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ORIGINAL ARTICLE

Utilisation of Chronic Disease and Mental Health Management Services and Cardioprotective Medication Prescriptions in Primary Care for Patients With Cardiovascular Diseases and Cancer: A Cross-Sectional Study

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Background Cardiovascular disease (CVD) is a leading cause of morbidity and mortality among cancer survivors. Mental health is considered an important risk factor affecting the treatment of cardiovascular disease. However, little is known about the use of secondary prevention strategies for CVD in patients with both cancer and CVD. This study aimed to compare the utilisation of primary care chronic disease management plans, mental health care and guideline-indicated cardioprotective medications among CVD patients with and without cancer.

Methods Retrospective cross-sectional study utilising clinical data of patients with CVD from 50 Australian primary care practices. Outcomes included the use of chronic disease management plans, mental health care, guideline-indicated cardioprotective medications and influenza vaccination. Logistic regression, accounting for demographic and clinical covariates and clustering effects by practices, was used to compare the two groups.

Results Of the 15,040 patients with CVD, 1,486 patients (9.9%) concurrently had cancer. Patients with cancer, compared to those without, were older (77.6 vs 71.8 years, $p<0.001$), more likely to drink alcohol (62.6% vs 55.7%, $p<0.001$), have lower systolic (130.3±17.8 vs 132.5±21.1 mmHg, $p<0.001$) and diastolic (72.2±11 vs 75.3±34 mmHg, $p<0.001$) blood pressure. Although suboptimal for both groups, patients with cancer were significantly more likely to have general practice management plans (GPMPs) (51.4% vs 43.2%, $p<0.001$), coordination of team care arrangements (TCAs) (46.2% vs 37.0%, $p<0.001$), have a review of either GPMP or TCA (42.8% vs 34.7%, $p<0.001$), have a mental health treatment consultation (15.4% vs 10.5%, $p=0.004$) and be prescribed blood pressure-lowering medications (70.1% vs 66.0%, $p=0.002$). However, there were no statistical differences in the prescription of lipid-lowering or antiplatelet medications. After adjustments for covariates and multiple testing, patients with cancer did not show a difference in GPMPs, TCAs, and a review of either, but were more likely to receive mental health treatment consultations than those without cancer (odds ratio 1.76; 95% confidence interval 1.42–2.19).

Conclusions Less than half of patients with CVD had a GPMP, TCA or review of either. Although those patients with cancer were more likely to receive these interventions, still around half the patients did not. Medicare-funded GPMPs, TCAs and a review of either GPMP or TCA were underutilised, and future studies should seek to identify ways of improving access to these services.

Keywords Cardio-oncology • Primary care • Secondary prevention • Health services • Data • Quality improvement

Introduction

Cardiovascular disease (CVD) and cancer are the two leading causes of morbidity and mortality worldwide, accounting for over two-thirds of premature deaths from noncommunicable diseases [1,2]. There is a complex interaction between cancer and CVD because they have similar pathophysiological processes and common risk factors including age, smoking, poor nutrition, obesity, physical inactivity, and alcohol use [3]. In addition, cancer treatment-induced cardiotoxicity, such as chemotherapy, and radiotherapy, significantly increases the risk of CVD and comorbid anxiety and depression, and impacts CVD care among patients with cancer [4,5]. As a result, there is an increased prevalence of patients with comorbid cancer and CVD, and a heightened need to focus on cardiovascular health among patients with cancer [6]. International guidelines highlight the importance of delivering optimal primary care services encompassing cardioprotective strategies and influenza vaccination to reduce cardiac-related morbidity and mortality in patients with cancer [7].

Patients with cancer often have high rates of mental health disorders (e.g., depression and anxiety). It is estimated that half of patients with a new diagnosis of cancer experience mental health disorders within a year of diagnosis [8]. Mental health disorders have significant impact on cancer survivors. Research evidence shows that poor mental health in cancer survivors can lead to serious consequences including decreased adherence to treatment, poorer quality of life, and increased hospitalisation and mortality rates [9]. However, studies have shown that mental disorders in patients with cancer are often underdiagnosed and undertreated, despite the existence of effective mental health services [10]. Therefore, it is important to provide an early assessment and appropriate treatment of mental health problems for patients with cancer.

