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Abstract

Background

Cancer-related breakthrough pain (BTP) is a common and quite challenging pain syndrome, with significant impact on quality of life. To date, no widely recognized and validated tool for the diagnosis and evaluation of BTP exists. The Alberta Breakthrough Pain Assessment Tool (ABPAT) underwent a validation process during its development, but no experience of its implementation in clinical practice has been reported.

Methods

ABPAT was tested in a cohort of cancer patients suffering from chronic severe cancer-related pain in order to assess its acceptability and efficacy as a tool for the characterization of BTP.

Results

A total of consecutive 249 patients from seven different centres were included in a 2-month study period and all completed the questionnaire; 231 out of the 249 (92.8%) stated that questions were easily understandable and 217 out of the 249 (87.1%) stated that the tool allowed to explain extensively the BTP problem. Physician–patient correlation tests about baseline BTP intensity and BTP relief by medication showed statistical significance at the level of $p = 0.001$ and $p = 0.0001$, respectively. Evaluation of the efficacy of BPT medication revealed a 78.2% of patients declaring a good relief from BTP, with a significant reduction of mean BTP numeric rating scale score ($p = 0.0001$), but only 55.9% of patients responded to be satisfied about time for onset of the relief.

Conclusions

In this study, ABPAT resulted to be a well-accepted tool for BTP assessment and characterization in a relatively large cohort of cancer patients. It is effective in discovering the unmet needs of cancer patients and in exploring the outcomes of BTP treatment.

What's already known about this topic?

- The Alberta Breakthrough Pain Assessment Tool was developed using a Delphi process involving a review by an international group of experts followed by pretest with think-aloud interviews of patients with breakthrough pain in cancer. To date, there are no data about its use in a large cohort of cancer patients.

What does this study add?

- The Alberta Breakthrough Pain Assessment Tool was administered to a large cohort of cancer patients suffering from chronic severe cancer-related pain and recruited from different centres.

The tool showed a good acceptance rate and explored efficiently the breakthrough pain in terms of treatment outcomes.

Introduction

Breakthrough pain (BTP) has been defined as 'a transitory exacerbation of pain experienced by the patient who has relatively stable and adequately controlled baseline pain' (Portenoy et al., 2004). Cancer-related BTP is a common and difficult-to-manage pain syndrome (Zeppetella, 2009). Surveys have reported BTP prevalence estimates ranging from 40% to 93% in patients with cancer pain, depending on a wide variety of clinical and other factors, such as adequacy of background pain control, ability to distinguish BTP from end-of-dose failure, different conceptual and operational definitions across studies and countries, different study designs and different settings (Portenoy and Hagen, 1990; Fine and Busch, 1998; Zeppetella et al., 2000; Swanwick et al., 2001; Fortner et al., 2002; Gómez-Batiste et al., 2002; Deandrea et al., 2014).

Recently, a review on assessment and classification of cancer BTP (Haugen et al., 2010) indicated that although there is agreement on many key factors, such as aetiology, pathophysiological mechanism and type, other aspects, such as baseline analgesic treatment and the definition of controlled baseline pain are still a matter of debate. Furthermore, although in the research setting several surveys or questionnaires have been used to collect information about BTP, there is currently no standardized assessment tool for BTP with demonstrated reliability and validity to be consistently used by clinicians. A recent investigation tested the Questionnaire for Intense Episodic Pain (QUDEI) in its Italian version to assess the prevalence and clinical characteristics of BTP in an unselected population of patients with cancer-related chronic pain, based on clinical diagnosis and the use of this assessment tool. The authors concluded that the appropriate recognition of BTP requires a more widely, internationally accepted general definition of the phenomenon, together with specific validated tools for its screening and evaluation (Caraceni et al., 2012). Despite the availability of several drugs specifically investigated for its treatment (i.e., rapid-onset opioids), no widely validated tool for the diagnosis of BTP is currently employed. In a recent version of BTP guidelines, it was stated that 'currently, no tool exists for assessing breakthrough pain that has undergone independent clinical validation, although the Alberta Breakthrough Pain Assessment Tool underwent a validation process during its development' (Caraceni et al., 2013). To date, in a very recent publication, at this time available online only, initial evidence for the validity and reliability of the BTP assessment tool, a simple instrument for the diagnosis and evaluation of BTP, has been provided (Webber et al., 2014).

