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Original Article

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Medication Prescriptions for Chronic Diseases in Terminal Cancer Patients in Korea: A Real-World Study

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Purpose: This study aimed to investigate the prescribing patterns of medications for chronic diseases in patients with terminal cancer in South Korea as their life expectancy declined. **Methods:** This study analyzed data on cancer patients from the National Health Insurance Service (NHIS) database in South Korea. It included a total of 89,606 patients who died of cancer in 2021. We evaluated prescriptions for dyslipidemia, hypertension, diabetes, and osteoporosis at 52, 12, 4, and 1 week prior to death. **Results:** A significant proportion of patients nearing death continued to receive prescriptions for chronic disease medications, despite guidelines suggesting that these medications can be discontinued when life expectancy is limited. For instance, 2.6% of patients were prescribed medications for dyslipidemia just 1 week before death, highlighting a discrepancy between clinical practice and recommended guidelines. **Conclusion:** These findings underscore the need to reevaluate prescription practices for terminal cancer patients. Optimizing medication use can decrease polypharmacy, reduce adverse drug reactions, and increase the quality of life (QOL) for these individuals.

Key Words: Neoplasms, Chronic disease, Palliative care, Drug prescriptions, Hospice care

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INTRODUCTION

Cancer continues to be one of the leading causes of death globally, significantly impacting the quality of life (QOL) for patients, particularly in advanced stages [1,2]. As cancer progresses to a terminal phase, treatment priorities shift from curative measures to palliative care, which focuses on alleviating symptoms and improving QOL rather than on aggressive interventions [3]. Despite this shift, many patients with terminal cancer are still prescribed medications that offer minimal short-term benefits. These medications can be harmful, contribute to polypharmacy, and lead to adverse drug reactions, thereby imposing a significant financial burden on both patients and society [4,5].

In palliative care settings, it is essential to prioritize treatments that improve QOL by alleviating cancer-related symptoms and avoiding unnecessary interventions [6]. Despite this, medications for the primary or secondary prevention of chronic conditions like cardiovascular diseases are still frequently prescribed, even when they may not be relevant for patients with terminal cancer who have a limited life expectancy [7]. Stopping preventive medications such as statins can enhance QOL and reduce medical costs for these patients [8]. For example, a multicenter randomized clinical trial demonstrated improved

QOL and lower healthcare costs among patients who discontinued statins compared to those who continued their use [9].

Guidelines recommend reassessing and potentially discontinuing certain medications for patients with terminal cancer. These guidelines specifically advise against the continued use of lipid-lowering agents (statins, fibrates, ezetimibe), osteoporosis medications (bisphosphonates, raloxifene, denosumab), antihypertensives, and oral hypoglycemics, unless they are used for acute management purposes [10-12]. Despite these recommendations, there is limited information available about the medications prescribed to patients with terminal cancer in South Korea. While the prevalence of prescribing unnecessary medications to terminal patients has been studied in other countries, comprehensive data specific to South Korea remain sparse. This study sought to fill this gap by analyzing the prescription of unnecessary or irrelevant medications to patients with terminal cancer in South Korea, utilizing data from the National Health Insurance Service (NHIS). We examined the proportions of such patients who were prescribed unnecessary medications for chronic diseases at 52, 12, 4, and 1 week before death.

METHODS

1. Data source

This study utilized mandatory health insurance claims data from the NHIS database, spanning from January 1, 2016 to December 31, 2021. The NHIS, overseen by the South Korean government, provides medical insurance coverage to over 97% of the South Korean population [13]. Healthcare providers must submit comprehensive treatment data to the NHIS for insurance reimbursement purposes. The NHIS database houses a vast array of epidemiological and medical information, including patient demographics, diagnostic codes, and prescription details (specifically drug codes and the duration of prescriptions). The diagnostic codes adhere to the seventh version of the Korean Classification of Diseases, which is an adaptation of the 10th edition of the International Classification of Diseases. The Institutional Review Board of Yonsei University Gangnam Severance Hospital granted approval for this study (Approval ID: 3-2022-0410) and waived the requirement for informed consent, as the study involved only the retrospective analysis of anonymized data. The research adhered to the ethical standards outlined in the 2013 amendment of the Declaration of Helsinki.