In Australia, a universal health insurance scheme (known as Medicare) aims to ensure affordable and equitable health care by subsidising the costs of primary care services. To facilitate General Practitioners (GPs) to plan and coordinate the health care of patients with chronic conditions (e.g., CVD and cancer), a chronic disease management program

Table 1 Medicare Benefits Schedule for chronic disease and mental health management services.

Item name	Medicare item number	Rebate amount (AUD)	Description
Chronic Disease Management Items			
GPMP	721	158.00	Rebate for GP to prepare a management plan for patients with a chronic or terminal condition.
TCAs	723	125.20	Rebate for GP to coordinate the development of TCAs for patients with a chronic or terminal medical condition.
Review of GPMP and/or TCA	732	78.90	Rebate for GP to review or coordinate a review of a GPMP and/or TCA.
Mental Health Care Items			
Preparation of a GP Mental Health Treatment Plan	2700/2701/2715/2717	78.55/115.60/99.70/146.90	Rebate for a GP to prepare a GP mental health treatment plan for a patient with mental disorder. Different item numbers indicate the varying duration in consultation and whether the GP has undertaken mental health skills training
Review of a GP Mental Health Treatment Plan	2712	78.55	Rebate for a GP to review a GP mental health treatment Plan or a psychiatrist assessment and management plan.
GP Mental Health Treatment Consultation	2713	78.55	Rebate for a GP to provide an extended consultation with a patient with mental disorder.

Abbreviations: AUD, Australian dollars; GPMP, General Practice Management Plan; TCA, team care arrangement; GP, general practitioner.

(CDMP) was introduced and subsidised by the Medicare Benefits Schedule (MBS). The CDMP included three key components: (i) general practice management plans (GPMP) to develop systematic care planning, (ii) team care arrangements (TCAs) to initiate multidisciplinary team-based collaborative care and facilitate access to allied health services, and (iii) reviews of both GPMP and TCA to support continuity of care (Table 1) [11]. CDMP offers an ideal environment for the effective implementation of CVD secondary prevention via promoting modification of risk factors, education, and support for self-management. For patients with mental health disorders, MBS items provide rebates for a list of mental health services including (1) mental health consultations, (2) preparation of a mental health management plan, and (3) subsequent review of the plan (Table 1). Alongside Medicare, the Pharmaceutical Benefits Scheme provides affordable access to a wide range of cardioprotective medications through government subsidies [4,12]. Evidence has demonstrated that MBS-funded CDMP may promote recovery and secondary prevention of CVD and reduce preventable hospitalisations [13].

Previous studies have shown inconsistent results on whether the use of secondary prevention strategies for CVD differs among patients with and without cancer. For example, two studies reported underutilisation of cardioprotective medications in patients with cancer, compared with the general population, [14,15], while two other studies reported higher utilisation rates in patients with cancer [16,17]. However, previous studies focused on the impact of cancer on the general population and did not specifically assess the impact of concurrent cancer on patients with established CVD. In addition, there is a paucity of research examining whether the use of primary care services varies among CVD patients with or without cancer. To address this knowledge gap, the aim of this study was to assess and compare the utilisation of CDMPs, mental healthcare services, guideline-indicated cardioprotective medications and influenza vaccination among CVD patients with and without cancer.

Methods

Study Design

The study design was a retrospective cross-sectional study. Secondary analysis of baseline data from the QUEL (QUality

improvement in primary care to prevent hospitalisations and improve Effectiveness and efficiency of care for people Living with coronary heart disease [CHD]) study was undertaken. QUEL is an Australia-based cluster randomised controlled trial (cRCT) to evaluate effectiveness of a data-driven quality improvement program for patients with CVD among 50 primary care practices [18]. The study was approved by the New South Wales Cancer Institute Population and Health Services Research Ethics Committee (HREC/18/CIPHS/44).

Practices and Participants

Primary care practices were eligible for recruitment if they (1) managed ≥100 patients with CVD annually, and (2) had a compatible data extraction tool installed. Practices were recruited with the support of local Primary Health Networks (PHNs). Supportive PHNs communicated with practices in their jurisdictions to seek expressions of interest for participating and research team confirmed eligibility and completed recruitment. The eligible patients were defined as those: (1) aged ≥ 18 years, (2) had a CVD diagnosis documented in the general practice health record including CHD, acute coronary syndrome, myocardial infarction, heart failure, stroke, or peripheral vascular disease, and (3) were active patients who had at least three encounters with the participating practice in the previous 24 months.

