The impact of excess alcohol consumption on health care utilisation in regional patients with chronic disease – a retrospective chart audit

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Abstract

Objective: To understand the impact of alcohol consumption on the health utilisation of people with chronic diseases.

Methods: A retrospective chart audit was undertaken in two primary care settings in a regional Australian city. Three indicator conditions were selected: type 2 diabetes, chronic obstructive pulmonary disease and chronic kidney disease. The audits were analysed to examine the impact of alcohol consumption on primary care and hospital-based health utilisation.

Results: A total of 457 records were audited. Alcohol consumption decreased engagement in the primary care setting, with fewer visits, prescriptions and lower primary care costs. There was a U-shaped association between alcohol consumption and hospital attendance rates and costs. Admission rates were unchanged but a decrease in length of stay was observed in non-smokers in the highest alcohol consumption category.

Conclusion: Excess alcohol consumption decreases engagement in primary care and results in increased emergency department attendance, but not admissions to hospital. In those who are admitted to hospital, alcohol is associated with a decreased length of stay.

Implications for public health: Alcohol consumption should be considered as a potential cause of decreased engagement in primary care. Follow-up and recall of patients may reduce shifting of care to the hospital environment.

Key words: chronic disease, alcohol, health utilisation

Alcohol consumption in Australia costs the economy in excess of $14 billion per year with $1.686 billion attributed to healthcare costs[1] and is responsible for 4.6% of the disease burden.[2] Chronic disease is the major contributor to disease burden in Australia and previous studies have demonstrated that alcohol consumption in people with chronic disease is similar to the general public.[3]

The Australian safe drinking guidelines current at the time of this study suggest no more than two standard drinks per day to prevent chronic harm from alcohol consumption, with a standard drink being defined as containing 10g of alcohol.[4] However, 17% of Australians report exceeding this guideline in the preceding year.[5]

General practitioners (GPs) are at the forefront of management of chronic disease and alcohol misuse,[6] especially in regional settings where specialist services may be less available. Over half (53.3%) of all general practice encounters are attributable to management of chronic disease[6]; this equates to 76.2 million encounters per year. Similarly, general practice encounters for specified alcohol counseling exceed 500 000 per year,[6] ten-fold higher than alcohol consultations in specialist facilities.[7]

Rates of alcohol consumption are higher than the national average in regional areas of Australia such as Townsville in north Queensland, where this study was undertaken;[8] specialist alcohol and drug services are also limited in these areas. In addition, remoteness is associated with an excess of burden of disease in outer regional areas compared with major cities.[2] This research follows from earlier work, which established that excess alcohol consumption was associated with lower attainment of chronic disease management targets and poorer chronic disease outcomes.[9] The article addresses a gap in the existing literature by exploring the association between alcohol and the health system utilisation of chronic disease patients in a general practice setting in a regional centre.

Methods

A retrospective chart audit of 12 months was undertaken by the primary author (also a registered medical practitioner) at two large, geographically separated multi-doctor primary care practices in Townsville. Type 2 Diabetes Mellitus (T2DM),[10] Chronic Obstructive Pulmonary Disease (COPD),[11] and Chronic Kidney Disease (CKD)[12] were chosen as three indicator chronic diseases because they are common and have clear management guidelines for general practice.

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To generate the patient list at each practice the electronic software was searched for records active (at least one visit) in the collection timeframe using the three indicator chronic diseases (T2DM, COPD and CKD) as diagnosis and keywords. No identifying details were collected. Patient lists were kept secured at the practice during collection and were destroyed at the completion of collection.

All CKD records and every second T2DM and COPD record were extracted. Exclusion criteria were: no information regarding alcohol consumption; no evidence to support the presence of the chronic disease; evidence of the patient transferring into or out of the practice during the collection timeframe; no attendances recorded in the allotted timeframe; or on ethical grounds (patient was known to the researcher). Data points collected relevant to health utilisation are reported in Box 1, additional data collection on disease outcomes has been presented previously.[9]

Ethics approval was obtained from James Cook University Human Research Ethics Committee [H6279]. Informed consent was obtained at the practice level.

