Clinical pharmacist in oncology palliative medicine: drug compliance and patient adherence

Martina Novosadova,1 Stanislav Filip,2 Veronika Molnarova,2 Peter Priester,2 Dagmar Svecova2

ABSTRACT
Objectives Most patients in palliative oncology care are polymorbid and thus treated with multiple drugs. The therapeutic effect and safety of these drugs can be compromised by drug/drug interactions, but also by wider problems such as polypharmacy and compliance. The clinical pharmacist is, therefore, responsible for risk analysis and prevention. Our prospective open label non-randomised clinical study evaluated the importance of a clinical pharmacist in the palliative care team.

Methods A total of 250 outpatients were included in the clinical study: 126 women (50.4%) and 124 men (49.6%), with a mean age of 71 years (range 21–94 years; SD 11.9). The patients had the performance status scale 0–3 (X = 2). Clinical examinations were performed on a monthly basis (n=509 check-up visits). The clinical pharmacist prepared an educational chart for all medications used after each visit and evaluated any drug-related problems. Follow-up was 6 months.

Results This study found a significant association between drug-related problems and polypharmacy (p<0.001). A low risk of drug-related problems was observed during the initial visit, that is, 68 female (27.2%) and 25 male (10.4%) patients. A greater clinical-pharmaceutical risk was observed among the patients taking antihypertensive drugs (p=0.003) and/or beta blockers (p=0.048).

Conclusion This study confirms the essential role of a clinical pharmacist in oncology palliative care. The feedback obtained from the patients showed a notable improvement in their quality of life. Further, this clinical study confirmed the need for a personalised approach in palliative oncology care.

INTRODUCTION
Due to the nature of the underlying disease, oncological treatment requires a multidisciplinary approach. During the course of treatment, we encounter a period of curative intention, which is sometimes hampered by the limited possibilities of active antitumour treatment and...
thus it has to be terminated. The purpose of oncology palliative care is to preserve the best possible quality of life for the patient, often by slowing the activity of the cancer tumour and ameliorating its associated symptoms. A wide range of factors apply during the transition from curative to palliative oncological treatment, some of which lie beyond the field of healthcare, for example, social care. The solution of problems associated with this transition is only possible through a multidisciplinary approach.1,2

Therefore, palliative care is conceived as a multidisciplinary endeavour for terminally ill patients. Although its composition and ideal timing for the necessary interventions remains a matter of discussion.2,3 Regardless, the members of the palliative care team are able to comprehensively address the needs of these patients, sustaining their quality of life and preventing or minimising, the complications derived from cancer and its treatment. Because of its personalised nature, palliative care identifies the needs of the patient from the start. Further, palliative oncology care is often ambulatory, which greatly influences its overall quality.1,4

Previous models concerning the optimal composition of the palliative care team have been extensively described, often including oncologists, social workers, psychologists and specialised nurses. However, a lesser effort has been dedicated towards the role of clinical pharmacists, whose inclusion cannot be understated, especially in ambulatory care, where greater cooperation and communication between team members is needed.5

A clinical pharmacist has in-depth knowledge of drug actions, mechanisms, adverse effects and interactions, thus making them an experienced element in the correct prescription, administration and disposal of therapeutic drugs, providing invaluable advise on the selection of suitable drug forms, for example, enteral, preparation of specially mixed dosage forms, identification of drug duplications and recommend alternative medication.6–8 Moreover, clinical pharmacists must adhere to a professional framework whose conditions are dictated by the legislative and ethical standards followed in most countries,9 including the Czech Republic.10–12

An oncology palliative care patient is in a fragile state. They have already gone under curative treatment, that is, chemotherapy, radiotherapy, immunotherapy, targeted therapy, hormonal treatment and possible combinations thereof. In addition, these patients may have polymorbid symptoms (diabetes, hypertension, heart, kidney, liver dysfunction, etc.). Therefore, the patients can be prescribed with a whole range of drugs unrelated to cancer. There are cases in which various symptoms can be manifested due to the combined treatment of cancer and non-tumour diseases, further deteriorating the patient’s health.13

The use of different drug groups is often associated with the risk of polypharmacy and non-compliance. In general, the patients who take multiple drugs display a higher risk of hospitalisation, mostly in direct relation with the quantity of drugs taken and their interaction within the body. Under a personalised approach, the clinical pharmacist is better able to detect and solve potential polypharmacy risks, thus making of their inclusion a fully preventive measure.14

This open, prospective and non-randomised clinical study evaluates the inclusion of clinical pharmacists in the palliative care team and their contribution towards diminishing or ameliorating the risk of polypharmacy and non-compliance in palliative oncology care patients. This report also describes the usefulness of individual educational tables clarifying the importance of symptom treatment, regimen adherence, compliance and treatment efficacy during ambulatory palliative care.