Data Collection

The PenCS Clinical Audit Tool (PenCS Consultancy Services, Australia) was used to extract de-identified data from patients' electronic medical records at 50 participating primary care practices [19]. Extracted data were securely stored on the university's computer server under password protection.

Data were collected on patient demographics (age, gender, Indigenous status), mental health disorders, CVD risk factors (blood pressure [BP], total cholesterol, high-density lipoproteins, low-density lipoproteins, glycated haemoglobin, smoking status, alcohol consumption, and body mass index). MBS items (CDMPs, mental health care and influenza vaccination) and Pharmaceutical Benefits Scheme-subsidised cardioprotective medications (anti-hypertensive [beta-blockers, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, calcium channel blockers and diuretics], lipid-lowering, and antiplatelet medications) prescribed between 2018 and 2019 were also extracted from the practice. All data above were automatically extracted from patients' electronic medical records.

Outcomes

The outcomes were (1) CDMP items claimed, (2) mental health items claimed among patients with CVD who were documented as having a mental health disorder, (3) prescription of cardioprotective medications written by GPs, and (4) influenza vaccination. Specific descriptions for each CDMP and mental health item are detailed in Table 1 [20].

Statistical Analysis

Data extracted at baseline for the QUEL study were used for analysis. Two (2) cohorts were defined: patients with a documented diagnosis of CVD alone, and patients with documented diagnoses of both CVD and cancer. All patients diagnosed with cancer are included, regardless of their cancer type or cancer stage. Demographic and clinical characteristics between the two groups were summarised using descriptive statistics including frequencies and proportions for categorical variables and means and standard deviations for continuous variables. Chi-squared tests for categorical variables or independent sample *t*-tests for continuous variables were performed to compare demographic and clinical characteristics between the two groups. Multiple-adjusted logistic regression within the generalised estimating equation framework was used to compare the rate of the outcomes between the two cohorts, adjusting for demographic and clinical covariates and clustering effects by practices. Independent variables were chosen by clinical and statistical (if univariable comparison showed significance of $p<0.05$) importance. Independent variables were: gender (women vs men), age, BP, body mass index and alcohol intake (yes vs no). To account for multiple testing of the outcomes, Holm–Bonferroni adjustment was made to the p-values. When analysing the provision of mental health items, only patients diagnosed with mental health disorders were included. All statistical analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC, USA), and the significance level was considered at $p<0.05$.

Results

Patient Characteristics

The study population included a total of 15,040 patients (60.4% men) with CVD (Table 2). The mean age was 72.4 (standard deviation, 12.7) years and 1,486 (9.9%) patients concurrently had cancer. Compared to those without cancer, patients with cancer were older (77.6 vs 71.8 years, $p<0.001$), more likely to drink alcohol (62.6% vs 55.7%, $p<0.001$), and have lower systolic (130.3 vs 132.5 mmHg, $p<0.001$) and diastolic (72.2 vs 75.3 mmHg, $p<0.001$) BP. The major cancers represented in this study were prostate cancer (35.9%), breast cancer (19.7%), melanoma of the skin (14.1%), bowel cancer (9.6%) and lung cancer (6.3%).

Provision of Chronic Disease Management Items

Of the total cohort with CVD, "preparation of GPMP", "coordination of TCA", and "review of GPMP or TCA", were claimed by 44.0%, 37.9% and 35.5%, respectively (Table 3). Patients with cancer, compared to those without, were significantly more likely to have a GPMP (51.4% vs 43.2%, $p<0.001$), TCA (46.2% vs 37.0 %, $p<0.001$), and a review of either (42.8% vs 34.7%, $p<0.001$). After adjusting for covariates and accounting for multiple testing, the odds of

Table 2 Demographic and clinical characteristics of CVD participants with and without cancer.

