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RESEARCH ARTICLE

Potentially inappropriate prescribing in older adults with cancer receiving specialist palliative care: a retrospective observational study

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Abstract

Background Older adults (≥ 65 years) with cancer receiving palliative care often have other health conditions requiring multiple medications.

Aim To describe and assess the appropriateness of prescribing for older adults with cancer in the last seven days of life in an inpatient palliative care setting.

Method Retrospective observational study of medical records for 180 patients (60.6% male; median age: 74 years; range 65–94 years) over a two-year period. Medication appropriateness was assessed using: STOPPFrail, OncPal deprescribing guideline and criteria for identifying Potentially Inappropriate Prescribing in older adults with Cancer receiving Palliative Care (PIP-CPC).

Results 94.5% of patients had at least one other health condition (median 3, IQR 2–5). The median number of medications increased from five (IQR 3–7) seven days before death, to 11 medications on the day of death (IQR 9–15). The prevalence of PIP varied depending on the tool used: STOPPFrail (version 1: 17.2%, version 2: 19.4%), OncPal (12.8%), PIP-CPC (30%). However, the retrospective nature of the study limited the applicability of the tools. Increasing number of medications had a statistically significant effect on risk of PIP across all tools (STOPPFrail (version 1: 1.29 (1.13–1.37), version 2: 1.30 (1.16–1.48)); OncPal 1.13 (1.01–1.27); PIP-CPC 0.70 (0.61–0.82)).

Conclusion This study found that the number of medications prescribed to older adults with cancer increased as time to death approached, and the prevalence of PIP varied with the application of different tools. The study also highlights the difficulties of examining PIP in this patient cohort.

Keywords Aged · Cancer · Geriatric oncology · Older adults · Palliative care · Prescribing

Impact statements

- The number of medications prescribed to older adults with cancer in the last seven days of life in an inpatient palliative care setting increased as time to death approached.
- Some older adults with cancer received medications that were potentially inappropriate during their last week of life, such as lipid-lowering therapies, alpha-blockers for hypertension, proton pump inhibitors and H_2 antagonists.
- Interventions are needed to optimise medication prescribing and use in older adults with cancer in palliative care settings.

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Introduction

Cancer commonly affects the older population, with almost half of all cancer diagnoses worldwide occurring in older adults (≥ 65 years) [1]. There is an ever increasing demand for palliative care services due to a multitude of factors, including global demographic ageing and improved detection and treatment of chronic illnesses, such as cancer [2]. Palliative care is an approach to care that aims to improve the quality of life for patients with life-limiting illnesses [3]. It focuses on providing comfort to patients and their families by addressing the physical, psychosocial, and spiritual needs of patients [3]. Traditionally, palliative care was synonymous with end-of-life care, whereby it was delivered to relieve symptoms at the terminal phase of illness [4]. More recently, it has been shown that early integration of palliative care in the disease course can lead to significant improvements in symptom management, quality of life and mood [5, 6].

Older adults with cancer often have other health conditions, which require management with multiple medications [7, 8]. However, polypharmacy (≥ 5 medications) is also associated with physical and functional decline in older adults with cancer [9], and an increased risk of potentially inappropriate prescribing (PIP) [10]. PIP encompasses a range of suboptimal prescribing practices, including prescribing inappropriate medications (i.e. inappropriate doses, durations, medications associated with high risks of adverse drug events (ADEs) and underprescribing (i.e. omission of medications for specific clinical indications) [11, 12]. Optimising medication regimens requires clinicians to consider multiple factors including treatment goals and life expectancy [13–15]. As life expectancy decreases, the goal of prescribing typically moves from disease prevention and treatment, to controlling symptoms (e.g. pain), and improving an individual's quality of life [16]. This change in the primary focus of care can lead to medications becoming potentially inappropriate as patients transition to the terminal phase of illness whereby the associated risks of the medication may outweigh the benefits.