In our study, we tested the Alberta Breakthrough Pain Assessment Tool (ABPAT; Hagen et al., 2008) in a relatively large cohort of cancer patients suffering from chronic severe cancer-related pain, in order to assess its acceptability and efficacy as a tool for the characterization of BTP in the clinical setting.

Patients and methods

Patients

From May to June 2012, consecutive 249 patients were enrolled in a multicentre, cross-sectional, observational study, carried out in seven oncology or palliative care centres in the Piedmont Region in Northern Italy.

The inclusion criteria included: histologically confirmed diagnosis of cancer; locally advanced or metastatic disease; analgesic treatment with major opioids; adequately controlled background pain, opioid dose for background pain assessed by previous titration, provided rescue dose of short acting opioid for the treatment of BTP; documented cancer-related BTP; adequate compliance with the

analgesic treatment; ability to differentiate incident, predictable BTP (e.g., related to movement) from incident, unpredictable and idiopathic/spontaneous BTP; age > 18 years; written informed consent; and ability to follow study procedures. Exclusion criteria were: clearly identifiable neurogenic pain secondary to brain metastases, spinal cord compression, dorsal nerve root compression, peripheral nerve neuropathy; concomitant local analgesic treatment (i.e., peripheral nerve ablation); radiation therapy or radionuclide therapy completed 1 month or less before the beginning of the study; ascertained possibility of end-of-dose-related pain; major psychiatric disorders or known cognitive impairments. Background pain was considered adequately controlled only in patients with baseline pain less than or equal to 4 on a 0 to 10 numeric rating scale (NRS), where 0 accounts for no pain and 10 for the maximum pain, considering the others not eligible for BTP assessment because of uncontrolled baseline pain (Mercadante et al., 2013).

All patients were treated for cancer pain with a long-acting major opioid for background pain. A rescue dose of a short-acting opioid (calculated as one-sixth of morphine equivalents of the total daily administered dose of a long-acting opioid) or rapid-onset opioids (after titration) were administered for treating BTP events.

The ethics committee of each of the seven participating centres approved the study. It was carried out in accordance with the Declaration of Helsinki, as revised in 2004, and Italian laws regarding clinical research. All patients provided written informed consent.

Assessment tools

The presence of BTP was assessed for each patient before study entry by means of a specific diagnostic algorithm (Davies et al., 2009). The ABPAT was administered once to each of the enrolled patients from the start of the study, at the same time in the different participant institutions; the ABPAT was administered to Day Hospital patients during their stay in the Day Hospital for therapy, to Medical Oncology hospitalized patients as well as hospice-assisted patients after one of the daily visits by the physicians and nurses, to patients receiving home palliative care after one of the periodic visits by physician and nurse; ABPAT consists of 17 questions, one with two parts, for a total of 18 evaluable items. Questions are designed conceptually to assess aspects of BTP that are thought to be important outcomes. In addition, classification systems to be completed by clinicians were derived for both the aetiology and inferred pathophysiology of BTP. The development of the items in the tool and the conceptualization of BTP into this assessment tool were based on (1) published literature describing assessments of novel cancer BTP interventions; (2) what is known about the aetiology and pathophysiology of pain, existing pain assessment tools (e.g., McGill Pain Questionnaire); and (3) analysis of a large data set pooled from three clinical trials of a novel intervention for BTP. Questions were constructed through identification of eight domains that have been used to characterize clinically relevant features of BTP: relationship to baseline pain, location, intensity, quality, duration, frequency, predictability, response to medication. The ABPAT has also modules to be fulfilled by the clinician concerning demographics, extent of underlying disease and medications used (Hagen et al., 2008). ABPAT gathered content and construct validity evidence using a Delphi process involving an expert panel review, followed by a think-aloud process involving patients with cancer-related BTP, providing initial validation of the tool.