Variables	Patients with CVD only (n=13,554)	Patients with CVD & Cancer (n=1,486)	All patients with CVD (n= 15,040)	P-value	Data available n (%)
Men, n (%)	8,173 (60.3)	916 (61.6)	9,089 (60.4)	0.318	15,038 (99)
Age (years), mean (SD)	71.8 (12.9)	77.6 (10.0)	72.4 (12.7)	<0.001	14,748 (98)
Indigenous, n (%)	311 (2.7)	32 (2.5)	343 (2.7)	0.710	12,850 (85)
Diagnosis of diabetes					
Type 1, n (%)	162 (1.2)	7 (0.5)	169 (1.1)	0.012	15,040 (100)
Type 2, n (%)	2,844 (21)	307 (20.7)	3,151 (21)	0.771	15,040 (100)
Cardiac tests (e.g., echocardiogram, stress echo)	888 (6.6)	147 (9.9)	1,035 (6.9)	<0.001	15,040 (100)
Cardiovascular risk factors					
SBP (mmHg), mean (SD)	132.5 (21.1)	130.3 (17.8)	132.3 (20.8)	<0.001	14,401 (96)
DBP (mmHg), mean (SD)	75.3 (34)	72.2 (11)	75 (32.4)	<0.001	14,409 (96)
TC (mmol/L), mean (SD)	4.2 (1.1)	4.2 (1.1)	4.2 (1.1)	0.941	1,3735 (91)
HDL (mmol/L), mean (SD)	1.3 (0.4)	1.3 (0.4)	1.3 (0.4)	0.033	13,172 (88)
LDL (mmol/L), mean (SD)	2.2 (1.0)	2.2 (1.0)	2.2 (1.0)	0.916	13,045 (87)
BMI, mean (SD)	29.5 (10.5)	28.6 (8.5)	29.4 (10.3)	<0.001	12,004 (80)
Current smoker, n (%)	1,389 (11.3)	151(10.8)	1,540 (11.3)	0.544	13,643 (91)
Alcohol drinker, n (%)	5,215 (55.7)	681 (62.6)	5,896 (56.4)	<0.001	10,449 (70)
HbA1c for those with diabetes, mean (SD)	7.5 (7.0)	8.1 (8.8)	7.6 (7.2)	0.054	8,560 (57)
Achieved cardiovascular risk factor targets					
SBP<130 mmHg, n (%)	5,569 (43.0)	685 (47.7)	6,254 (43.4)	<0.001	14,401 (96)
DBP< 80 mmHg, n (%)	8,505 (65.6)	1,011 (70.4)	9,516 (66.0)	<0.001	14,409 (96)
HDL >1.0 mmol/L, n (%)	8,795 (74.3)	1,014 (76.1)	9,809 (74.5)	0.158	13,172 (88)
LDL<1.8 mmol/L, n (%)	4,284 (36.5)	458 (34.6)	4,742 (36.4)	0.167	13,045 (87)
TC< 4.0 mmol/L, n (%)	5,763 (46.7)	645 (46.6)	6,408 (46.7)	0.968	13,735 (91)
HbA1c ≤ 7%, n (%)	5,895 (76.7)	708 (81.2)	6,603 (77.1)	<0.001	8,560 (57)
Mental disorder, n (%)	3,254 (24.0)	383 (25.8)	3,637 (24.2)	0.031	15,040 (100)
Depression	2,285 (70.2)	273 (71.3)	2,558 (70.3)	0.668	3,637 (100)
Anxiety	1,306 (40.1)	145 (37.9)	1,451 (39.9)	0.390	3,637 (100)
Post-traumatic stress disorder	125 (3.8)	11 (2.9)	136 (3.7)	0.344	3,637 (100)
Schizophrenia	67 (2.1)	5 (1.3)	72 (2.0)	0.317	3,637 (100)
Cancer type					
Prostate, n (%)	N/A	534 (35.9)	534 (3.6)	N/A	15,040 (100)
Breast, n (%)	N/A	292 (19.7)	292 (1.9)	N/A	15,040 (100)
Melanoma of the skin, n (%)	N/A	209 (14.1)	209 (1.4)	N/A	15,040 (100)
Bowel, n (%)	N/A	142 (9.6)	142 (0.9)	N/A	15,040 (100)
Lung, n (%)	N/A	93 (6.3)	93 (0.6)	N/A	15,040 (100)

Abbreviations: CVD, cardiovascular disease; SD, standard deviation; SBP, systolic blood pressure; DBP, diastolic blood pressure; TC, total cholesterol; HDL, high-density lipoprotein; LDL, low-density lipoprotein; BMI, body mass index; HbA1c, glycosylated haemoglobin; N/A, not applicable.

receiving GPMP, TCA and a review were not significantly different between those with and without cancer (adjusted odds ratio [aOR] 1.07; 95% confidence interval [CI] 0.93–1.22; $p_{H\text{-}B\ corrected}$=0.999; aOR 1.15, 95% CI 1.01–1.30), $p_{H\text{-}B\ corrected}$=0.261; and aOR 1.04, 95% CI 0.93–1.17), $p_{H\text{-}B\ corrected}$=0.999, respectively) (Table 4).