While the topic of PIP in older adults with cancer is receiving increased attention [17], there are various issues that need to be addressed. A recent scoping review found that only a minority of studies assessed PIP in patients receiving palliative care, and that the prevalence of patients receiving ≥ 1 PIP ranged from 15 to 92% [16]. The review also highlighted that several studies used tools that are not specific to palliative care populations (e.g. Beers criteria) [16]. The use of such tools outside of the intended population could result in the misclassification of medications as potentially inappropriate, where the medication may have an important role, such as managing symptoms experienced by patients towards end of life (e.g. pain, breathlessness).

Some progress has been made in recent years to develop tools that are specific to palliative care populations. Most existing tools focus specifically on medication deprescribing [18–20]. For example, STOPPFrail was developed to assist deprescribing in frail older adults with limited life expectancy [18, 20]. OncPal is a guideline that was specifically developed for deprescribing in palliative patients with cancer [19]. To ensure appropriate prescribing, it is also important to consider potential prescribing omissions (PPOs) of medications for symptom control at end of life. The PIP-CPC criteria (criteria for identifying Potentially Inappropriate Prescribing in older adults with Cancer receiving Palliative Care) were recently developed to identify PIP involving medications for symptomatic relief in older adults with cancer and limited life expectancy [21]. However, to date, the application of these tools to older adults with cancer has been lacking [16].

Aim

To describe and assess the appropriateness of prescribing for older adults with cancer in the last seven days of life in an inpatient palliative care setting. The specific objectives were to:

1. Describe the medications received during the last week of life in a cohort of older adults with cancer;
2. Identify the prevalence of PIP using three tools: STOPP-Frail (Version 1 and 2) [18, 20], OncPal [19] and PIP-CPC [21];
3. Determine the association between the presence of PIP and each of the following variables: gender, age, number of other health conditions and number of medications in the cohort of older patients with cancer.

Ethics approval

Ethical approval was granted by the University of Limerick Research Ethics Committee in December 2019 (REC reference: 143/19).

Method

Study design

A retrospective observational cohort study was conducted of medical records of older adults with cancer who received specialist palliative care in an inpatient palliative care setting.

Setting

The specialist palliative care centre served a population of 360,000 within the mid-western region of Ireland. The centre comprises a 30-bed specialist palliative care inpatient unit and also provides community services (home care service, specialist palliative care day unit and outpatient clinics).

Participants

Healthcare records of the following population were included in the analysis: older adults (≥ 65 years at time of death) with a primary diagnosis of cancer, who received inpatient specialist palliative care services through the palliative care centre in the final week of life. Participants included in this study were under the care of the inpatient palliative care unit prior to death at any time between January 1, 2017 and December 31, 2018.

Data collection

Hardcopy medical records of patients meeting the above inclusion criteria were identified and retrieved by staff members using the centre's electronic database. A specifically designed electronic pro-forma was developed and used by the researcher (MM) to collate all necessary information relating to patient demographics [gender, age, type of cancer(s) and other health conditions coded using ICD-classification system (ICD-10 Version: 2019)] and prescribed medications (date administered, drug name, dose, route of administration, frequency and indication, where available). The researcher pseudonymised all patients meeting inclusion criteria, by assigning them with a unique study identification code (e.g. PT001). Data collection commenced in February 2020. Due to the COVID-19 pandemic, data collection was temporarily suspended and subsequently concluded in June 2020.

Assessment of potentially inappropriate prescribing

The following tools were applied to the dataset: STOPPFrail (Version 1 [18] and 2 [20]); consists of 27 and 25 deprescribing criteria, respectively, for use in frail older adults with limited life expectancy), the OncPal deprescribing guideline [19]; consists of eight medication classes for deprescribing in palliative patients with cancer, and PIP-CPC criteria [21]; consists of 24 criteria for identifying potentially inappropriate prescribing of medications for symptomatic relief in older adults with cancer. The study was designed prior to publication of STOPPFrail V2 and the team decided to apply both versions of STOPPFrail in the current study. The criteria across each of the three tools were assessed for applicability to the study dataset by the research team. Some criteria could not be applied due to the absence of clinical information. For example, the STOPPFrail criteria "any drug without clear indication" could not be applied because some medications would not have a clear indication consistently documented in the Kardexes. Other criteria were partially applicable, and required caveats. Caveats were supported by published scientific evidence and input from the palliative care clinicians. Full details on the applicability of each individual criterion can be found in Supplementary Table S1. MM applied the criteria to the data and any difficulties were resolved through discussion with the research team.