2. Study population and design

In this study, terminal cancer patients were defined as individuals with a recorded cancer diagnosis code and whose cause of death was listed as cancer in both the NHIS claims data and the mortality records from Statistics Korea. The analysis included patients who died in 2021 with a confirmed cancer diagnosis as the cause of death. This retrospective cohort study examined data from the NHIS database on patients diagnosed with cancer who passed away in 2021, using the date of death as the index date. The inclusion criteria did not consider the presence or absence of specific chronic diseases such as dyslipidemia, hypertension, diabetes, or osteoporosis. The primary objective was to analyze prescription patterns without regard to formal diagnoses of these conditions. We reviewed the medications prescribed to 89,606 patients diagnosed with cancer, analyzing prescriptions from 52, 12, 4, and 1 week prior to their deaths in 2021.

3. Prescribed drugs

We primarily analyzed data concerning medications for dyslipidemia, hypertension, diabetes, and osteoporosis. We calculated the proportions of patients prescribed these medications at 52, 12, 4, and 1 week before death. This was done by dividing the number of patients prescribed each medication at these time points by the total study population (n=89,606). The list of included medications and their ingredient codes can be found in the Supplementary Material.

4. Covariates

Demographic data collected included age, sex, cancer type, type of medical institution at the time of death, and region at the time of death. Age was determined based on the index date.

5. Statistical analyses

Continuous and categorical variables are presented as means and as n (%), respectively. All data underwent statistical anal-

ysis using SAS version 9.4 (SAS Institute, Cary, NC, USA).

RESULTS

Table 1 presents the characteristics of cancer patients (average age 72.7 years; 62.6% male) who passed away in 2021. The most common cancer locations were the lungs (23.5%), liver (16.5%), and colon (13.4%). The majority of these deaths occurred in Seoul, Incheon, and Gyeonggi Province, accounting for 48.2% of the total. This was followed by Busan, Ulsan, and Gyeongsangnam Province at 15.6%. Regarding the type of facility, 34.2% died in general hospitals, 32.7% in tertiary general hospitals, and 19.7% in long-term care hospitals.

Table 1. Characteristics of 89,606 Patients with Cancer Who Died during 2021.

Characteristics	Patients n (%)
Mean age (yr)	72.7
Sex	
Male	56,137 (62.6)
Female	33,469 (37.4)
Cancer site	
Lung	21,038 (23.5)
Liver	14,816 (16.5)
Colon	11,967 (13.4)
Stomach	10,020 (11.2)
Pancreas	8,143 (9.1)
Prostate	5,394 (6.0)
Breast	3,505 (3.9)
Ovary	1,735 (1.9)
Cervix	1,159 (1.3)
Endometrium	560 (0.6)
Thyroid	460 (0.5)
Other	10,809 (12.1)
Type of medical facility at time of death	
Tertiary general hospital	29,318 (32.7)
General hospital	30,645 (34.2)
Hospital	6,806 (7.6)
Long-term care hospital	17,625 (19.7)
Clinic	4,854 (5.4)
Other	358 (0.4)
Location at time of death	
Seoul, Incheon, Gyeonggi Province	43,182 (48.2)
Busan, Ulsan, Gyeongsangnam Province	14,315 (16.0)
Daegu, Gyeongsangbuk Province	9,450 (10.6)
Gwangju, Jeollabuk Province, Jeollanam Province	9,668 (10.8)
Daejeon, Segjong, Chungcheongbuk Province, Chungcheongnam Province	8,727 (9.8)
Gangwon Province	3,171 (3.5)
Jeju Province	1,093 (1.2)

Table 2 presents the percentages of patients who were prescribed various medications at different time points before death. Specifically, 23.8%, 12.0%, and 2.6% of patients were prescribed dyslipidemia medications at 12, 4, and 1 week before death, respectively. Similarly, hypertension medications were prescribed to 69.9%, 46.5%, and 11.4% of patients at these same intervals. For diabetes, the medications were prescribed to 40.9%, 30.0%, and 10.5% of patients at 12, 4, and 1 week before death, respectively. Lastly, osteoporosis medications were prescribed to 7.5%, 3.5%, and 0.6% of patients at 12, 4, and 1 week before death, respectively.