Assessment of alcohol consumption

Alcohol consumption was assessed using the Alcohol Use Disorders Identification Tool-Consumption (AUDIT-C),[13] which was embedded into the practice software and therefore the most consistent and reliable. For each patient the recorded AUDIT-C score was confirmed by utilising a keyword search to look for evidence of alcohol assessment in the written notes.

In this study, the AUDIT-C was used as a proxy for consumption, with a high specificity cut-off selected due to the retrospective nature of the study. The score was categorised as follows: score 0 (no consumption in last 12 months), score 1–4 (low risk drinkers), score 5–8 (moderate range drinkers) and score 9+ (high risk drinkers). Patients identified as having a binge only pattern in the absence of any regular consumption (n=10) and patients with insufficient information to generate an AUDIT-C score (n=15) were excluded from the primary analysis.

Box 1: Data points collected.

Diagnosis, age, gender, Indigenous identification, medications, number of doctor visits, number of nurse visits, Emergency Department (ED) presentations, hospital admissions, length of stay in hospital, alcohol use (frequency, amount, frequency of >6 drinks), glycated haemoglobin fraction (HbA1c; T2DM only), forced expiratory volume-one second % predicted (FEV1 %; COPD only), estimated Glomerular Filtration Rate (eGFR; CKD only), gamma-glutamyl transferase (GGT), alanine aminotransferase (ALT), aspartate aminotransferase (AST), mean corpuscular volume (MCV), smoking status, and total practice billings for that patient.

Classification of severity

COPD: assigned by spirometry FEV1% predicted or specialist determination if unable to do spirometry.

- Mild: 60+% predicted;
- Moderate: 41–59% predicted;
- Severe: <40% predicted.

CKD: assigned by eGFR or formal GFR measurement where available.

- Mild: eGFR > 60 + microalbuminuria or eGFR 45–59;
- Moderate: eGFR 30–59+ microalbuminuria or eGFR 30-44 with no albuminuria;
- Severe: eGFR <30 or macroalbuminuria.

T2DM: severity was assigned by a combination of number of medications and HbA1c as described previously.[9]

Cost calculations for health system utilisation

Prescription costs were estimated using the average dispensed price for 2015–16: $45.00 per script.[14] Practice billings were collected from the practice software, to the nearest dollar, for each individual patient. Emergency Department and hospitalisation costs were derived from the Independent Hospital Pricing Authority[15] and set at $660/ED presentation and $2,236/day for admissions.

Analysis

Unless otherwise stated, statistical analyses were completed using SPSS 25.[16] Differences between AUDIT-C groups in mean costs, prescription numbers and primary practice visits were compared using ANOVA if more than two groups, with Bonferroni post-hoc analysis where relevant. Where ANOVA homogeneity of variance conditions were not met, Welch tests with Games-Howell post-hoc analyses are reported. Where there were only two groups being analysed, independent samples t-tests were used. Data with small group sizes, outliers or that were not normally distributed were analysed using nonparametric tests (Kruskal-Wallis test for three groups or more, and Mann-Whitney U test for two groups). Analysis of variance was performed for either single or groups of covariates that were independently associated with AUDIT-C score and the outcome measure, as specified in each result.

Hospital admissions, emergency department attendance and hospital encounters (defined as an ED presentation and/or an admission) are presented as rate percentages (the number of people who experienced the encounter within the collection period as a percentage of the number of patients within the AUDIT-C category group). Groups were compared using relative risks with 95% confidence intervals calculated using the online version of MedCalc™ software.[17] Comparisons of proportions were tested with Chi-squared test of independence or Fisher's exact test where assumptions were violated. Where categorical variables were ordinal, chi-square test for trend was used.

Results

Data collection

The combined client base of the two large group practices was 19,704 or 11% of the total Townsville population; 63% (12,377) of these patients were seen during the collection period. From these records, 1,179 patients were identified as having T2DM (n=644), COPD (n=385) or CKD (n=150), and 482 of these records were audited.

This resulted in 457 records after exclusions, as described in more detail elsewhere.[9] Briefly, mean age was 66 years (± 12years), and the sample was predominantly non-Indigenous, non-smoking, and equally distributed between males and females. T2DM was the most frequent chronic disease (54%), followed by COPD (34%), and CKD 12%). Only sex and current smoking status were significantly associated with AUDIT-C category.[9] Table 1 shows health utilisation data by AUDIT-C scores of participants.