METHODS

Setting

This prospective open-label clinical study was conducted in the Department of Oncology and Radiotherapy (University Hospital in Hradec Králové, Czech Republic) by the palliative care team.

Participants and sampling period

The clinical study comprehended the period between March 2020 to March 2022. All of the patients provided their informed consent. The inclusion criteria involved the termination of active antitumour treatment with a curative goal. A total of 250 individuals, treated on an outpatient basis, were included in the study, of which 126 were female (50.4%; \( \bar{x} =71.8\pm11.9 \) years; range 21–94 years) and 124 were male (49.6%; \( \bar{x} =70.2\pm11.7 \); range 30–91 years). The Performance status scale (PS), measured according to ECOG (Eastern Cooperative Oncology Group), was estimated in 0–3 (\( \bar{x} =2 \)) at the start of the clinical trial. The most common type of cancer found in these patients was colorectal cancer (n=47; 18.8%) (table 1).

Design

The inclusion of the selected patients was done at the recommendation of the attending physician and with the consent of the patient. The first visit was established at 1 or 2 months after ending curative or palliative antitumour treatment. Other inclusion criteria required an ECOG PS of 0–3, and a life expectancy longer than 6 months, which was also the follow-up period. Outpatient clinical examinations were done on a monthly basis by a palliative oncology care specialist in cooperation with a clinical pharmacist (figure 1). The clinical pharmacist evaluated the patient’s medication based on the legislative standard for clinical pharmaceutical procedures covered by healthcare.15,16

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The used methodology for medication reconciliation in hospitalised patients, includes the following:

### Risk factor assessment
Comprehensive evaluation of the patient’s medication on admission to the medical facility. Risk assessment concerning drug-related problems (DRPs) following a graduation strategy, that is, low, medium or high risk (table 2).

### Plan preparation and recommendation
Preparing a pharmacotherapeutic plan for medication adjustment according to current or potential DRPs. The clinical pharmacist evaluated the results of his investigation and, in cooperation with the attending physician, evaluated the current pharmacological situation and contributed to the creation and updating of the palliative oncology care plan.

### Clinical pharmacy methodology
The initial examination included the revision of personal, medical and social data, as well as pharmacological anamnesis, followed by the evaluation of their current PS and medication regimen. All of the obtained data were logged in their medical records. The clinical pharmacist provided the patients with an educational chart containing important information regarding their medication (figure 2). This table had an interactive format from which the clinical pharmacist and patient could set a baseline for collaboration. The table was created on the basis of already published experiences of other authors and further modified on the basis of our experiences.17 This educational table was created after each check-up visit and given to the patient, usually within 48 hours, recording all of the used drugs, that is, systemic, subcutaneous, anti-coagulants, insulin therapy, etc. The clinical pharmacist would, in this manner, review the full medication regimen of the patient and determine the risk level of DRPs, suggesting alternative measures if necessary, that is, choice of drug (if there is evidence for indications), dose and form of the drug, length of treatment (eg, antibiotics), conditional drugs (eg, pain, nausea, constipation) and/or reduced medication for fragile, comorbid patients during disease progression or in terminal stage. These evaluations were recorded and organised in the form of a protocol by the clinical pharmacist, which was then submitted to the attending physician and added to the palliative oncology care plan.

### Quality of life
Quality of life was determined with an IPOS (Integrated Palliative Outcome Scale) questionnaire translated into Czech. The dimensions included were health status, physical function, pain, social function, vitality (energy and fatigue), general mental health and overall symptoms. The questionnaire was offered to the patients during their first visit and in a monthly basis after that. Participation was voluntary.

The IPOS questionnaire contains a total of 10 questions, most of which allow expanded answers. Question number 1 is designed to describe the main issues of the patient, hence it is not scored. Question number 2 evaluates how the disease affects the patient and their symptoms. Questions 3–9 address psychological, spiritual, communication and practical issues or concerns. Questions 6–8 look for more optimistic answers, thus running in opposite direction to the other questions. Question number 10 asks whether the patient required assistance to fill the questionnaire or managed to do so on their own. The questionnaire addresses a total of 22 individually scored items with multiple response options, that is, up to five different answers were available, of which only one was allowed. Special attention was set on items scoring 3 or more points. The total sum was used as a final IPOS score, ranging from 20 to 80 points and classified as follows: 1–20 (very good), 21–40 (good), 41–60 (bad) and >61 (very bad). The initial patient score was compared against their most recent, discussing the identified changes with them and adjusting the palliative oncology care plan as needed.

