 90% of the costs as measured by the Treatment Inventory of Costs in Patients with psychiatric disorders (TIC-P). **Methods:** The TIC-P is a validated patient-reported outcome measure concerning the utilization of medical care and productivity losses. The present study focused on direct medical costs. We applied data of 7756 TIC-P administrations from three studies in patients with mental health care issues. Items that contribute least to the total cost were eliminated, providing that 80% and 90% of the total cost was retained. **Results:** Average medical costs per patient were €658 over the last 4 weeks. The distribution of cost was highly skewed, and 5 of the

14 items of the TIC-P accounted for less than 10% of the total costs. The 80% Mini version of the TIC-P required five items: ambulatory services, private practice, day care, general hospital, and psychiatric clinic. The TIC-P Midi 90% inventory required eight items. Both had variance between the three samples in the optimal choice of the items. **Conclusions:** The number of items of the TIC-P can be reduced considerably while maintaining 80% and 90% of the medical costs estimated by the complete TIC-P. The reduced length makes the questionnaire more suitable for routine outcome monitoring. **Keywords:** health care costs, patient-reported outcome measures, routine outcome monitoring, short form questionnaires.

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Introduction

In economic evaluations of health care costs, cost measurements are frequently based on patient self-reports. Typically, these cost inventories comprise a large number of items that try to capture as validly as possible the volume of care (e.g., Bhandari and Wagner [1]). The drawback of such a comprehensive measurement strategy is a lengthy administration at risk of respondents' fatigue, which may increase the number of nonresponses.

In routine outcome monitoring (ROM), patients fill out patient-reported outcome measures (PROMs) and other questionnaires on a routine basis to provide data on the quality of a therapy in terms of treatment outcome. An example of ROM is the routine use of PROMs introduced by the National Health Service in 2009. From 2009 onward, PROMs are being collected for four elective procedures: hip surgery, knee surgery, hernia repair, and varicose veins, with more than 100,000 administrations each year (www.hscic.gov.uk/proms). Another example is the International Consortium for Health Outcome Measurement, which tries to

establish an international standard for routine administration of PROMs on the basis of the framework developed at the Harvard Business School by Michael E. Porter (www.ichom.org). A similar development arises in The Netherlands, specifically in the field of mental health care. In The Netherlands, mental health care providers and health insurance companies have agreed that all patients will fill in a battery of questionnaires at the beginning and at the end of the therapy (<http://www.sbggz.nl/>). In all examples, the idea is to make the quality of care of the mental care services transparent.

If PROMs data collected in a ROM setting could be linked to the costs registered in the hospital administration, the relation between cost and effect can be investigated [2]. A complication in such research is that medical costs outside the clinic are not registered in the hospital administration. Leaving these costs out would wrongfully favor treatments that rely on the support of other health care services. It would therefore be helpful if questionnaires such as the Treatment Inventory of Costs in Patients with psychiatric disorders (TIC-P) could be used in

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<http://dx.doi.org/10.1016/j.jval.2015.07.006>

ROM. The administration of the TIC-P, however, is quite lengthy: The mean time reported to fill out the full TIC-P was 9.4 ± 5.5 minutes [3]. This can be considered too long when the questionnaire is administered with high frequency, or when all patients fill in the questionnaire at a routine basis as in ROM. Both in high-frequency administrations and when all patients are routinely asked to fill questionnaires, a short administration time and simple questions would facilitate logistics and reduce nonresponse. In this article, we set out to reduce the 14 items on medical consumption of the TIC-P to make it more suitable for ROM and other situations in which short form questionnaires are crucial to ensure a reasonable response rate. In this article, we set out to find the minimal number of items needed to retrieve 80% and 90% of the costs as measured by the TIC-P [4]. These proportions are chosen because these are also generally accepted for power calculations.