The impact of alcohol consumption on health care utilisation

Primary practice-based care

The care of people living with chronic disease within the primary practice environment was examined in terms of visits to the practice, prescription provision and practice billings. These were also used to derive a total primary care cost as outlined in the methods.

Primary care encounters include visits to the doctor or nurse. The data contained some extreme outliers with six individuals having

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more than 60 visits per year, four of whom were in the AUDIT-C 0 category, one in the AUDIT-C 1–3 category and one in the AUDIT C 9+ category. These six individuals came from all three diagnostic groups, CKD (3), T2DM (2) and COPD (1). Therefore, practice visits were divided into categories (<4 (quarterly), 5–12 (up to monthly), 13–26 (up to fortnightly), 27+ (more than fortnightly)) to limit the impact of outliers. An inverse association was observed between practice attendance and AUDIT-C score (X^2=6.93; df=1; *p*=0.009, Table 1). Two per cent of patients who scored in the AUDIT-C 0 category had four or less annual practice visits compared with 9% of those scoring in the AUDIT-C 9+ category. Conversely, almost three-quarters (74%) of patients scoring in the AUDIT-C 0 category had more than 13 practice visits, compared with approximately half (48%) those in the AUDIT-C 9+ category. A similar pattern was observed for prescription provision (F[3, 453]=3.22; *p*=0.023), though the only significant post-hoc differences were between AUDIT-C 0 and AUDIT-C 9+ categories (*p*=0.042). Analysis of variance models remained significant after adjustment for age (F[3, 455]=3.02; *p*=0.029).

Total primary care costs (Table 1) declined with increasing AUDIT-C score category (F[3, 453]=4.06; *p*=0.007); mean costs were only significantly higher in the AUDIT-C 0 than in AUDIT-C 9+ categories (*p*=0.013) in post-hoc analyses. The association between total primary care costs and AUDIT-C score remained significant after adjustment for age, gender, diagnosis, and current smoking status (F[3, 453]=3.31; *p*=0.020). The same pattern was observed for prescription costs (F[3, 453]=3.33; *p*=0.020) with mean prescription costs also significantly higher in AUDIT-C 0 than AUDIT-C 9+ categories (*p*=0.033) in post-hoc analyses. The association between PBS costs and AUDIT-C score remained significant after adjustment for age, gender, diagnosis, and current smoking status (F[3, 453]=2.95; *p*=0.033). While the same pattern was observed for practice billing, this was not significant (F[3, 453]=2.08; *p*=0.102).

Hospital-based care

Overall, 35% (n=162) of participants used the hospital at least once in the year. Twenty per cent (n=93) visited the emergency department (without being admitted), and 22% were admitted to hospital at least once (Table 1). There were no significant gender differences in the proportion of admissions (both 21%), emergency department attendances (females 23%, males 16%; X^2=3.46, df=1; *p*=0.063) or hospital attendance (females 36%, males 33%; X^2=0.44; df=1; *p*=0.507). There was no association between Indigenous status and emergency department attendance (X^2=1.52, df=1; *p*=0.218) or overall hospital encounters (X^2=3.02; df=1; *p*=0.082), but there was an increased frequency of admissions in Indigenous people (28%) compared with non-indigenous people (19%) (X^2=4.85; df=1; *p*=0.03). There was no association between smoking and emergency department attendance (X^2=1.19; df=1; *p*=0.275) or hospital encounters (X^2=2.16; df=1; *p*=0.141), but a higher proportion of smokers were admitted (29%) than non-smokers (19%; X^2=4.59; df=1; *p*=0.032).

The association between AUDIT-C score and hospital use approximated an asymmetric U-shaped curve (Figure 1, panel A), a pattern also seen for emergency department attendance (Figure 1, panel B), and admissions (Figure 1, panel C). The highest attendances were observed in those who scored in the 0 category, lowest costs occurred in the 5–8 category, and costs increased again in the 9+ category. Rates for total hospital encounters, emergency department encounters, and admissions are presented in Table 1.