### Statistical analysis
Descriptive statistics are expressed as mean and SD (x ± SD), or frequency. The comparison of two independent samples involved a two-sample t-test. A Mann-Whitney test was used where the assumption of normality was not met. A one-way analysis of variance or Kruskal-Wallis test was used in cases of non-normal

<table>
<thead>
<tr>
<th>Table 1 Participants in the clinical study</th>
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<tbody>
<tr>
<td>Patients (n=250)</td>
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<tr>
<td>Female (n=126)</td>
</tr>
<tr>
<td>Average age 71.8 years (ranged 21–94 years)</td>
</tr>
<tr>
<td>Median 61 years</td>
</tr>
<tr>
<td>Male (n=124)</td>
</tr>
<tr>
<td>Average age 70.2 years (ranged 30–91 years)</td>
</tr>
<tr>
<td>Median 64 years</td>
</tr>
<tr>
<td>ECOG</td>
</tr>
<tr>
<td>Performance Status Scale (PS)</td>
</tr>
<tr>
<td>PS 0–3</td>
</tr>
<tr>
<td>Median 2</td>
</tr>
<tr>
<td>Diseases</td>
</tr>
<tr>
<td>Colorectal cancer 47 (18.8%)</td>
</tr>
<tr>
<td>Pancreatic cancer 36 (14.4%)</td>
</tr>
<tr>
<td>Breast cancer 16 (6.4%)</td>
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<tr>
<td>Stomach cancer 13 (5.2%)</td>
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<tr>
<td>Oesophageal cancer 11 (4.4%)</td>
</tr>
<tr>
<td>Liver cancer 11 (4.4%)</td>
</tr>
<tr>
<td>Renal cancer 9 (3.6%)</td>
</tr>
<tr>
<td>Prostate cancer 9 (3.6%)</td>
</tr>
<tr>
<td>Ovarian cancer 8 (3.2%)</td>
</tr>
<tr>
<td>Other tumours occurring in less than 3%</td>
</tr>
<tr>
<td>ECOG, Eastern Cooperative Oncology Group.</td>
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</tbody>
</table>
data distribution. Frequency was analysed using the Pearson $\chi^2$ test. Cross-correlation of two-interval variables was treated as Pearson correlation coefficient ($r$) or as Spearman’s $r$ in ordinal variables. Results with a $p<0.05$ were considered statistically significant. The data were analysed using IBM SPSS Statistics for Windows V.22.0 IBM).

**RESULTS**

The clinical pharmacist examined the patient’s overall condition, PS, pharmacological history and current medication regimen. A total of 509 checkups were performed, distributed as follows: 119 patients completed 2 visits (47.6%), 71 patients completed 3 visits (28.4%), 35 patients completed 4 visits (14%), 17 patients completed 5 visits (6.8%), 7 patients received 6 visits (2.8%), 4 patients received a total of 7 visits (1.6%), 3 patients received a total of 8 visits (1.2%) and 2 patients received a total of 9 visits (0.8%).

**Polypharmacy evaluation**

Drugs with topical effects (e.g., inhalation therapy, ointments) or nutritional support are typically excluded from the current definition of polypharmacy. With this in consideration, polypharmacy was recorded in 137 patients (54.8%) in a range of 1–21 systemic drugs ($\bar{x} = 8$) (figure 3). A detailed analysis found that 188 patients (75.2%) used analgesics, whereas that 170 (68%) used antihypertensives and 127 (50.8%) used antiulcerants (figure 4). Age is often associated with polymorbidity requiring therapy, such as heart failure, hypertensive disease, diabetes, thyroid hormone replacement therapy, among others. This study revealed relevant information regarding clinical-pharmaceutical
risk (CF risk). At the time of the first visit, the correlation between age and the number of drugs used per patient was evaluated, finding a null association between these two variables (p=0.280). However, CF risk was strongly linked with age (p=0.004). Further, the patients using multiple drugs due to the progressive symptoms of cancer and its treatment were at greater risk of developing DRPs (p<0.001).