Methods

The TIC-P Health Care Consumption Module

The TIC-P is a questionnaire designed for self-report in adult patients with a mental disorder [3,4]. The TIC-P is a generic questionnaire, implying that the items are not related to one specific disease in mental health. The TIC-P consists of two parts, which can be used separately. In addition, a number of general questions may be added for collecting data on respondents' demographic characteristics and comorbidity. The wording and the layout of the TIC-P have varied over time. The most actual version of the TIC-P and its shorter versions are available through registration as a user at <http://www.imta.nl/questionnaires/>. For nonprofit organizations, the use of the TIC-P in scientific investigations is in principle free of charge. The first part of the TIC-P includes 14 structured questions on the volume of medical

consumption (Table 1). The second part deals with productivity losses, which is not the subject of the present research. The part that deals with medical consumption includes a comprehensive list of contacts within the mental health care sector (ambulatory mental health care organization, psychiatrist/psychologist or psychotherapist in private practices or outpatient hospitals, institutional day-care treatment, and admission to a psychiatric hospital) and contacts outside the mental health care sector (general practitioner, industrial physician, medical specialist at an outpatient clinic, paramedical worker, social worker, clinic for alcohol and drugs, alternative healer, self-help group, inpatient hospital care, and home care).

The TIC-P also set out to measure the use, doses, and frequencies of medications in a 15th question. The administration of medication use includes many missing, incomplete, and erroneous answers. For instance, in the Rotterdam Monitoring Study (RoMS), the name of the drug was missing in 12% and the intake dose in 20% of the cases [3]. Moreover, the drug name was often incorrectly spelled. This complicated computerized calculation, implying that most medication administrations had to be performed manually, which is not suitable for high-frequency administration. Considering the small proportion of the total cost (4.4%) and the cumbersome calculations, we did not include the medication costs in the TIC-P Mini and the TIC-P Midi.

Cost Calculation

We calculated the costs according to the guidelines of the Dutch manual of costing studies in health care [5]. For each type of health care use, we multiplied the number of contacts or hospital days with the corresponding reference price. All cost estimates were calculated by applying this method, which is according to the Dutch guidelines for costing research. The total costs were calculated by summing the costs per health care provider. The percentage cost estimated by the Mini and Midi is relative to the full-length TIC-P (full-length TIC-P = 100%).

Samples

Data were collected in three large-scale studies: the RoMS, the STandard Evaluation Project (STEP), and the Study on Cost Effectiveness of Personality disorder TREATment (SCEPTRE). These studies applied the 2000 version of the TIC-P. Demographic characteristics of the three patient samples are presented in Table 2. Most of the 6258 included patients suffered from personality disorders, but other mental illnesses were also present. Because both the STEP and SCEPTRE investigations included many patients who stayed overnight in a hospital, the severity of the symptoms was more pronounced than in the RoMS, which included mainly outpatients.

Rotterdam Monitoring Study: RoMS

RoMS data were collected in a Web-based monitoring application in the period July 1, 2006, to June 31, 2011. Participants were recruited in private psychotherapy practices and a number of regional mental health institutes providing outpatient treatments. Inclusion criteria were an age of 17 years or older and sufficient understanding of the Dutch language to complete the questionnaires without assistance. A total of 631 patients provided 2132 administrations. Clinician-rated psychiatric classification according to the *Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV)* on all five axes was provided by the therapists in the online system. Mood disorders were rated in 27%, adjustment disorders in 17%, anxiety disorders in 11%, relational problems in 14%, and personality disorders in 28% of the patients. Typically, these therapies were provided for 1 hour on a weekly basis, though session time and frequency varied. The

Table 1 – Items of the full-length TIC-P medical costs.