For each separate type of encounter, relative risks and 95%CI were calculated comparing each AUDIT category with every other AUDIT category. Only rates that were significantly different from each other are reported here. The relative risk was higher in the AUDIT-C 9+ group than in the AUDIT-C 5–8 group for attending the emergency department (RR:2.6; 95%CI: 1.1–6.0; *p*=0.03), having a hospital encounter (RR:1.8; 95%CI: 1.0–3.1; *p*=0.04), but not for admissions (RR:1.5; 95%CI: 0.7–3.3; *p*=0.32).

To account for the impact of multiple attendances by individuals, mean costs in each group were compared. Total hospital costs (Figure 1, panel A), emergency department costs (Figure 1, panel B) and admission costs (Figure 1, panel C) follow the same approximate asymmetric U-shape as encounters. Emergency department costs differed significantly by AUDIT-C category (F [3,179]=4.10; *p*=0.008), with mean costs in patients in the AUDIT-C 5–8 category significantly lower than in the 1–4 category (*p*=0.036), and also lower than patients in the AUDIT-C 9+ category, though this difference was not significant (*p*=0.16) – most likely due to sample size. There were no differences in admission costs (F=1.69; df=3, 146; *p*=0.17) or total hospital costs (F=1.88; df=3,147; *p*=0.135) according to AUDIT-C score.

Table 1: Health utilisation by AUDIT-C category.

Variable	AUDIT-C Score				All
	0	1–4	5–8	9+	
Number of records	198	158	58	43	457
Males, n (%)	77 (39%)	80 (51%)	40 (69%)	32 (74%)	229 (50%)
Current Non-Smoker, n (%)	157 (79%)	138 (87%)	40 (69%)	21 (49%)	356 (78%)
Severity Category, n (%)					
Mild	79 (40%)	70 (44%)	29 (50%)	20 (47%)	198 (43%)
Moderate	78 (39%)	63 (40%)	23 (40%)	12 (28%)	176 (39%)
Severe	41 (21%)	25 (16%)	6 (10%)	11 (25%)	83 (18%)
Number of Medications, mean (SEM)	6.9(0.3)	6.3(0.5)	6.0 (0.9)	5.3 (0.5)	6.4 (0.2)
Practice encounters, n (%)					
≤4	3 (2%)	1 (1%)	1 (2%)	4 (9%)	9 (2%)
5–12	48 (25%)	43 (27%)	20 (33%)	20 (43%)	131 (29%)
13–26	90 (47%)	76 (48%)	23 (37%)	13 (28%)	202 (44%)
≥27	51 (27%)	38 (24%)	17 (28%)	9 (20%)	115 (25%)
Practice Billings, $, mean (SEM)	1,144 (51)	1,029 (49)	992 (130)	915 (140)	1,062 (31)
Total Primary Care Costs, $, mean (SEM)	5,920 (222)	4,998 (192)	5,563 (242)	4,500 (686)	5,399 (123)
Number attended ED, n (%)	41 (24%)	33 (21%)	7 (12%)	12 (28%)	93 (20%)
ED costs $, mean (SEM)	295 (85)	221 (44)	76 (32)	215 (60)	227 (40)
Number admitted, n (%)	46 (23%)	34 (21%)	10 (18%)	10 (23%)	100 (22%)
Admission Costs, $, mean (SEM)	4,620 (1091)	2,062 (514)	1,743 (807)	2,558 (1551)	3,065 (525)
Number with hospital encounter, n (%)	72 (36%)	57 (36%)	15 (26%)	18 (42%)	162 (35%)
Total Hospital Costs, $ mean (SEM)	4,939 (1100)	2,283 (526)	1,819 (814)	2,773 (1565)	3,258 (526)