Data analysis

Sample size calculations were conducted using an estimate of 50% prevalence of PIP in this patient cohort. To yield data with 7.5% precision, 171 patient records were required.

Demographic data were presented using descriptive statistics. Means (standard deviations) or medians (inter-quartile range, IQR and range) were used for continuous data and frequency (proportions) for categorical data. The prevalence of each individual criterion within each tool was calculated as a proportion of all eligible persons in the dataset, and reported as percentage estimates. The association between the presence of PIP (any *vs.* no PIP) and gender (male vs female), age (continuous variable), number of other health conditions (continuous variable), and number of medications (continuous variable) was examined using logistic regression presenting adjusted odds ratios (OR) and associated 95% confidence intervals (CI). There were no missing data for the main variables of interest. Analysis was performed using Stata software (version 15) and significance at $p < 0.05$ is assumed.

Results

Study population

One hundred and eighty older adults were included (Table 1), 60.6% (n = 109) of whom were male. The median age at time of death was 74 years (range 65–94 years). Cancer of the digestive organs was the most common primary cancer diagnosis (n = 57, 31.7%). Almost all patients (n = 170, 94.5%) had at least one other health condition (median 3, IQR 2–5).

Patients received a median of nine medications (IQR 7–12) over the last seven days of life. In general, patients received more medications as time to death approached (Table 2). The median number of medications prescribed seven days before death was five (IQR 3–7) compared to 11 medications on the day of death (IQR 9–15).

Table 1 Characteristics of the study population (n = 180)

Characteristic	Value
Age (years)	
Median (range)	74 (65–94)
Gender	n (%)
Male	109 (60.6)
Primary cancer diagnosis	n (%)
Digestive organs	57 (31.7)
Respiratory and intrathoracic organs	34 (18.8)
Male genital organs	18 (10)
Lymphoid and haematopoietic	16 (8.9)
Female genital organs	14 (7.8)
Urinary tract	13 (7.2)
Melanoma and other skin	8 (4.4)
Breast	8 (4.4)
Unspecified sites	6 (3.3)
Other*	6 (3.3)
Most common other health conditions	n (%)
Hypertension	72 (11.4)
Diabetes mellitus	38 (6.0)
Ischaemic heart disease	29 (4.6)
Atrial fibrillation	27 (4.3)
Dyslipidaemia	26 (4.1)

*Other category consists of cancer of: lip/oral/pharynx, mesothelial/soft tissue, eye/brain/CNS

Table 2 Number of medications (median, IQR and range) prescribed to the sample population over last 7 days of life

Number of days before death	Median	IQR	Range (max–min)
−7	5	3–7	0–24
−6	7	6–9	3–22
−5	8	6–11	2–22
−4	9	6–13	2–23
−3	10	7–13	2–26
−2	11	8–13	2–24
−1	11	8–14	3–24
0 (day of death)	11	9–15	0–25

Table 3 provides an overview of the drug classes that patients received in the last week of life (full table can be found in Supplementary Table S2). The most frequently prescribed drug classes were: opioids (n = 180, 100%), antipsychotics (n = 173, 96.1%), antispasmodics (n = 156, 86.7%), benzodiazepines (n = 172, 85.6%) and paracetamol (n = 143, 79.4%). Drugs for other health conditions were also observed in this patient cohort: including β-blockers (n = 37, 20.6%), alpha blockers (n = 29, 16.1%), antiplatelets (n = 19, 10.6%), antidiabetic agents (8.3%), calcium channel blocker (6.7%) and cholesterol lowering agents (4.4%).