Health care provider or medication	
1	General practitioner
2	Health care professional from the ambulatory mental health service
3	Psychiatrist, psychologist, or psychotherapist in private (group) practice
4	Psychiatrist, psychologist, or psychotherapist outpatient care
5	Occupational physician
6	Medical specialist at the outpatient care (examples of medical specialists are cardiologists, rheumatologists, internists, or neurologists)
7	Physical therapist
8	Social worker
9	Clinic for alcohol and drugs or similar institution
10	Home care
11	Alternative medicine (examples of alternative medicine include homeopaths and acupuncturists)
12	Psychiatric day care
13	Inpatient care (i.e., admission to, e.g., a hospital, a revalidation center, or a psychiatric hospital)
14	Self-help group (e.g., the Alcoholics Anonymous group, support group within a patient association)
15	Medication

TIC-P, Treatment Inventory of Costs in Patients with psychiatric disorders.

Table 2 – Demographic and background characteristics of the samples.

Characteristic	RoMS	STEP	SCEPTRE	Total
N	631	3758	1869	6258
Age (y), mean \pm SD	37.6 \pm 11.8	26.7 \pm 8.6	33.2 \pm 9.9	32.2 \pm 10.6
Sex: male (%)	33.4	27.8	35.5	33.0
Education (%)				
Lower	6.4	14.7	15.4	13.9
Medium	29.0	38.2	35.8	36.2
High	64.6	47.1	48.8	49.9
Therapy type (%)				
Ambulatory, private practice	81.5	0.0	0.0	7.3
Ambulatory, outpatient clinic	18.5	9.4	31.1	14.7
Day care	0.0	16.7	38.1	19.7
Inpatient	0.0	74.0	30.8	58.4

RoMS, Rotterdam Monitoring Study; SCEPTRE, Study on Cost Effectiveness of Personality disorder TReatment; STEP, STandard Evaluation Project.

questionnaires were administered mostly at a computer in the waiting room, but may also have been administered before the session at home. More details on this sample are reported in De Jong et al. [6].

STandard Evaluation Project: STEP

STEP was carried out in the period from 2000 to 2008 in eight psychiatric clinics in The Netherlands with a focus on personality disorders [7]. The treatments included long-term inpatient treatments of more than 6 months, short-term clinical treatments of less than 6 months, part-time treatments of 2, 3, 4, or 5 days per week, and clinical treatments for adolescents. The patients undergoing clinical treatments stayed overnight in the clinics. Some patients had an outpatient after-care treatment. Data were collected at the start of treatment and at several follow-ups. Baseline administrations of 3755 patients were included in the present study. In STEP, no data on diagnoses were collected centrally. All administrations of the questionnaires were paper and pencil based.

Study on Cost Effectiveness of Personality disorder TReatment: SCEPTRE

SCEPTRE participants were recruited from consecutive admissions to six mental health care centers in The Netherlands. [8,9] These institutions offer outpatient, hospital day-care, and inpatient psychotherapeutic treatment for patients with personality disorders. From March 2003 to March 2006, 1869 patients completed the intake procedure. For the present study, baseline measurements of medical consumption were used. DSM-IV axis II diagnoses were measured using a semi-structured diagnostic interview, that is, the Structural Clinical Interview for DSM disorders [10,11], or the Structured Interview for DSM-IV Personality [12]. Cluster A was diagnosed in 7%, cluster B in 26%, and cluster C in 42% of the patients. Depression was diagnosed in 30%, self-destructive symptoms in 6%, and negativistic symptoms in 4% of the patients. All administrations were paper and pencil based.

Statistical Methods

Demographic differences between the three samples were analyzed with an analysis of variance for age, chi-square tests for sex, and Mann-Whitney tests for education.

Cost data can be expected to be highly skewed. For this reason, we chose a nonparametric selection of items. The percentages of costs for various health care providers were ordered from high to

low. Items of the TIC-P that contributed least were eliminated on the condition that at least 80% and 90% of the total costs remained estimated in each of the three samples separately. This implies that the selection need not be the highest percentages in each sample. As explained above, medications cost were not included (see also the Discussion section).

Results

Demographic and Background Characteristics

Table 2 presents the demographic and background characteristics of the samples. RoMS participants are older than SCEPTRE participants ($P < 0.001$), who are older than STEP participants ($P < 0.001$). STEP participants include significantly less men than do RoMS ($P = 0.02$) and SCEPTRE ($P < 0.001$) participants. RoMS participants are higher educated ($P < 0.001$) than STEP and SCEPTRE participants.