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As admission rates differed by Indigenous status and current smoking status (see hospital-based care above), analyses of the association between AUDIT-C and admission costs, total hospital costs and length of stay were then stratified by Indigenous status and smoking status. Adjusting for Indigenous status did not alter the findings described above, except for length of stay which reflected the smoking effect described below, most likely due to an overrepresentation of smokers in the Indigenous 9+ category. There was an effect from current smoking status. In non-smokers there was a significant association between AUDIT-C and emergency department costs (F=5.25; df=3,101; *p*=0.02), total hospital costs (F=2.92, df=3, 112; *p*=0.037), and an equivocal effect on admission costs (F=2.68, df=3, 114; *p*=0.05). For each of these costs, the asymmetric U-shape was approximated and the most pronounced decline in costs as evidenced through post-hoc analyses was observed from the AUDIT-C 1–4 category to the 5–8 category. In hospitalised patients, length of stay was also statistically different (F=2.77; df=3, 352; *p*=0.04) – length of stay was highest in AUDIT-C category 0 and lower in both the AUDIT-C 5-8 (*p*=0.042) and 9+ category (*p*=0.035, Figure 1, panel D). In smokers, there was no association between total hospital costs (F=0.16; df=3, 97; *p*=0.92), admission costs (F=0.15; df=3, 97; *p*=0.93) or length of stay (F=0.15; df=3, 97; *p*=0.93) and AUDIT-C category, potentially the result of a substantially lower sample size.

Discussion

Overall, alcohol had a measurable impact on the health care utilisation of people living with chronic disease as measured through primary practice and hospital visits.

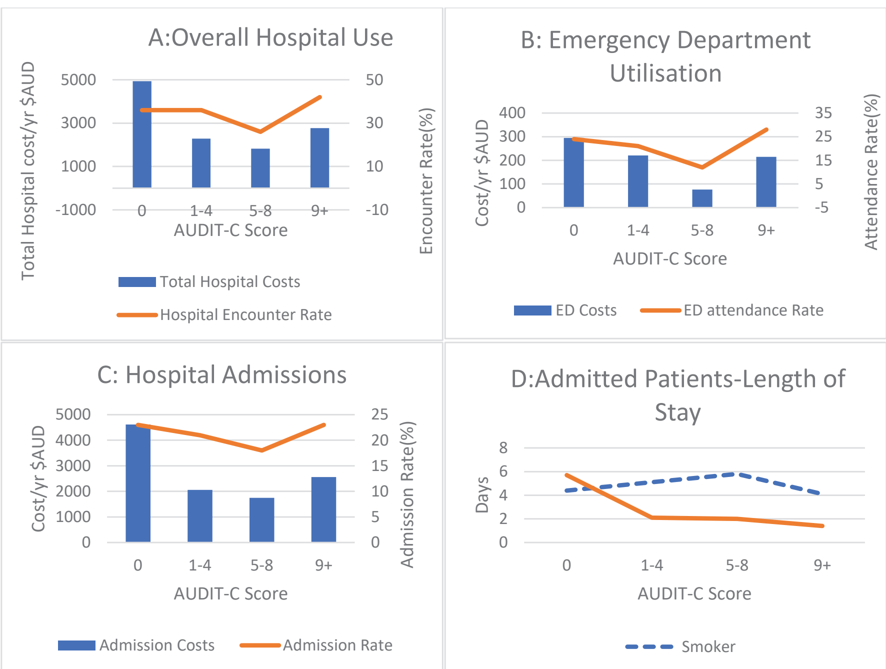
Alcohol consumption patterns

AUDIT-C is verified as a screening tool for alcohol dependence but has been used previously as a proxy for consumption.[13] As identified previously,[9] AUDIT–C scores over five are consistent with drinking in excess of Australian safe drinking guidelines, with scores of four equivocal, suggesting 30% of the people with chronic disease in this study were drinking in excess of guidelines, compared with 17% of the general Australian population in 2015.[5] Abstinence rates, at 40%, were also higher than the general population (19.4%[5]).

Validity of the sample

The overall proportion of people with COPD and T2DM reflects the proportions in the Australian population.[5] The proportion for CKD is substantially lower than anticipated by national rates, especially in the mild range.

Figure 1: The impact of AUDIT-C category on (A) Mean overall hospital use; (B) Mean emergency department utilisation; (C) Hospital admissions and (D) Length of stay (smokers/non-smokers).



It is likely that many of the excluded CKD records, where insufficient evidence was available to support the diagnosis (47/150) were mild CKD with pre-existing evidence that was unavailable.