The Italian version of ABPAT was obtained by means of the guidelines for the process of cross-cultural adaptation of self-report measures (Beaton et al., 2000). Two independent Italian native speaker translators were responsible for the translation of the original questionnaire from English to Italian (one nurse and one Italian teacher); subsequently, the two translations were discussed and integrated into an Italian version. The preliminary Italian version was then blind back-translated in English by two separate English native speaker (one English teacher and one business consultant); then the two back-translated versions were synthesized. A panel of two medical oncologists, two physicians devoted to palliative medicine and four oncological nurses then reviewed the final Italian version. These experts worked independently with the aim of assessing the appropriateness of the

translation and obtaining a consensus on any ambiguity of the meanings attributed to individual words as well as the comprehensibility of the different items. All recommendations have been adopted to define and contextualize the translation and adaptation in the context of the Italian vocabulary. This revision lead in the item Q9 ('Is there anything that triggers this breakthrough pain?'), to translate 'movement in bed' as 'movivento', differently from the literal translation of the sentence 'muoversi nel letto', and in the item Q12 ('In the past 24 h, how much relief had your breakthrough pain medication provided for this breakthrough pain?') to reverse the order of the answer options from 'complete relief' to 'no relief', in order to match with the order of the options of the item Q13, which ranges in the original version from 'very satisfied' to 'very dissatisfied'. Lastly, the Italian version of ABPAT was administered to 30 patients meeting all the inclusion/exclusion criteria, recruited from three of the centres taking part to the study, by well-trained nurses; after completing the questionnaire, all these patients were interviewed. In particular, they were asked: if questions were clear and easily understandable, if the instrument appeared exhaustive in exploring the phenomenon, if precompiled answers to the questions had always been exhaustive, if they felt to have been able to express themselves fully or they would have preferred other options for answers. All the patients answered positively to the questions raised in the interviews; the only remark, expressed by two of them, was that items Q12 and Q13 appeared very similar.

Procedures

Each patient underwent a baseline evaluation in order to verify the eligibility for the study and was enrolled after signing the informed consent.

Two healthcare professionals examined all patients enrolled on a single day; the first was the physician who completed the ABPAT part concerning medical evaluation; additionally the physician evaluated the intensity of BTP before BTP drug administration and BTP relief after BTP drug administration. Data about primary site of the disease, presence of metastases and their location, drugs administered for the treatment of both background pain and BTP episodes and ECOG (Eastern Cooperative Oncology Group) performance status were obtained from medical records.

A second healthcare professional, represented by a nurse, was then involved in order to help patients to clarify any doubt in fulfilling the appropriate section of the ABPAT; this procedure, on the average, requested 15 to 20 min to be accurately performed.

Additionally, patients were asked to evaluate the intensity of BTP before BTP drug administration and BTP relief after BTP drug administration by means of a 0 to 10 NRS and to answer to two further questions: 'Were all questions clear and easily understandable?'; 'Do you think the questions allowed to explain extensively your BTP problem?'

In order to guarantee homogeneous and standardized procedures, five preparatory meetings were organized in which at least one physician and one nurse from each participating centre attended the meetings. A special emphasis was dedicated to the definition of BTP and the different subtypes of BTP; it was defined that BTP might be considered an episode of severe pain flare in a patient treated with major opioids for analgesic purpose, with adequately controlled background pain, adequate compliance to the treatment and no more than four episodes of such pain flares throughout the day (Gatti et al., 2012). All protocol procedures were clearly exposed and discussed.