Provision of Mental Health Care

Patients with cancer had a marginally higher prevalence of recorded mental health disorders than patients without cancer (25.8% vs 24%, p<0.05). Of those with cancer diagnosed with mental health disorders, receipt of a "mental health treatment consultation", "preparation of a GP mental

Table 3 Utilisation of MBS items and cardioprotective medications in the CVD participants with and without cancer.

Outcomes	Patients with CVD only	Patients with CVD & Cancer	All patients with CVD	P-value
Components of Chronic Disease Management Program				
Preparation of GPMP	5,856 (43.2)	764 (51.4)	6,620 (44.0)	<0.001
Coordination of TCA	5,011 (37.0)	686 (46.2)	5,697 (37.9)	<0.001
Review of GPMP or TCA	4,701 (34.7)	636 (42.8)	5,337 (35.5)	<0.001
Mental health care items				
Preparation of a GP Mental Health Treatment Plan[a]	420 (12.9)	47 (12.3)	467 (12.8)	0.673
Review of a GP Mental Health Treatment Plan[a]	160 (4.9)	22 (5.7)	182 (5.0)	0.483
GP Mental Health Treatment Consultation[a]	341 (10.5)	59 (15.4)	400 (11.0)	0.004
Guideline recommended prescribed cardiovascular medication				
BP-lowering medication	8,939 (66.0)	1,041 (70.1)	9,980 (66.4)	0.002
Lipid-lowering medication	7,689 (56.7)	828 (55.7)	8,517 (56.6)	0.456
Antiplatelet medication	6,325 (46.7)	679 (45.7)	7,004 (46.6)	0.476
Combination of BP-lowering, lipid-lowering and antiplatelet medications	4,065 (30.0)	420 (28.3)	4,485 (29.8)	0.167
Influenza vaccination	10,144 (74.8)	1,236 (83.2)	11,380 (75.7)	<0.001

All values given are indicated in n (%).

[a]Denominator: those who were documented as having a mental health disorder.

Abbreviations: BP, blood pressure; MBS, Medicare Benefits Scheme; CVD, cardiovascular disease; GPMP, General Practice Management Plan; TCA, team care arrangement; GP, general practitioner.

health treatment plan", and "review of a GP mental Health Treatment Plan", were only 15.4%, 12.3%, and 5.7%, respectively (Table 3). Compared to patients without cancer, those with cancer were more likely to be provided Mental Health Treatment Consultation (15.4 vs 10.5%, aOR 1.76; 95% CI 1.42–2.19; $p_{H\text{-}B\ corrected}$=0.001). However, provision of "preparation of a GP mental health treatment plan" and "Review of a GP Mental Health Treatment Plan" showed no significant difference between the two groups after adjustment and accounting for multiple testing (aOR 1.28; 95% CI 0.93–1.78; $p_{H\text{-}B\ corrected}$=0.664; aOR 1.59; 95% CI 1.03–2.45; $p_{H\text{-}B\ corrected}$=0.291, respectively) (Table 4).

Prescription of Cardioprotective Medications and Influenza Vaccination

In comparison with patients without cancer, patients with cancer were more likely to be prescribed BP-lowering medications (70.1% vs 66.0%, p=0.002) but less likely to be prescribed lipid-lowering and antiplatelet medications (55.7% vs 56.7%, p=0.456 and 45.7% vs 46.7%, p=0.476, respectively) (Table 3). Patients with cancer had a significantly higher receipt of vaccination compared with patients without cancer (83.2% vs 74.8%, p<0.001). However, the difference was no longer significant after adjustment for clinical and demographic characteristics and correcting for multiple testing (aOR 0.83; 95% CI 0.70–0.99; $p_{H\text{-}B\ corrected}$=0.291; aOR 0.88; 95% CI 0.80–0.97; $p_{H\text{-}B\ corrected}$=0.103; aOR 0.93; 95% CI 0.83–1.04; $p_{H\text{-}B\ corrected}$=0.766; aOR 1.04; 95% CI 0.83–1.29; $p_{H\text{-}B\ corrected}$=0.999) (Table 4).

Discussion

Purportedly, this is the first study to compare the utilisation of CDMPs, mental health care and cardioprotective medications for patients with and without cancer in primary care. The present study found that both groups received suboptimal use of Medicare-funded GPMPs and TCAs. Although those with cancer were more likely to receive these interventions, half of all patients did not.