As previously reported,[9] the large total patient pool, geographically dispersed, increases the likelihood that the sample is representative of the Townsville population with chronic disease. Comparison of the demographics of the T2DM sample with a national diabetes audit sample of over 5,000 people showed similar demographics, blood pressure readings, lipid levels and HbA1c ranges.[18] This provides some evidence for generalisability of the observed results to the wider Australian population living with chronic disease. However, the national diabetes audit did not report on alcohol consumption.[18]

Impact of alcohol consumption on health costs

Despite evidence of worsening disease outcomes with increased alcohol consumption, these results consistently demonstrate a trend towards decreased health care utilisation at higher levels of alcohol consumption. This was observed for general practice visits, prescription numbers, practice billings and total costs. The exception is costs from hospital attendances, for which there is an approximate U-shaped curve and increasing hospital encounters, ED visits and a trend towards increasing admissions (albeit non-significant), in the highest consumption category relative to moderate drinking. U-shaped or J-shaped associations in response to alcohol abound in the literature, and are frequently attributed to a protective effect of low levels of drinking. However, a 195-nation global burden of disease study by Griswald *et al. (2018)*, the largest of its kind, demonstrated that the level of alcohol consumption that minimised harm was zero, with an uncertainty interval of 0-0.8 drinks per week.[19] In the Griswald study, the apparent protective effect reported elsewhere is attributed to an artefact due to confounders in the zero consumption group.[19] In the current study, it is likely that many former drinkers had ceased alcohol use due to their chronic health condition, increasing the variability seen in the zero consumption category.

When the analyses were stratified by smoking, the association was significant for non-smokers. This suggests that people with

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higher alcohol consumption are missing out on regular preventive care, thus having more acute presentations. As hospital costs per encounter are more expensive than primary care costs, this suggests that more active follow-up of disengaged patients and consideration of alcohol consumption as a potential contributing factor could potentially prevent hospital attendances.

This phenomenon is seen elsewhere in the literature. Sacco et al.[20] showed that while alcohol consumption did not increase overall health costs in patients with depression, it was associated with a different admission pattern. Patients were more likely to be admitted but had a shorter length of stay. Similarly, in the current study, there was no significant change to the number of annual presentations to hospital, but there was a decrease in length of stay in non-smokers consuming alcohol. The reasons for the observed reduced health care utilisation cannot be explained using the data available in this study, but are likely to be a complex interplay between the physiological impacts of chronic excess alcohol consumption on chronic disease progression, the behavioral implications of the potential impairment from alcohol consumption and stigma that may impair help seeking. Interestingly, the observed decrease in length of stay represents an average discharge in the AUDIT-C 9+ group of 32 hours, which approximates the onset of phase two alcohol withdrawal.[21] This raises the possibility that early discharge in these patients could potentially be related to withdrawal syndromes, either as self-discharge due to unrecognised withdrawal or deliberate discharge before the onset of withdrawal. A large prospective cohort study of emergency department attendances and hospital admission relative to alcohol consumption would better elucidate the impact of alcohol consumption on hospitalisation patterns in people with chronic disease, and would also allow investigation into factors affecting repeat presentations. However, such a study would be contingent on adequate and detailed coding of alcohol consumption at presentation to hospital.

Limitations

The limitations of the overarching study have been discussed previously,[9] but include challenges associated with practice data that are designed for clinical management not research, and the inability to distinguish recent ex-drinkers from long-term ex-drinkers or those who have never drunk alcohol. Of most relevance to this paper is the fact that hospital attendance data are derived from the practice data and will potentially not reflect attendances where the patient has not specified the correct GP practice or where the hospital has failed to provide discharge summaries. This limitation was mitigated by the delayed retrospective access of practice data by the researcher, which gave time for discharge summaries to have been incorporated into the record.

These limitations are offset by the benefits of using primary care data as recorded for usual care, clear inclusion criteria, consistency of collection and a sample size that exceeded the minimum 360 records suggested by sample size calculations. In addition, the sample is socioeconomically and demographically diverse and comparable to large national samples, which increases the generalisabiltiy of the findings.