Supplementary Table 1 displays the numbers and proportions of patients who were prescribed medications one week prior to death, categorized by region. The analysis indicated only minor differences, pointing to relatively consistent prescription patterns across different regions. Supplementary Table 2 shows the numbers and proportions of patients who were prescribed medications at 1, 4, 12, and 52 weeks before death, categorized by cancer site.

DISCUSSION

This study investigated the prescription patterns of chronic disease medications among terminal cancer patients in South Korea, utilizing NHIS data. We found that a notably high percentage of these patients continued to receive medications for chronic conditions such as dyslipidemia, hypertension, diabetes, and osteoporosis, even as they approached the end of life. Current guidelines suggest that discontinuing treatment for these chronic diseases may be appropriate when life expectancy is significantly reduced. Despite this, many patients with terminal cancer are still administered these medications up until one week before death.

One of our most notable findings was the prescription of statins for managing dyslipidemia until one week before death, at a rate of 2.6%. This raises concerns, as discontinuing statins in patients with limited life expectancy could potentially improve their QOL and reduce healthcare costs [9]. Additionally, medications for hypertension, diabetes, and osteoporosis were prescribed until one week before death for 11.4%, 10.5%, and 0.6% of patients, respectively.

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Table 2. Numbers and Proportions of Patients Prescribed Medications at 1, 4, 12, and 52 Weeks Prior to Death (N=89,606).

Reason for medication	1 week	4 weeks	12 weeks	52 weeks
	n (%)	n (%)	n (%)	n (%)
Dyslipidemia	2,309 (2.6)	10,769 (12.0)	21,346 (23.8)	30,867 (34.4)
Hypertension	10,171 (11.4)	41,647 (46.5)	62,663 (69.9)	72,936 (81.4)
Diabetes	9,387 (10.5)	26,849 (30.0)	36,645 (40.9)	41,614 (46.4)
Osteoporosis	528 (0.6)	3,092 (3.5)	6,747 (7.5)	12,094 (13.5)

Proportions (%) are calculated based on the total study population (N=89,606).

Our findings suggest discrepancy between clinical guidelines and their actual implementation in the management of patients with terminal cancer. Although guidelines recommend reassessing and potentially discontinuing medications for chronic diseases in patients with limited life expectancy, many continue to receive these treatments. This practice can lead to polypharmacy, increased risk of adverse drug reactions, and unnecessary financial burdens [14-16]. Research supports the benefits of deprescribing certain medications for chronic diseases in terminally ill patients, which can enhance QOL by reducing adverse effects and simplifying medication regimens without adversely affecting survival. For example, a systematic review demonstrated that deprescribing interventions in older adults improved QOL and reduced mortality rates [17]. Furthermore, a study focused on palliative care found that stopping unnecessary medications alleviated symptom burden and enhanced patient comfort [18]. This study underscores the critical need to minimize unnecessary prescriptions of chronic disease medications for terminal cancer patients, especially those with a limited life expectancy. Although prescription data from the NHIS indicate which medications are prescribed, our study concentrates on the appropriateness of these prescriptions rather than the actual consumption of the medications. It is important to recognize that the prescriptions recorded may not always reflect actual medication use, particularly in the final month of life when many terminal cancer patients have reduced oral intake. Prescribing chronic disease medications to patients with diminished oral intake or limited survival benefits can increase burdens on patients and their families without improving QOL [19,20]. Continuing medications such as statins, antihypertensives, or antidiabetic agents in terminal cancer patients has shown limited survival benefits, while contributing to polypharmacy and an increased risk of adverse drug reactions. Deprescribing strategies have been linked to improved patient comfort and reduced healthcare costs, highlighting the need for treatment plans that align with palliative care principles [19,21]. To address these issues, healthcare providers should regularly reassess the necessity of chronic disease medications in terminal cancer patients, ensuring that treatment plans prioritize comfort and symptom management over long-term disease prevention [22]. Deprescribing strategies can help eliminate unnecessary prescriptions and focus on interventions that provide meaningful benefits to patients in their remaining time [23].