**Medication risk analysis**

The medication regimen of each patient was logged in their medical records and the hospital information system after each visit. During the initial visit, 68 (27.2%) patients were in the low-risk category, 153 (61.2%) were at medium-risk category and 26 (10.4%) patients were in the high-risk category. A recommendation was made by the clinical pharmacist for the latter patients and forwarded to the attending physician, suggesting the adjustment of the current medication regimen to reduce this risk. These recommendations were made within 48 hours and the medic had to inform the patient of the change made in their treatment plan and medication schedule. Disease-related symptoms, DRPs and current treatment were all recorded in the case of high-risk patients. Interestingly, DRPs were

<table>
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<tr>
<th>Table 2</th>
<th>Classification of risk factors</th>
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<tr>
<td>Risk factors</td>
<td>Specification</td>
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<tr>
<td>---</td>
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</tr>
<tr>
<td>Polypharmacy</td>
<td>When there are eight or more systemic drugs used by the patient</td>
</tr>
<tr>
<td>Drugs with narrow therapeutic window</td>
<td>Vancomycin, aminoglycoside antibiotics, phenytoin, carbamazepine, valproic acid, warfarin, therapeutic anticoagulation, cyclosporine, everolimus, tacrolimus, temrolimus, digoxin and theophylline, among others</td>
</tr>
<tr>
<td>Drugs with high interaction potential</td>
<td>Those described in the literature as serious or very serious according to current classification</td>
</tr>
<tr>
<td>Renal insufficiency</td>
<td>When the value of glomerular filtration is &lt;60mL/min</td>
</tr>
<tr>
<td>Hepatic insufficiency</td>
<td>Albumin &lt;20 g/L, ALT, AST, GMT, bilirubin three times above the upper normal limit</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>PDK and/or insulins</td>
</tr>
<tr>
<td>Pancytopenia</td>
<td>Significant changes in haematological parameters</td>
</tr>
<tr>
<td>Coagulopathy</td>
<td>Significant blood clotting disorder</td>
</tr>
<tr>
<td>Immunosuppression</td>
<td>Immunosuppression goes beyond 7 days systemic corticosteroids or another immunosuppressants</td>
</tr>
<tr>
<td>Active antitumour therapy</td>
<td>Cytostatics, hormonal therapy, immunotherapy, targeted treatment</td>
</tr>
<tr>
<td>Specific care</td>
<td>When the patient is in intensive care, epilepsy, Parkinson’s disease, etc</td>
</tr>
</tbody>
</table>

ALT, alanine transaminase; AST, aspartate transaminase; GMT, glutamyl transferase; PDK, Peroral antidiabetic drug.

**Figure 2** Educational table used pharmacist. SOS, Si Opus Sit (if necessary, in case of need).
found in only 8 (5.2%) medium-risk patients. Regardless, a protocol was immediately prepared to adjust the pharmacotherapy and treatment plan for both risk categories. In contrast, DRPs requiring resolution were recorded in only 2 (2.9%) low-risk patients. Pharmacotherapeutic adjustment for high risk patients was often recommended when drugs with a narrow therapeutic window (p=0.009) and/or anticoagulants (p=0.011) were being used, with the risk of DRPs increasing significantly when drugs with high interaction potential were also involved (p=0.007).

**Drug risk analysis**

The most commonly used drugs were analgesics (n=188 patients), which were distributed as follows: 53 (28.2%) non-opioid analgesics, 31 (16.5%) opioid analgesics and 104 (55.3%) patients used a combination of opioid and non-opioid analgesics. Antiulcer drugs were used by 127 (51.4%) patients. Antihypertensives were used by 168 (68%) patients; of these, 69 (27.9%) used only one drug and 99 (40%) used a combination of two or more antihypertensive drugs (figure 3). In this regard, the patients under antihypertensive therapy were often...
considered at medium and high CF risk ($p=0.003$), which was directly correlated with the number of drugs taken. The previous finding notwithstanding, this study found a greater number of patients at high CF risk under treatment with $\beta$-blockers ($p=0.048$). Further, these $\beta$-blockers increased the odds of developing medium vs low CF risk by 3.6-fold ($p=0.001$) and high versus low CF risk by 5.2-fold ($p=0.002$).

Quality of life

In this study, 146 (58.4%) patients were evaluated using the IPOS questionnaire. After the first visit ($V_{\text{first}}$), 27 (18.4%) patients declared their health and psychosocial status as very good, 47 (32.3%) as good, 40 (27.4%) as bad and 32 (21.9%) as very bad. At the time of their last visit ($V_{\text{last}}$), 20 (13.7%) patients considered their health and psychosocial status as very good, 41 (28.2%) as good, 47 (32.2%) as bad and 38 (26%) as very bad. The IPOS score showed no significant difference between $V_{\text{first}}$ and $V_{\text{last}}$ regarding overall health and psychosocial parameters (Table 3). It must be noted that, according to the patients’ feedback, the presence of a clinical pharmacist improved the perception of their quality of life, and their work was positively evaluated across the board.