Statistical analyses

Data were collected in a database and processed by specific software for statistics (IBM SPSS Statistics 20, Chicago, IL, USA). Common descriptive statistics were used for the computation of

frequencies within the different items. Agreement between physician and patients' ABPAT-based evaluation of BTP intensity and relief was assessed by means of correlation measure (Pearson's *r*). All statistical tests were two-sided; statistical significance was set at $p < 0.05$.

Results

Patient characteristics

Of the 260 screened, a total of 249 subjects [130 (52.2%) males and 119 (47.8%) females] were included in the study. Seven patients were excluded because clinical conditions did not allow them to perform the procedure with adequate carefulness, three because of side effects of the analgesic treatment consisting in transient drowsiness and mental confusion, one because of refusal. The 30 subjects who were recruited for the test of the prefinal version of the Italian version of the questionnaire were not included. Patients' characteristics are summarized in Table 1. Patients were recruited in seven different oncology or palliative care centres; 170 (68.3%) were recruited among patients referred to daily clinic for chemotherapy or molecular targeted therapies, 30 (12%) hospitalized in Medical Oncology divisions, 37 (14.9%) while they were receiving palliative treatment at home and 12 (4.8%) palliative care in hospice facilities. All patients included in the evaluation of the results completed the assessment by the ABPAT.

Table 1. Patients' characteristics

Variable	***n°***	**%**
1. ECOG, Eastern Cooperative Oncology Group. 2. [a] Patients could have multiple metastatic sites.		
Gender		
Males	130	52.2
Females	119	47.8
Age (mean ± standard deviation)	68.7 ± 11.08	
Minimum–maximum	33–78	
ECOG performance status		
0	53	21.3
1–2	140	56.2
3–4	56	22.5
Setting		
Day Hospital	170	68.3

Table 1. Patients' characteristics		
Variable	***n°***	**%**
Medical Oncology division	30	12.0
Home palliative care	37	14.9
Hospice	12	4.8
Primary sites of cancer		
Breast	53	21.3
Lung	39	15.7
Colon-rectum	30	12.0
Prostate	24	9.6
Pancreas	19	7.6
Kidney	7	2.8
Ovary	6	2.4
Stomach	5	2.1
Oesophagus	5	2.1
Uterus	4	1.6
Other sites	57	22.9
Metastases		
Yes	212	85.1
No	37	14.9
Sites of metastases[a]		
Liver	85	40.1
Lung	79	37.3
Bone	75	35.4
Limp nodes	68	27.3

Table 1. Patients' characteristics		
Variable	***n°***	**%**
Peritoneum	31	12.4
Brain	25	10.0
Pelvis	23	9.2
Adrenal glands	15	6.0
Skin	8	3.8

Background pain and BTP characterization

The average background pain intensity of the entire cohort of patients was 5.2 ± 2.1 and average pain duration was 18.2 ± 8.7 weeks; 72% of patients had somatic pain, while 28% had visceral pain, additionally 32% presented also neuropathic pain. In almost every patient, the cause of pain was tumour-related. The most common anatomical sites of pain were abdomen, lower back, thorax, lower limbs and shoulders, with other sites reported in less than 10% of cases. All patients were treated for background pain with major opioids, according to World Health Organization ladder step 3, being oxycodone the most used drug; adjuvant drugs were administered to more than a half of patients, including steroids, antidepressants and anticonvulsants (Table 2). All patients received a rescue dose of a major opioid for the treatment of BTP episodes. Drugs used for BTP included immediate-release morphine, taken orally (112 patients – 44.9%); immediate-release morphine administered subcutaneously (21 patients – 8.4%); oral transmucosal fentanyl citrate (32 patients – 12.9%), fentanyl buccal tablets (26 patients – 10.4%), sublingual fentanyl (25 patients – 10%), fentanyl pectin nasal spray (24 patients – 9.6%) and intranasal fentanyl spray (nine patients – 3.6%).