The 80% Mini Version

Table 3 presents the contribution of the individual items to the mean total costs per patient as measured with the 14 original questions. Four of the items covered 80% of the costs in each population (RoMS 82.5%, STEP 86.4%, SCEPTRE 80.6%, and overall 84.6%). These questions include ambulatory mental health service, therapist with private practice, day-care treatment in a mental health clinic, and (general and psychiatric) hospital stay (nights). This last question included five additional subquestions indicating whether this admittance was at a university hospital, a general hospital, an institution for psychotherapy, a psychiatric hospital, or another institution. Distinction in general and psychiatric hospitals, which have a large difference in costs per night, led to a total of five questions in the Mini 80% version of the TIC-P. The question on therapists with a private practice included a much larger proportion in the RoMS sample, whereas questions on the hospital treatments had notably larger proportions in the STEP and SCEPTRE samples.

The 90% Midi Version

The five questions of the 80% Mini version were also used in the 90% Midi version. In RoMS, the three additional questions resulted in 92.5% of the total costs, in STEP 94.0%, in SCEPTRE 91.3%, and overall 93.2%. The questions include the general practitioner, the psychotherapist of the outpatient general

Table 3 – Percentages of costs of health care provider per patient in the last 4 wk, selections for 80% and 90% of costs threshold.

Health care provider	RoMS (n = 2132) [*]				STEP (n = 3755) [†]				SCEPTRE (n = 1869) [†]				Total (N = 7756)				
	€/visit	Visits	€	%	Selected %	Visits	€	%	Selected %	Visits	€	%	Selected %	Visits	€	%	Selected %
General practitioner	28	0.52	14.46	4.3	4.3	0.70	19.74	2.2	2.2	0.82	23.03	3.7	3.7	0.68	19.08	2.9	2.9
<u>Ambulatory mental health service</u>	<u>173</u>	<u>0.52</u>	<u>89.10</u>	<u>26.4</u>	<u>26.4</u>	<u>1.23</u>	<u>212.62</u>	<u>24.1</u>	<u>24.1</u>	<u>1.09</u>	<u>187.90</u>	<u>30.6</u>	<u>30.6</u>	<u>1.00</u>	<u>172.71</u>	<u>25.9</u>	<u>25.9</u>
<u>Therapist private practice</u>	<u>89</u>	<u>1.58</u>	<u>140.26</u>	<u>41.6</u>	<u>41.5</u>	<u>0.61</u>	<u>54.13</u>	<u>6.1</u>	<u>6.1</u>	<u>0.67</u>	<u>59.29</u>	<u>9.6</u>	<u>9.6</u>	<u>0.89</u>	<u>79.05</u>	<u>11.8</u>	<u>11.8</u>
Therapist general hospital	102	0.04	4.21	1.2	1.2	0.37	37.92	4.3	4.3	0.29	29.63	4.8	4.8	0.26	26.66	4.0	4.0
Industrial physician	28	0.12	3.45	1.0		0.26	7.14	0.8		0.32	8.87	1.4		0.23	6.55	1.0	
Medical specialist	73	0.21	15.07	4.5	4.5	0.13	9.18	1.0	1.0	0.18	12.85	2.1	2.1	0.16	11.68	1.7	1.7
Paramedical	31	0.37	11.36	3.4		0.31	9.58	1.1		0.35	10.73	1.7		0.33	10.34	1.5	
Social worker	66	0.04	2.72	0.8		0.21	14.11	1.6		0.17	11.48	1.9		0.16	10.35	1.5	
Clinic for alcohol and drugs	28	0.01	0.38	0.1		0.07	1.90	0.2		0.02	0.61	0.1		0.04	1.17	0.2	
Home care	18	0.07	1.31	0.4		0.39	6.96	0.8		0.28	5.06	0.8		0.27	4.95	0.7	
Alternative healer	50	0.09	4.39	1.3		0.17	8.70	1.0		0.23	11.56	1.9		0.16	8.20	1.2	
<u>Day care mental health clinic</u>	<u>156</u>	<u>0.20</u>	<u>31.46</u>	<u>9.3</u>	<u>9.3</u>	<u>1.04</u>	<u>162.15</u>	<u>18.4</u>	<u>18.4</u>	<u>0.36</u>	<u>56.59</u>	<u>9.2</u>	<u>9.2</u>	<u>0.65</u>	<u>100.74</u>	<u>15.1</u>	<u>15.1</u>
<u>General hospital (nights)</u>	<u>470</u>	<u>0.02</u>	<u>8.38</u>	<u>2.4</u>	<u>2.5</u>	<u>0.26</u>	<u>120.41</u>	<u>13.6</u>	<u>13.6</u>	<u>0.22</u>	<u>102.85</u>	<u>16.7</u>	<u>16.7</u>	<u>0.18</u>	<u>84.84</u>	<u>12.7</u>	<u>12.7</u>
<u>Psychiatric clinic (nights)</u>	<u>249</u>	<u>0.04</u>	<u>9.46</u>	<u>2.8</u>	<u>2.8</u>	<u>0.86</u>	<u>213.79</u>	<u>24.2</u>	<u>24.2</u>	<u>0.36</u>	<u>88.60</u>	<u>14.4</u>	<u>14.4</u>	<u>0.51</u>	<u>127.45</u>	<u>19.1</u>	<u>19.1</u>
Self-care group	53	0.03	1.74	0.5		0.09	4.63	0.5		0.10	5.44	0.9		0.08	4.03	0.6	
Total 80%			<u>278.22</u>		<u>82.5</u>		<u>763.10</u>		<u>86.4</u>		<u>495.23</u>		<u>80.6</u>		<u>564.79</u>		<u>84.6</u>
Total 90%			<i>311.95</i>		<i>92.5</i>		<i>829.93</i>		<i>94.0</i>		<i>560.74</i>		<i>91.3</i>		<i>622.21</i>		<i>93.2</i>
Total 100%			337.30	100.0			882.96	100.0			614.49	100.0			667.80	100.0	