DISCUSSION

The quality of curative and palliative cancer treatment depends on the optimal composition of the medical team and the correct timing of palliative oncology care.2–4 The inclusion of a clinical pharmacist in the palliative team, especially for ambulatory care, minimises the risk of DRPs by regulating polypharmacy and

### Table 3 Quality of life analysis of palliative oncological care patients

<table>
<thead>
<tr>
<th></th>
<th>First visit ($V_{\text{first}}$)</th>
<th>Last visit ($V_{\text{last}}$)</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very good</td>
<td>Mean (±SD) $n_{\text{first}}=27$ (18.4%)</td>
<td>Mean (±SD) $n_{\text{last}}=20$ (13.7%)</td>
<td>0.239</td>
</tr>
<tr>
<td>Good</td>
<td>Mean (±SD) $n_{\text{first}}=47$ (32.3%)</td>
<td>Mean (±SD) $n_{\text{last}}=41$ (28.1%)</td>
<td>0.331</td>
</tr>
<tr>
<td>Bad</td>
<td>Mean (±SD) $n_{\text{first}}=40$ (27.4%)</td>
<td>Mean (±SD) $n_{\text{last}}=47$ (32.2%)</td>
<td>0.375</td>
</tr>
<tr>
<td>Very bad</td>
<td>Mean (±SD) $n_{\text{first}}=32$ (21.9%)</td>
<td>Mean (±SD) $n_{\text{last}}=38$ (26%)</td>
<td>0.303</td>
</tr>
</tbody>
</table>

IPOS questioners (n=146 patients). Questioners score ranging from 20 to 80 points and classified as follows: 1–20 (very good), 21–40 (good), 41–60 (bad) and >61 (very bad). IPOS, Integrated Palliative Care Outcome Scale.

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promoting drug adherence. It is known that the risk of polypharmacy and non-compliance increases with the number of drugs used and the age of the patient. In this study, polypharmacy was noted in 137 (54.8%) patients, which is consistent with other authors.18 19 The age and gender of the patients must be considered during risk assessment.20 In general, the medication regimen of older patients (≥65 years of age) needs to be evaluated under Beer’s criteria21 to better identify the drugs and doses that should be used with caution in elderly patients, for example, sedatives/hypnotics, anticholinergics or the combination of ≥3 drugs acting on the central nervous system (CNS) (ie, antiepileptics, opioids, selective serotonin reuptake inhibitors - SSRIs, serotonin and norepinephrine reuptake inhibitors - SNRIs, benzodiazepines and hypnotics). Elderly oncology patients also have an increased risk of gastrointestinal tract (GIT) bleeding when treated with a combination of corticosteroids, anticoagulants, antiplatelet active secondary prophylaxis or non-steroidal anti-inflammatory drugs (NSAIDs) during analgesia. Considering that the average age of the included patients was 71.4 years, every clinical evaluation was performed using Beer’s criterion.

The need to predict potential risks has prompted the development of diverse methodologies to improve the quality of palliative care, one of such includes the active participation of a clinical pharmacist in the preparation and implementation of the treatment plan.22 23 In this clinical study, we created a methodology using educational tables with a written evaluation by the clinical pharmacist, who gave it to both the attending physician and the patient during the next outpatient visit. This methodology24 25 confirmed the importance of a personalised approach for the patients under long-term multidrug therapy, for example, analgesics, antiemetics, antidiarrheics, antidepressants, etc. This method provides the patient with basic information regarding their medication and how to use it to maximise its therapeutic effect and minimise potential side effects. This approach also seeks to educate the patient regarding drug dosage, schedule and adherence. The cooperation between the patient, their family and the general practitioner are essential in an outpatient setting. Further, the clinical pharmacist must evaluate the drug dose and form, detect unsuitable medication and determine the length of treatment. Moreover, the clinical pharmacist can recommend reduced medication for fragile patients during disease progression or in terminal stage.26–28