Table 2. Characteristics of background pain and analgesic treatment		
Variable	***n°***	**%**
1. [a] Multiple responses were possible.		
Pain intensity (mean ± standard deviation)	5.9 ± 2.1	
Pain duration (weeks)	18.2 ± 8.7	
Cause of pain		
Tumour	226	90.8
Treatment	10	4
Other	13	5.2

Table 2. Characteristics of background pain and analgesic treatment		
Variable	***n*°**	**%**
Anatomical site[a]		
Abdomen	107	42.9
Lower back	71	28.5
Thorax	62	24.9
Lower limbs	41	16.4
Shoulders	21	8.4
Other	16	6.5
Analgesic drugs for background pain		
Oxycodone (oral)	102	40
Fentanyl (transdermal)	53	21.3
Morphine (oral)	39	15.7
Hydromorphone (oral)	20	8.0
Morphine (intravenous)	21	8.4
Buprenorphine (transdermal)	14	5.6
Adjuvant drugs		
Steroids	132	53.0
Antidepressants	39	15.7
Anticonvulsants	22	8.9

Of the entire cohort, 184 patients (73.9%) had a background pain ≤4 on a 0 to 10 NRS; the others were not considered for the further analyses because of not adequately controlled background pain. Detailed characteristics of BTP in evaluable patients are summarized in Table 3.

Table 3. Characteristics of breakthrough pain (BTP) in 184 patients with background pain from ≤4 (0–10 numeric rating scale)		
Variable	***n*°**	**%**

Table 3. Characteristics of breakthrough pain (BTP) in 184 patients with background pain from ≤4 (0–10 numeric rating scale)

Variable	***n*°**	**%**
Number of episodes during the last 24 h		
0	10	5.4
1–3	168	91.3
> 4	6	3.3
How BTP was		
Usual	85	46.2
Better	56	30.4
Worse	43	23.3
Time from onset to end of episode (min)		
0–10	4	2.2
10–30	125	67.9
> 30	55	29.8
Time from onset to peak intensity		
0–10	65	35.3
10–30	93	50.5
> 30	10	5.4
It's hard to say exactly when it started	16	8.7
Predictability		
Never	86	46.7
Rarely	35	19.0
Sometimes	25	13.6
Often	27	14.6
Always	11	5.9

Table 3. Characteristics of breakthrough pain (BTP) in 184 patients with background pain from ≤4 (0–10 numeric rating scale)

Variable	***n*°**	**%**
Relationship with background pain		
Brief flare up of baseline pain	108	58.7
Different from baseline pain	67	36.4
Not sure	9	4.8
Last BTP event		
Today	165	89.6
Yesterday	19	10.4
Before then	0	0
Maximum intensity of pain		
Mild	15	8.2
Moderate	11	5.9
Severe	158	85.8
Location		
Lower limb	42	22.8
Thorax	35	19.0
Abdomen	29	15.7
Lower back	18	9.7
Upper back	14	7.6
Shoulders	13	7.1
Upper limb	13	7.1
Hips	11	5.9
Head and neck	9	4.8
Quality of BTP		

Table 3. Characteristics of breakthrough pain (BTP) in 184 patients with background pain from ≤4 (0–10 numeric rating scale)

Variable	***n*°**	**%**
Throbbing	45	24.5
Stabbing	24	13.0
Cramping	31	16.8
Hot-burning	44	23.9
Heavy	22	12.0
Splitting	13	7.1
Sickening	13	7.1
Punishing-cruel	14	7.6
Shooting	23	12.5
Sharp	39	21.2
Gnawing	7	3.8
Aching	21	11.4
Tender	2	1.1
Tiring-exhausting	8	4.3
Fearful	4	2.2
Other	5	2.7

BTP treatment efficacy

The mean time for relief from BTP was 29.89 ± 19.48 min (range 3–75). Evaluation of relief from BTP by patients showed a statistical significance of $p = 0.0001$, being the mean NRS prior to rescue dose administration of 7.86 ± 1.97 and the mean NRS after rescue dose administration of 2.82 ± 1.98.