Absence of claiming reimbursement is not evidence of absence for chronic disease management in primary care. Our results are comparable with a previous Australian study showing despite the proven benefits of CDMPs, care plans appear to be underutilised for patients with CVD, especially reviews and adjustments of care plans which tend to produce the most positive outcomes [21]. Patients with cancer often require long-term individualised treatment and care coordination. This means that the traditional non-CDMP model of primary practice makes it difficult to provide continuous and affordable chronic care to meet patients' complex care needs [22]. Previous studies demonstrated that increased uptake of

Table 4 Multiple-adjusted cancer to non-cancer ORs and 95% CIs for the utilisation of MBS items and cardioprotective medications.

Outcomes	OR (95% CI)	Raw P-value	Holm–Bonferroni corrected P-value
Preparation of GPMP	1.07 (0.93–1.22)	0.333	0.999
Coordination of TCA	1.15 (1.01–1.30)	0.029	0.261
Review of GPMP or TCA	1.04 (0.93–1.17)	0.475	0.999
Preparation of a GP Mental Health Treatment Plan[a]	1.28 (0.93–1.78)	0.133	0.664
Review of a GP Mental Health Treatment Plan[a]	1.59 (1.03–2.45)	0.036	0.291
GP Mental Health Treatment Consultation[a]	1.76 (1.42–2.19)	<0.001	0.001
BP-lowering medication	0.83 (0.70–0.99)	0.042	0.291
Lipid-lowering medication	0.88 (0.80–0.97)	0.010	0.103
Antiplatelet medication	0.93 (0.83–1.04)	0.191	0.766
Combination of BP-lowering, lipid-lowering and antiplatelet medications	0.85 (0.72–0.99)	0.042	0.291
Influenza vaccination	1.04 (0.83–1.29)	0.750	0.999

Adjusted for gender (women vs men), age, SBP, BMI, and alcohol intake (yes vs no).

[a]Denominator: those who had mental illness listed as a condition.

Abbreviations: OR, odds ratio; CI, confidence interval; MBS, Medicare Benefits Schedule; GPMP, General Practice Management Plan; TCA, team care arrangement; GP, general practitioner; BP, blood pressure; SBP, systolic BP; BMI, body mass index.

CDMPs was associated with reduced hospitalisation and positive health outcomes [13,23]. Furthermore, primary practice plays a central role in monitoring acute and long-term cardiotoxicities and is considered an optimal location for providing cardio-oncology services [7]. Therefore, the underutilisation of CDMPs in both groups observed in our study suggests that opportunities persist to optimise primary care in cardio-oncology by increasing the uptake and provision of holistic healthcare planning and reviews for patients with both conditions—CVD risk and cancer.

Two (2) earlier Australian studies showed the likelihood of a GP consultation by cancer groups with or without comorbidity was significantly higher than in non-cancer groups [24,25]. which aligns with our findings. Higher claim or provision rates of CDMP items observed in patients with cancer may be suggestive of a cancer effect, and indicate that GPs are providing more care services to those who are in most healthcare need, as intended by the CDMP. Presence of comorbid CVD with cancer may prompt GPs to become more proactive in providing primary care. Patients with cancer tend to have greater needs for specific self-care support, and CVD risk factor assessment and management, than those without cancer [7]. Given the complexity of managing comorbid CVD and cancer, GPs may commonly utilise GPMPs for individualised self-care support and action planning, and TCAs for comprehensive and coordinated care for patients with cancer. Therefore, our findings are likely to be encouraging and represent an effective response of primary care system for patients with CVD and cancer with greater needs for chronic care.

This study found that patients with cancer had a marginally higher proportion of mental health disorders diagnoses recorded (e.g., depression, anxiety) than those without. Similar finding exists that having both CVD and cancer was associated with a higher risk of developing mental illness than either diagnosis alone [26]. A possible explanation could be that both cancer and CVD are risk factors for mental illness and the psychological burden imposed by awareness of having comorbid cancer and CVD might compound their inherent vulnerability to mental illness [27]. Consequently, the compound effect of both diagnoses could lead to greater need for mental health treatment. This is supported by our findings that mental health treatment consultation was more commonly used by patients with cancer, compared to patients without cancer.