Conclusions

Increasing alcohol consumption, as recorded in practice records, was associated with a decreased utilisation of health services in people with chronic diseases. This consisted of a decreased use of primary care and medications, an increase in emergency department attendances, no change in admission rates and a decrease in length of stay in non-smokers.

It is recommended that staff in primary care consider alcohol consumption when patients are disengaging with health services. Additionally, improved coding of alcohol use in hospitals would assist in determining the reasons for altered admission patterns in people consuming excess alcohol.

References

1. Manning M, Smith C, Mazerolle P. The societal costs of alcohol misuse in Australia. *Trends Issues Crime Crim Justice*. 2013(454):1-6.
2. Australian Institute of Health and Welfare. *Australian Burden of Disease Study: Impact and Causes of Illness and Death in Australia 2011*. Canberra (AUST): AIHW; 2016.
3. Spangler JG, Konen JC, McGann KP. Prevalence and predictors of problem drinking among primary care diabetic patients. *J Fam Pract*. 1993;37(4):370-5.
4. National Health and Medical Research Council. *Australian Guidelines to Reduce Health Risks from Drinking Alcohol*. Canberra (AUST): NHMRC; 2009.
5. Australian Bureau of Statistics. *4364.0.55.001 - National Health Survey:2014-2015*. Canberra (AUST): ABS; 2015.
6. Britt H, Miller GC, Henderson J, Bayram C, Harrison C, Valenti L, et al. *General Practice Activity in Australia 2015–16*. General Practice Series No.: 40. Sydney (AUST): Sydney University Press; 2016.
7. Australian Institute of Health and Welfare. *Alcohol and Other Drug Treatment Services in Australia, 2015–16*. Canberra (AUST): AIHW; 2017.
8. Australian Institute of Health and Welfare. *National Drug Strategy Household Survey 2016: Detailed Findings*. Catalogue No.: PHE 214. Canberra (AUST): AIHW; 2017.
9. Mudd J, Watt K-A, Larkins S. The impact of excess alcohol consumption of chronic disease clinical outcomes in a regional general practice setting - a retrospective chart audit. *Aust NZ J Public Health*. In Press.
10. The Royal Australian College of General Practitioners. *General Practice Management of Type 2 Diabetes: 2016-18*. Melbourne (AUST): RACGP; 2016.
11. Yang IA, Brown JL, George J, Jenkins S, McDonald CF, McDonald VM, et al. COPD-X Australian and New Zealand guidelines for the diagnosis and management of chronic obstructive pulmonary disease: 2017 update. *Med J Aust*. 2017;207(10):436-42.
12. Kidney Health Australia. *Chronic Kidney Disease (CKD) Management in General Practice*. Melbourne (AUST): KHA; 2015.
13. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol use disorders identification test. *Arch Intern Med*. 1998;158(16):1789-95.
14. Australian Department of Health and Ageing. *Pharmaceutical Benefits Scheme. Expenditure and Prescriptions Twelve Months to 30 June 2016*. Canberra (AUST): AGP; 2016.
15. Independent Hospital Pricing Authority. *National Hospital Cost Data Collection Cost Report: Round 19 Financial Year 2014-2015*. Sydney (AUST): IHPA; 2016.
16. *SPSS*: Statistics for Windows. Version 25. Armonk (NY): IBM Corp; 2017.
17. *MedCalc*: User-friendly Statistical Software. Version 19. Ostend (BEL): MedCalc; 2019.
18. National Association of Diabetes Centres. *Australian National Diabetes Audit*. Sydney (AUST): NADC; 2015.
19. Griswald MG, Fullman N, Hawley C, Arian N, Zimsen SRM, Tymeson HD, et al. Alcohol use and burden for 195 countries and territories, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 2018;392(10152):1015-35.
20. Sacco P, Unick GJ, Zanjani F, Camlin EA. Hospital outcomes in major depression among older adults: Differences by alcohol comorbidity. *J Dual Diagn*. 2015;11(1):83-92.
21. Muncie HL Jr, Yasinian Y, Oge L. Outpatient management of alcohol withdrawal syndrome. *Am Fam Physician*. 2013;88(9):589-95.

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