Table 3 Main drug classes administered to patients in the last week of life (N, %)

Drug class	Number of patients who received drug class (%)*
Opioid	180 (100)
Antipsychotic	173 (96.1)
Antispasmodic	156 (86.7)
Benzodiazepine	172 (85.6)
Paracetamol	143 (79.4)
Proton pump inhibitor	136 (75.6)
Laxative	126 (70)
Steroid	118 (65.5)
Non-steroidal anti-inflammatory	95 (52.8)
Antibiotic	78 (43.3)
Local antiseptic	78 (43.3)
Antimuscarinic	72 (40)
Z-drug	66 (36.7)
Antifungal	64 (35.6)
Antiepileptic	62 (34.4)
Antiemetic	57 (31.7)
Electrolytes	47 (26.1)
Antithrombotic	46 (25.6)
Drugs for respiratory system	43 (23.9)
Agents for local oral treatment	37 (20.6)
Diuretic	37 (20.6)
Beta blocker	37 (20.6)
Alpha blocker	29 (16.1)
Eye drops	22 (12.2)
Other antidepressant (e.g. mirtazapine)	20 (11.1)
Antiplatelet	19 (10.6)

*Drug classes reported in ≥ 10% of population

Prevalence of PIP

The different tools comprised 85 criteria in total. Thirty-four criteria (40%) across these tools were applicable to the dataset based on available clinical information. The prevalence of PIP ranged from 12.8% (23/180 patients) to 30% (54/180 patients) of the population, depending on which tool was used to identify PIP. A further breakdown of the identified PIPs is provided under each tool below.

STOPPFrail (V1 and V2)

The prevalence of PIP could be calculated for 16 of 27 STOPPFrail V1 criteria (59.3%) (Supplementary Table S1). Based on these criteria, 31 patients (17.2%) were found to have received at least one potentially

inappropriate prescription. One potentially inappropriate prescription was identified in 22 patients (12.2%), two potentially inappropriate prescriptions in eight patients (4.4%) and three potentially inappropriate prescriptions in two patients (1.1%). The most prevalent potentially inappropriate prescription identified was α-blockers for hypertension, with nine patients (5%) continuing to receive this medication in the last week of life. Eight patients (4.4%) received a statin, five patients (2.8%) received an anti-platelet agent and five patients (2.8%) received calcium supplementation in the final week of life.

The prevalence of PIP could be calculated for 10 of 25 STOPPFrail V2 criteria (40%) (Supplementary Table S1). Using these criteria, 35 patients (19.4%) were found to have received at least one potentially inappropriate prescription. One potentially inappropriate prescription was identified in 25 patients (13.9%) and two potentially inappropriate prescriptions in 10 patients (5.5%). The most commonly identified potentially inappropriate prescription was lipid-lowering therapies, with eight patients (4.4%) continuing to receive a lipid-lowering therapy in the last week of life. Anti-platelets, calcium and vitamin D were prescribed to five patients (2.8%). The prevalence of PIP identified by the STOPPFrail criteria V1 and V2 are detailed in Table 4.

OncPal

The prevalence of PIP could be calculated for four of nine OncPal criteria (44%) (Supplementary Table S1). Based on these criteria, 23 patients (12.8%) were found to have received at least one potentially inappropriate prescription. Nineteen patients (10.5%) received one potentially inappropriate prescription and four patients (2.2%) received two potentially inappropriate prescriptions, as identified by OncPal.

The most prevalent potentially inappropriate prescription identified by OncPal was the prescription of gastroprotective drugs without any medical history of gastrointestinal bleeding, peptic ulcer, gastritis, GORD or the concomitant use of anti-inflammatory agents including NSAIDs and steroids (n = 14, 7.8%), followed by statins (n = 8, 4.4%), aspirin (n = 3, 1.7%) and osteoporosis medications (n = 2, 1.1%) (Table 5).

PIP-CPC

The prevalence of PIP could be calculated for four of 24 criteria (16.7%) (Supplementary Table S1). Only one of the four applicable PIP-CPC criteria (Table 5) identified PIP amongst the cohort.