Concerning patients' satisfaction about relief from BTP medication, 18 (9.8%) reported no relief, 22 (11.9%) slight relief, 63 (34.2%) good relief, 59 (32.1%) very good relief and 22 (11.9%) complete relief. All patients received at least one time the BTP medication in the previous 24 h before filling the questionnaire. Patients' satisfaction from BTP medication was as follows: 28 (15.2%) were very satisfied, 42 (22.8%) moderately satisfied, 32 (17.4%) slightly satisfied, 20 (10.9%) neutral, 22 (11.9%) slightly not satisfied, 24 (13%) moderately not satisfied and 16 (8.7%) not satisfied at all.

Patients' satisfaction with onset of pain relief was reported as very satisfied in 12 (6.5%), moderately satisfied in 23 (12.5%), slightly satisfied in 40 (36.9%), neutral in 30 (16.3), slightly not satisfied in 38 (10.9%), moderately not satisfied in 25 (8.2%) and not satisfied at all in 16 (8.7%).

Patients' compliance with ABPAT

Compliance with the assessment tool was investigated on the entire cohort of patients and showed that 231 out of 249 (92.8%) patients stated that questions were easily understandable and 217 out of 249 (87.1%) stated that the instrument allowed to explain extensively the BTP problem.

Correlation measures

A strong correlation between the assessment of BTP intensity prior to rescue dose administration by the physician or by the patient was found ($p = 0.001$) as well as between evaluation of BTP relief by medication by the physician or by the patient ($p = 0.0001$).

Discussion and conclusion

The ABPAT tool for BTP assessment underwent a validation during its development, but in our knowledge it has not been extensively assessed in clinical practice. In this multicentre study, we administered the ABPAT to a relatively large population of cancer patients suffering from chronic severe pain treated with major opioids, in order to test this instrument in the clinical setting.

The patient population included patients undergoing therapies for cancer as well as patients receiving palliative care only; therefore, almost all types of patients with cancer-related pain were considered, reflecting a real life world. Furthermore, the distribution of patients according to the primary site of cancer mirrored the frequencies commonly reported in literature.

The careful application of the process of cross-cultural adaptation developed by Beaton et al. should have resulted in making a final Italian version of the ABPAT by means of an appropriate instrument in order to get an equivalent tool as compared with the original version. As a matter of fact, this methodology is considered to allow data collection efforts to be the same in cross-national studies where there are no translated versions of a questionnaire.

Of the entire cohort of patients, only those with adequately controlled background pain were evaluated; for this purpose, we considered as adequately controlled a baseline pain intensity from 0 to 4 on a visual analogue scale, a more restrictive criterion than that used by Caraceni et al. in a recent study about QUDEI (Caraceni et al., 2012). That baseline assessment was performed in accordance with the algorithm established by Portenoy et al. (1999), integrated into international recommendations about the management of BTP (Davies et al., 2009).

Worth noting is the significant number of patients with inadequate baseline pain control; this finding might trigger a more accurate pain evaluation in order to modify treatment before justifying an inappropriate administration of ‘on demand’ prescriptions and medications (Mercadante et al., 2004).

Our results indicate that ABPAT was consistent concerning patient–physician correlation measures; as well as acceptability, with more 90% of patients declaring that questions were easily understandable. Moreover, a large majority of patients stated that the instrument was able to exhaustively investigate their BTP problem.