The treatment of pain, hypertension, dyspeptic problems and nutritional issues is an important aspect of palliative oncology care.29–31 The decision to discontinue lipid-lowering and antihypertensive medications is relatively simple. Antithrombotic therapy can be stopped in low-risk primary prevention patients, but not in those at high risk. Discontinuing heart failure medication can exacerbate its symptoms and should only be considered in the last weeks of life. However, the situation is different with pain management drugs and with those that maintain a given condition under control. These issues are best documented in direct communication with the patient, where their experience and satisfaction with the treatment can be assessed. In this analysis, 119 patients (47.6%) showed up for at least one repeat check-up over the evaluation period. Of these, 87 (73.1%) claimed to be satisfied with the educational chart; however, there is no record in this regard from 32 patients (26.9%). The immediate communication, that is, ≤48 hours, between the clinical pharmacist and the attending physician is essential; otherwise, the patient’s life might be endangered in urgent cases. In this study, only 8 (6.7 %) cases related with medication required urgent solution, the most severe of which were associated with established hypercalcaemia and coagulation disorders.

From the point of view of a clinical pharmacist, there is a clear difference in risk perception between a hospitalised patient and an outpatient, even if they are being treated with the same medication. For instance, a hospitalised patient under a combination of drugs prolonging the QTc interval can be easily evaluated, for example, ECG, K, Mg, Ca disorders and kidney disease are monitored. This is very difficult to accomplish with an outpatient; therefore, the medication context must always be considered (eg, diuretics, fluid intake). The same scenario applies when a combination of drugs with serotoninergic potential is being used for example, SSRIs antidepressants, paracetamol plus tramadol or fentanyl plus setron (antagonists 5-HT3 receptors), etc. Depending on the number of tramadol/fentanyl/setron tablets that they have to take during the day, the patient might be at risk of developing serotonin syndrome. This condition can be quickly detected and corrected in the hospital; this is not the case for an ambulatory patient. Thus, clinical pharmacists perceive the latter at higher risk of developing DRPs.6 20 Elderly and frail patients with cancer are also at higher risk of developing or exacerbating hyponatraemia or SIADH due to the combination of tramadol, SSRIs, SNRIs, diuretics and carbamazepine (as antiepileptics or analgesics for neuropathic pain). It cannot be understated that all of these issues can be quickly detected and corrected in hospitalised patients but not so in outpatients.25 31

The quality of life, as evaluated through the IPOS questionnaire,32 enabled an objective health status assessment of the patients included in this study.33 The results obtained thereby suggest the crucial role of clinical pharmacists, as mastering the personalised procedures for palliative outpatients directly correlates with the efficacy of the provided care and thus their quality of life.34 35

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Clinical implication
The results of our pilot study support the collaboration of the clinical pharmacist in the preparation of the palliative oncology care plan. Some clinical studies recommend the early inclusion of a clinical pharmacist.²⁸ Our pilot study tries to address these problems mainly by proposing the early inclusion of patients in the programme of good pharmacological practice.¹⁵¹⁶ Further research is needed to precisely determine the correct timing of intervention by the clinical pharmacist, the methodology of the intervention and the programme of wider collaboration of the palliative care team.⁹²²

Study limitation
Our study was the first to investigate how to optimise clinical pharmacist intervention in ambulatory palliative oncology care. It should be mentioned that the study was hampered by the low number of enrolled patients, who had three visits in 28.4% and five visits in only 6.8% of patients. Based on our additional unpublished experience, a number of controls more than five appears to be optimal for evaluation. However, the distribution of patients in our study between groups according to the frequency of completed controls was heterogeneous; therefore, randomisation was not possible due to the small number of patients who completed more than five controls. In our study, a high percentage of acceptance of the recommendation by both the doctor and the patient was also recorded. Non-compliance was less than 12%. We will further evaluate this data and it will be part of the analysis related to the cost benefit assessment. We will prepare an analysis in this regard. Regardless, the obtained results are informative and indicate the need for a prospective randomised trial involving a larger number of patients.

CONCLUSION
The results shown here support the involvement of clinical pharmacists in the palliative care team. Their capacity for risk analysis and preventive action were major contributions. There is no doubt that the personalised approach and methodology presented in this pilot study enabled the administration of precise pharmacological interventions to improve or maintain the best possible quality of life for palliative oncology care patients.

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Contributors
The study was predominantly conceived by MN and SF. The data were collected by VM, PP and DS, analysed by MN and SF and interpreted by all authors. MN and SF wrote the first draft, and all authors contributed to its critical revision and approved the final manuscript. SF is responsible for the overall content as the guarantor.

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Competing interests
None declared.

Patient consent for publication
Not applicable.

Ethics approval
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Data availability statement
Data available on request from the authors.

Supplemental material
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Original research