Table 4 Prevalence of PIP identified by STOPPFrail V1 and V2 in the study population (n = 180) in the last 7 days of life

Section	Criteria	Prevalence of PIP N (%)	
		STOPPFrail V1	STOPPFrail V2
Cardiovascular system	Lipid lowering therapies	8 (4.4)	8 (4.4)
Cardiovascular system	Alpha blockers for hypertension	9 (5)	N/A
Coagulation system	Anti-platelets	5 (2.8)	5 (2.8)
Coagulation system	Aspirin for stroke prevention in atrial fibrillation	N/A	1 (0.6)
Respiratory system	Theophylline [and aminophylline (Version 2)]	2 (1.1)	2 (1.1)
Respiratory system	Leukotriene antagonists	0 (0)	0 (0)
Musculoskeletal system	Calcium supplementation	5 (2.8)	5 (2.8)
Musculoskeletal system	Vitamin D	N/A	5 (2.8)
Musculoskeletal system	Anti-resorptive / bone anabolic drugs for osteoporosis	2 (1.1)	2 (1.1)
Musculoskeletal system	Selective Oestrogen Receptor Modulators (SORMs) for osteoporosis	0 (0)	N/A
Urogenital system	5-Alpha reductase inhibitors	2 (1.1)	3 (1.7) (Version 2 merges 5-alpha reductase inhibitors and alpha blockers)
Urogenital system	Alpha blockers	1 (0.6)	
Urogenital system	Muscarinic antagonists	0 (0)	N/A
Endocrine system	Diabetic oral agents	3 (1.7)	3 (1.7)
Endocrine system	Angiotensin-Converting Enzyme (ACE) inhibitors for diabetes	3 (1.)	N/A
Endocrine system	Angiotensin Receptor Blockers (ARBs) for diabetes	0 (0)	N/A
Endocrine system	Systemic oestrogens for menopausal symptoms	0 (0)	N/A
Miscellaneous	Prophylactic antibiotics to prevent recurrent cellulitis or urinary tract infections (UTIs)	3 (1.7)	N/A

N/A: criterion not included in this version of STOPPFrail

Table 5 Prevalence of PIPs identified by OncPal and PIP-CPC criteria in the study population (n = 180)

	Prevalence of PIP N (%)
OncPal Criteria	
Aspirin for primary cardiovascular prevention only	3 (1.7)
Dyslipidemia medications	8 (4.4)
Osteoporosis medications (except if used for treatment of hypercalcaemia secondary to bone metastases)	2 (1.1)
Proton pump inhibitors and H_2 antagonists (unless history of gastrointestinal bleeding, peptic ulcer, gastritis, GORD or the concomitant use of anti-inflammatory agents including NSAIDs and steroids)	14 (7.8)
PIP-CPC criteria	
Avoid the use of oral liquid paraffin as a laxative	0 (0)
Opioid analgesics without laxative treatment	54 (30)
Monoamine oxidase inhibitors prescribed	0 (0)
NSAIDs and corticosteroids without prophylactic gastroprotective drug	0 (0)

The PIP-CPC criteria identified that 54 patients (30%) received an opioid without a concomitant laxative. Three criteria were applicable to the dataset, but were not prevalent within the dataset; no patient received oral liquid paraffin, a monoamine oxidase inhibitor, or concurrently used NSAIDs and corticosteroids without a gastroprotective drug.

Factors associated with PIP

Female gender was significantly associated with a decreased risk of PIP as identified by STOPPFrail V2 (OR 0.42, p = 0.03), but was not a statistically significant predictor of PIP as identified by the other tools (Table 6). Age and increased number of health conditions were not identified as statistically significant predictors of PIP based on any of the tools (Table 6). Increased number of medications contributed to an increased risk of PIP as identified by STOPPFrail V1 (OR = 1.29, $p < 0.01$), STOPPFrail V2 (OR = 1.30, $p < 0.01$) and OncPal (OR = 1.13, p = 0.03), however it contributed to a decreased risk of PIP as identified by the PIP-CPC tool based on the application of 4/24 criteria (OR = 0.70, $p < 0.01$).