Notes. The ranking is based on the TIC-P questionnaire version 2000. The health care providers selected for total cost percentage of at least 80% are underlined. The additional health care providers selected for total cost percentage of at least 90% are in italics.

RoMS, Rotterdam Monitoring Study; SCEPTRE, Study on Cost Effectiveness of Personality disorder TRTreatment; STEP, STandard Evaluation Project; TIC-P, Treatment Inventory of Costs in Patients with psychiatric disorders.

* Repeated measures from 631 patients.

† Measures taken at baseline of clinical treatments.

hospital, and outpatient visits to a medical specialist in a hospital. Thus, the TIC-P Midi includes eight questions.

Conclusions

The TIC-P can be reduced to 5 of the original 14 questions with the preservation of more than 80% of the medical costs in all the three samples, resulting in the “TIC-P Mini.” This short inventory facilitates application in highly frequent routine outcome monitoring. The TIC-P Midi consisting of eight questions preserves more than 90% of the medical costs in all the three samples. The total costs can be estimated with the TIC-P Mini by dividing the costs by 0.846 and with the TIC-P Midi by dividing the costs by 0.932.

Limitations

Although the five and eight questions for the Mini and Midi versions, respectively, are the same in all three populations, the difference in proportions shows that main cost drivers need not be the same over different populations. In the RoMS sample, which comprises ambulatory therapies, the proportion of hospital costs is only 5.3%, whereas in the STEP and SCEPTRE samples, which comprise much less ambulatory therapies, these costs amount to 37.8% and 31.1%, respectively. In addition, costs for therapists with a private practice make out 6.1% in STEP and 9.6% in SCEPTRE, whereas this is 41.5% in RoMS. A main reason for this is that RoMS includes exclusively ambulatory therapies with many repeated administrations in which the preceding sessions are reported. This could limit the validity of the selected items for other populations, though we argue that because the selection is valid in these varying therapy studies, it is reasonably robust.