It is of concern that almost 80% of the patients stated a good relief from BTP medication, data confirmed by the dramatic decrease of BTP intensity after rescue dose administration, but only

55.9% were satisfied concerning the time to the onset of pain relief. A possible explanation of this phenomenon is that almost 50% of patients received treatment with immediate-release oral morphine as treatment for BTP episodes. Oral immediate-release morphine sulfate indeed has a time to onset of analgesia of approximately 30 min, takes 1.1 h to achieve maximal plasma concentration and has a half-life of approximately 2 h (Smith, 2013); therefore, the pharmacokinetic profile of this agent does not match the dynamics of BTP, since BTP reaches its maximum intensity within few minutes and is characterized by a mean duration of 30–60 min (Caraceni et al., 2013). This hypothesis is confirmed by the finding that the mean time for the beginning of relief from BTP in our patient population was 29.89 ± 19.48 min. In light of these data, rapid-onset opioids are likely to represent a more appropriate treatment of BTP episodes, since these drugs are characterized by pharmacodynamics reflecting the features of the pain being treated, due to the rapid effect, clinically observable 10–15 min after drug administration and the short duration of action (Mercadante, 2012).

ABPAT revealed to be very effective in pointing out the characteristics of BTP, but more relevantly, the appropriateness of the treatments for this phenomenon, through well-tailored questions as well as quantitative measures. It can be therefore stated that ABPAT may be a very important and useful tool for the evaluations of BTP treatment outcomes. Since BTP is known to be associated with more severe pain and more impairment of quality of life (Portenoy et al., 1999; Knudsen et al., 2011) as well as significant physical, psychological and economic burdens on patients and their productive life (Fishbain, 2008), it is very important to focus the attention on an appropriate management of BTP, avoiding scarcely effective treatments.

The so-called rapid-onset opioids have been developed specifically for the treatment of BTP and five of them are commercially available in Italy; many studies, including phase III registrative studies, which evaluated the efficacy of these drugs assessed the treatment outcomes with simple numeric scales (i.e., relief expressed on a 5-point categorical scale of relief expressed or 0% to 100%, evaluated at different times from administration) (Farrar et al., 1998; Coluzzi et al., 2001; Portenoy et al., 2006, 2010; Kress et al., 2009; Rauck et al., 2009, 2010). On the basis of the results of the present study, the ABPAT could be considered an appropriate tool to evaluate the efficacy of investigational drugs in the context of clinical trials, due to the accuracy in the description of BTP prior and after administration of BTP medication, consisting both in questions and numeric measures; furthermore, the patient's evaluation is paired together with that of the physician.

On the other hand, the ABPAT could be used in order to perform periodic assessments of the efficacy of BTP analgesia; the above-documented use of not appropriate BTP treatments, such as immediate-release oral opioids, and the necessity to use correctly the new BTP drugs provide further room for this type of assessment.

ABPAT is a complex and time-consuming tool and cannot be considered the ideal tool to BTP assessment in the routine clinical practice. It is likely that BTP can be assessed with simpler tools, like that developed by Webber et al. (2014) which are well accepted by patients, and ABPAT may be used as a second-level tool.

In conclusion, for the first time, this study provides evidence about acceptability and effectiveness of the ABPAT for the assessment of BTP and its treatment outcomes as documented in a relatively large cohort of cancer patients suffering from severe chronic cancer-related pain. The inclusion of patients known to have already experienced BTP prevented us to perform validity measures of the tool, but it must be taken into account that the ABPAT underwent a validation process during its development. The ABPAT could represent a very effective tool in outcome evaluation of BTP treatment efficacy in the context of clinical trials as well as in periodic assessment of appropriateness of therapy.

Author contributions

The authors R.S. and A.S. were mainly responsible for conducting this study. R.S., A.B., R.R. and A.S. projected the study and its design. R.S., S.C., P.L., P.L.G., I.G., S.P. and M.T. performed the translation procedure and the revision about clinical appropriateness of the Italian version of the ABPAT as well as data collection. A.S. and A.B. prepared and revised the manuscript and performed statistical analyses. G.V.S. critically reviewed and commented on the manuscript. All authors contributed to the conception and design of the study and took an active part in the discussion and interpretation of the findings. All authors read and approved the final manuscript.

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