Table 6 Risk factors associated with any PIP according to STOPPFrail (V1 and V2), OncPal and PIP-CPC tools

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	*P* value
STOPPFrail V1			
Female	0.41 (0.17–0.96)	0.65 (0.26–1.67)	0.37
Age	1.02 (0.96–1.07)	1.01 (0.95–1.08)	0.71
Number of other health conditions	1.38 (1.10–1.73)	1.21 (0.93–1.57)	0.15
Number of medications	1.29 (1.14–1.45)	1.29 (1.13–1.47)	< 0.01
STOPPFrail V2			
Female	0.34 (0.16–0.70)	0.42 (0.19–0.92)	0.03
Age	1.02 (0.97–1.07)	1.01 (0.96–1.07)	0.75
Number of other health conditions	1.30 (1.07–1.57)	1.21 (0.98–1.51)	0.08
Number of medications	1.35 (1.20–1.52)	1.30 (1.16–1.48)	< 0.01
OncPal			
Female	0.43 (0.18–1.01)	0.51 (0.21–1.24)	0.14
Age	1.02 (0.97–1.08)	1.01 (0.95–1.07)	0.74
Number of other health conditions	1.33 (1.06–1.66)	1.27 (0.99–1.61)	0.05
Number of medications	1.17 (1.05–1.31)	1.13 (1.01–1.27)	0.03
PIP-CPC			
Female	0.97 (0.50–1.86)	0.65 (0.31–1.37)	0.26
Age	0.99 (0.95–1.04)	0.98 (0.93–1.03)	0.43
Number of other health conditions	0.87 (0.72–1.04)	0.93 (0.76–1.13)	0.44
Number of medications	0.72 (0.62–8.3)	0.70 (0.61–0.82)	< 0.01

Discussion

Statement of key findings

This study found that the median number of medications prescribed for older adults with cancer in an inpatient palliative care setting in Ireland increased during the last week of life. The prevalence of PIP ranged from 12.8% to 30%, depending on which tool was used to identify PIP. The main factor associated with predicting PIP was the number of medications.

Strengths and limitations

This study sought to address recognised gaps with previous observational research examining prescribing practices in palliative care settings by using tools (STOPPFrail (V1 and V2), OncPal, PIP-CPC) that have been specifically developed to examine the prevalence of PIP in adults with life-limiting illness [16]. Several previous studies have examined the appropriateness of prescribing in this cohort using tools, such as Beers criteria [22], which are not intended for patients in hospice or palliative care settings [23, 24]. Moreover, previous studies in palliative care settings have tended to overlook the underprescribing of necessary medications [16]. The current study sought to address this by applying the PIP-CPC criteria. This is the first known attempt at applying these criteria.

The main limitation of this study relates to its retrospective design. Due to the reliance on chart records, detailed information regarding the real-time clinical decision-making was not consistently available. As data were only included for the final seven days of life, several criteria relating to long-term prescribing were not applicable. Although the most common primary cancer diagnoses among the study population reflect those associated with most common cancer deaths in Ireland [25], this study cannot claim to be representative of the entire population of older adults with cancer, as it was localised to one study site and participants were predominantly male.

Interpretation

The observed increase in the median number of medications per patient during the last week of life is consistent with previous related research, whereby drugs for symptomatic relief are increasingly prescribed, and there is typically a reduction in the number of medications for other health conditions [23, 26–28]. Although the current study did not differentiate between medications according to treatment intention (i.e. preventative versus symptomatic relief), it was evident from the most frequently prescribed drug classes that the medications were primarily prescribed for symptom control (e.g. opioids, antipsychotics, antispasmodics, benzodiazepines).

It is difficult to make direct comparisons between the assessments of prescribing appropriateness and those of previous studies due to the challenges in applying the full set of criteria for each of the tools. For example, previous studies involving the application of STOPPFrail V1 have reported a prevalence of PIP ranging from 67.2 to 91.2% [29, 30]. In both studies, the STOPPFrail criterion relating to 'any drug without clear indication' accounted for 47% and 43.8%, respectively. This criterion was not applicable to our dataset due to the reliance on information contained within Kardexes, which could have contributed to an underestimation of PIP in the current study.

To a large extent, the medications identified as potentially inappropriate by STOPPFrail and OncPal involved preventative medications. These findings mirror those of a systematic review that reported that the most common classes of inappropriate medication identified in patients with life-limiting illnesses were: statins, vitamins and mineral supplements, antidiabetic agents, antihypertensives, antiplatelets, and anti-ulcer medications [31]. Cholesterol-lowering agents are one of the few therapeutic groups that are widely deemed futile towards the end of life, because the time to risk reduction is a minimum of 1.9 years [32–34]. Moreover, clinical trial evidence has shown that these medications can be safely and effectively discontinued in advanced life-limiting illness [34].