Mental health items appear to be underutilised in both groups (4%–15%). This finding may indicate unmet mental health needs of patients and a suboptimal clinician response to mental health conditions. It supports previous studies that less than 20% of cancer survivors had a GP mental health treatment plan in place for their mental health management [28], and 90% of cancer survivors with mental disorders did not seek professional help after their cancer diagnosis [29]. GPs may misidentify mental health symptoms as normal emotional responses to cancer, which may lead to patients not receiving the treatment they need. Our findings suggest that it is necessary for GPs to pay more attention to patients mental health needs and provide a more proactive treatment response by increasing the use of mental health items. Further, barriers for patients to seeking mental health care may include stigma, social isolation, preference for self-reliance, prioritisation of physical health above mental health, or financial burden [30]. There is evidence that patients receiving mental health care have higher compliance with cancer treatment and lower all-cause and cancer-specific mortality [31]. Accordingly, improving GPs' awareness of mental health care and strengthening mental health services through comprehensive screening, assessment and treatment should become a critical aspect of cardio-oncology care in primary care settings.

Although patients with cancer received more GPMPs, their prescriptions of lipid-lowering and antiplatelet medications

were slightly lower. This contradicts previous findings that GPMP was associated with more prescriptions dispensed [13,16]. Medications including BP-lowering, lipid-lowering and antiplatelet medications are main secondary prevention therapies to mitigate CVD risk factors [4]. Given that a history of cancer or cancer treatment can dramatically exacerbate preexisting CVD, the lower use of lipid-lowering and antiplatelet medications among patients with cancer than those without cancer warrants specific attention. Previous studies showed that cardioprotective medications were underutilised among patients with CVD and cancer [32,33]. For example, an Australia-based cross-sectional study of 333 patients admitted to a cardiology unit found that patients with cancer were less likely to receive statins and antiplatelets than those without cancer [33]. Barriers to cardioprotective medication use among patients with cancer include challenges of polypharmacy, drug interactions, side effects, clinician hesitance to add to an already significant pill burden, financial barriers, and inaccurate beliefs of the effectiveness of agents [32,34]. It is unclear whether our observations reflect pharmacological undertreatment in managing cancer treatment-induced cardiotoxicity, as cardioprotective medications used for managing CVD and cancer treatment-induced cardiotoxicity may be duplicative. Furthermore, there is no clear guideline regarding whether patients with cancer require a lower lipid target than those without cancer [35]. Therefore, the absence of difference in lipid-lowering medications observed might be explained by LDL targets in cancer and non-cancer patients being the same, and GPs frequently treat to target rather than individualised risk. Our findings present opportunities to continue to optimise cardioprotective pharmacotherapies among patients with cancer.

This study has several limitations. First, despite accounting for several covariates, there is also a risk for uncontrolled confounding. Second, the exact indications for medication prescription or reasons for not prescribing were not identified for each patient, limiting the conclusions that could be drawn. Moreover, over-the-counter medications (e.g., aspirin) were not captured in the written prescriptions, which may result in an underestimate of the overall medication taken. Third, participating practices were recruited for a cRCT of a collaborative quality improvement program, so they were more likely to be attentive to guideline implementation and recording of clinical data. A selection of a high-performing sample of practices may exist, and lead to an underestimation of the problem by overestimating the utilisation rate of CDMPs. Fourth, absence of claiming reimbursement does not reflect that health services are not provided to patients. Patients may receive mental health care during GPMP, so mental health service use is likely to be underestimated. Fifth, the data analysed were the baseline data of a cRCT and were not collected specifically to answer the research questions. Data on severity of conditions (e.g., time since cancer diagnosis, comorbidities) and anti-cancer treatment (e.g., anthracyclines, radiotherapy, cardiac testing such as echocardiogram) were not available, which might influence the results. Last, the current evidence indicates that mental health conditions are significant cardiovascular risk factors (e.g., depression) and so, a lack of information on mental health treatments and psychiatric medication use is a further limitation of our data.

In conclusion, almost one in two patients with CVD had a GPMP or TCA, and marginally more if cancer was present. Although patients with cancer were more likely to receive mental health treatment consultations than those without cancer, mental health services were underutilised among both groups. Opportunities for greater use of Medicare-funded GPMPs, TCAs and mental health services exist for patients with cardio-oncology diagnoses. Further studies are needed to identify for improve access to these services for patients and identify the factors associated with health care utilisation.

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Conflicts of Interest

There are no conflicts of interest to disclose.

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