In the general Dutch population with mental health issues, 14.9% are treated in private practices, 80.0% in outpatient clinics, and 5.2% in day-care and inpatient clinics [14]. The RoMS sample includes a relatively larger proportion of patients from private practices than do the overall Dutch patient population with mental health issues, whereas the STEP and SCEPTRE samples include larger proportions of day-care and inpatient therapies. Overall, ambulatory mental health services are underrepresented. The item “Ambulatory mental health service” is retained in both the TIC-P Mini version and the TIC-P Midi version, implying that this is not a cause for bias. However, it may be that those certain health care providers that are related to ambulatory mental health services could deserve a higher weight. A follow-up study with representative proportions of private practice patients and inpatients and outpatients can shed light on this issue.

As explained in the Introduction section, medication costs were not included. Generally, the costs of medication are low. For example, the cost of medication in the monitoring study was 4.4% of the total cost. In addition, patients’ reports about medication are unreliable and cumbersome to calculate because of nonuniform descriptions of the medication intake by patients [13]. This last administrative problem might not be such a big problem when the number of patients and the number of measurements per patients are limited. In that case, the investigator will correct the responses of the patient by hand. But this is not possible when the data collection is massive, as in ROM. For this reason, we did not include medication in the TIC-P Mini and the TIC-P Midi. Obviously, total medical costs should include these medication costs. We recommend investigating medication costs using face-to-face interviews in a smaller sample than the ROM sample, and then generalize the results of the small sample to the whole sample. We think that the improved quality of collection of medication costs data by using face-to-face investigation in a smaller sample outweighs the lower number of respondents

involved. It would be helpful if this assumption would be tested in the near future because this might have implications for data collection not only in ROM but also in other investigations.

Implications/Implementation

We have reduced the number of items of the TIC-P to facilitate its administration in, for instance, ROM. Another way to facilitate the administration of the TIC-P is to improve readability of the questions. At this moment we are experimenting whether splitting the items helps the respondent to move quickly through the list. For instance, item 5 of the TIC-P Midi first asks whether the patient has been to an outpatient clinic of a general hospital. If “no,” the patient is directed to the next question. If “yes,” the patient is asked to specify the consulted medical specialist (cardiologist, orthopedist, etc.) and the number of visits over the last 3 months. Alternatively, when split, the new questions directly asked to fill in the number of visits over the last 3 months to an outpatient clinic/medical specialist. The answer to these questions must then include “zero times.” This alternative “split question” avoids the routing after “yes” and “no,” which probably makes the task and questions easier. In addition, it is assumed that this will contribute positively to the reliability of the data. However, the number of questions is increased. This might be less dramatic than it seems because the old question was a combination of at least two questions. The trade-off then becomes whether a possible improved understanding of the task and question (if any) outweighed changing the format, which is less well tested. As we are experimenting with these alternative questions, the alternative format of the full TIC-P, the TIC-P Mini, and the TIC-P Midi are available on request.

Future Research

This reduction of the full-length TIC-P to Mini and Midi forms has been based on data of the administration of the full-length TIC-P. This data do not permit the determination of administration time and the proportion of patients who will complete the different forms of the questionnaire. To answer these questions, a follow-up study is needed in which patients are randomized over three arms: full-length TIC-P, Mini TIC-P, and Midi TIC-P. In addition, information on the test-retest reliability and the validity of the estimated costs is needed. An interesting option in that respect is to relate the costs estimated by the three forms of the TIC-P to data collected by insurance companies, or otherwise in-depth cost investigations.

The number of items of the TIC-P can be reduced considerably while maintaining 80% and 90% of the estimated medical costs estimated by the complete TIC-P. The reduced length makes the questionnaire more suitable for routine outcome monitoring.

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