Proactive deprescribing (described as "discontinuing a medicine if future gains are unlikely to outweigh future harms" [35]) is an essential aspect of combatting PIP, although it is only accountable for approximately 14% of deprescribing activities in clinical practice [35, 36]. Reactive deprescribing (described as "discontinuing a medicine in response to an adverse clinical trigger" [35]) is more commonly seen in clinical practice, whereby failure to deprescribe would likely lead to definite patient harm [37]. The hesitancy to deprescribe medications proactively has been associated with uncertainties regarding the likely benefits and potential harms [38]. Other factors that contribute to health care professionals' decisions to engage in deprescribing in this patient cohort include: involvement of patients and relatives in treatment decisions, communication between healthcare professionals (e.g. communication between the general practitioner, oncology and palliative care) and organisational factors (e.g. workload) [39]. Deprescribing is a complex process, and it is important to note that while patients with advanced cancer generally show predictable decline in the terminal phase [40], in some instances, rapid deterioration and subsequent death could have been sudden or earlier than expected [41].

The application of the PIP-CPC criteria in this study highlighted potential underprescribing of laxative treatment in patients receiving opioid analgesics. As the data collection in this study only documented drugs that were administered, and did not account for anticipatory prescribing, there is the possibility that the prevalence of PIP related to this criterion is overestimated. Furthermore, the prescription of oral laxatives may not always be appropriate in the last week of life, as some patients may be nil by mouth. Potential prescribing omissions (PPOs) have been largely overlooked in observational research in palliative care settings [16]. This merits further investigation as, there is evidence to show that community-dwelling older adults with multiple PPOs experience higher healthcare utilisation, increased risk of functional decline and reduced quality of life [42].

In this study, increasing numbers of medications was the most prominent factor in predicting PIP in older adults with cancer. An increasing number of medications led to an increased risk of PIP for the tools which have a focus on deprescribing (STOPPFrail (V1 and 2) and OncPal). The inverse was found for PIP-CPC, whereby an increased number of medications was associated with decreased odds of PIP, however, this may be due to the fact this tool has a focus on PPOs and, therefore, should be interpreted with some caution due to possible bias. While this is the first known study to examine factors associated with PIP specific to older adults with cancer receiving palliative care, it should be interpreted with caution as only a limited number of criteria within each tool were applicable to the dataset. However, an association between PIP and multiple medications has also been demonstrated in other studies in the general older adult population [43–48].

Further research

The study highlights the importance of reviewing prescribing for older adults with cancer receiving palliative care. A previous scoping review highlighted a lack of robust evaluations of interventions aimed at optimising medication prescribing in older adults with cancer, as well as a complete deficit of intervention studies involving palliative care settings and populations [49]. It is important to note that each of the applied tools identify cases of potentially inappropriate prescribing and there may have been a valid clinical reason for particular prescribing practices. The study highlights the challenges in retrospectively applying prescribing criteria using historical data, particularly with the use of hardcopy records. There is a need for electronic health records to enable a more efficient and streamlined review of clinical data. Finally, in light of the limitations with the retrospective study design (discussed above), it is not possible to recommend one tool over another without further investigation. Further research is required to determine the most suitable study design and methodology for collecting information on prescribing in older adults with cancer in a palliative care setting, in an ethically sound, practical and efficient manner.

Conclusion

This study highlights that some older adults with cancer received medications that were potentially inappropriate during their last week of life and the prevalence of PIP ranged from 12.8% to 30%, depending on which tool was used. The main factor associated with predicting PIP was the number of medications. Interventions are needed to optimise medication prescribing and use in older adults with cancer in palliative care settings. Further research is required to determine the most appropriate study design and methodology for collecting information on prescribing in older adults with cancer in palliative care settings.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11096-022-01506-4.

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Conflicts of interest The authors have no conflicts of interest to declare.

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