Several factors might contribute to the continued use of these medications. Physicians may be reluctant to discontinue treatments that have been part of a long-term management plan, especially when the life expectancy is uncertain. Additionally, a lack of communication between oncologists and primary care physicians can lead to prolonged prescriptions of medications for chronic diseases without adequate reassessment of their necessity [24]. This issue could be addressed by incorporating palliative care principles into the management of patients with terminal cancer [25]. This approach would involve regular reassessment of medication regimens and prioritizing symptom relief and QOL over the prevention of long-term complications [26]. Enhanced communication and coordination among healthcare providers, patients, and their families are essential to ensure that treatment plans are aligned with the patients' current needs and prognoses [27,28]. Moreover, educational initiatives aimed at healthcare providers regarding the benefits of discontinuing unnecessary medications in terminally ill patients could help close the gap between guidelines and their practical application. Integrating systematic medication reviews and decision-making frameworks into palliative care settings may assist clinicians in making informed decisions about whether

to continue or withdraw medications for chronic diseases [29]. Additionally, a significant proportion (32.7%) of patients with terminal cancer died in tertiary general hospitals. This may have contributed to the higher proportion of chronic disease medication prescriptions observed in these settings, as tertiary hospitals often handle patients with more complex medical needs and advanced stages of disease.

This study explored regional differences in the prescription of medications for chronic diseases during the week preceding death. The analysis revealed only slight differences in prescription rates across regions, suggesting a broadly consistent approach to chronic disease management throughout South Korea. Further investigation with larger datasets or more comprehensive clinical data could reveal more nuanced regional patterns or corroborate these initial findings. In addition to examining regional disparities, future research should also explore how different care settings—such as hospice wards versus general wards—influence prescription patterns for medications. Distinguishing between these settings may highlight specific factors that affect medication use, including institutional policies, caregiver preferences, or the availability of palliative care resources. For example, hospice wards might implement strategies that focus more on palliative care, emphasizing symptom management rather than ongoing chronic disease treatment, whereas general wards may continue to follow standard chronic disease management protocols [30].

This study has several limitations. First, it relies on data from the South Korean NHIS, which may limit the applicability of the findings to other countries with different healthcare systems and cultural contexts. Second, the retrospective design of the study could introduce selection and information biases, potentially compromising the accuracy of the results. Third, the use of administrative data, which lacks detailed clinical information such as patient preferences, comorbidities, and specific reasons for continuing or discontinuing medications, might have impacted the outcomes. Fourth, terminal cancer patients were identified as those with a recorded cancer diagnosis code and a cause of death confirmed as cancer. Although this definition was practical given the data constraints, it may have included patients who were not clinically in the terminal stage due to the lack of detailed information on cancer stage or progression. Fifth, the study did not verify whether the medications for dyslipidemia, hypertension, diabetes, and osteoporosis were prescribed before or after the cancer diagnosis. Some prescriptions might reflect acute management of cancer-related conditions (e.g., elevated blood pressure or glucose levels) rather than ongoing chronic disease management. Lastly, certain osteoporosis medications (e.g., bisphosphonates and denosumab) might have been used for cancer-related complications, such as managing hypercalcemia or pain from bone metastases. This dual use of osteoporosis medications complicates the interpretation of the findings, as the data did not differentiate between prescriptions for chronic disease management and cancer-related symptom control. Future research should aim to distinguish between medications prescribed for chronic disease management and those used for cancer-related symptom control, especially in terminal cancer patients.

Despite these potential limitations, the NHIS database encompasses nearly the entire South Korean population, offering a comprehensive and representative analysis of medications prescribed to patients with terminal cancer. This study fills a significant gap in the literature by exploring the chronic disease medications prescribed to these patients, an area that has been minimally researched, especially within the South Korean context. Our findings could significantly influence healthcare policy and clinical practice, particularly by encouraging the discontinuation of non-beneficial medications and improving the QOL for patients with terminal cancer.

In conclusion, this study underscores the necessity of reevaluating prescription practices in terminal cancer care. By doing so, we can lessen the burden of polypharmacy, minimize the risk of adverse drug reactions, and enhance the QOL for these patients.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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AUTHOR CONTRIBUTIONS

Conception or design of the work: YK and J-MP. Data collection: MK. Data analysis and interpretation: all authors. Drafting the article: MK and J-MP. Critical revision of the article: all authors. Final approval of the version to be published: all authors.

SUPPLEMENTARY MATERIALS

Supplementary materials can be found via https://doi.org/10.14475/jhpc.2025.28.1.18.

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