The effect of alcohol consumption on clinical outcomes in regional patients with chronic disease: a retrospective chart audit

Julie Mudd,[1,2] Sarah Larkins,[2] Kerrianne Watt[1]

Abstract

Objective: To better understand the impact of alcohol consumption on the clinical management of chronic diseases in a regional general practice setting.

Methods: A retrospective chart audit was undertaken of individual patient records at two large group general practices in Townsville, a regional Australian city. Three common indicator chronic diseases were selected that have clear management guidelines for general practice: type 2 diabetes; chronic obstructive pulmonary disease; and chronic kidney disease. The audits were analysed using SPSS software to examine the association between alcohol consumption on acquisition of clinical management targets and primary disease intermediate outcomes (haemoglobin A1c fraction; per cent of normal forced expiratory volume at one second; and estimated glomerular filtration rate).

Results: A total of 457 records were audited. Higher-risk alcohol consumption is associated with reduced ability of patients to reach management targets ($F[3,453]=3.68$; $p=0.012$) and decreased standardised primary disease outcome ($F[3,403]=2.86$; $p=0.037$).

Conclusion: Higher-risk alcohol consumption is associated with reduced attainment of chronic disease management targets and worse chronic disease outcomes.

Implications for public health: Alcohol consumption should be assessed frequently in people with chronic disease, especially when there is difficulty acquiring management targets or worsening of disease outcomes without a clear explanation. Better education about the potential associations between alcohol use and chronic disease would benefit those managing these complex conditions, both clinicians and patients.

Key words: chronic disease, alcohol, healthcare provision, clinical management

In Australia, alcohol is consumed by nearly 80% of the population[1] and is responsible for 4.6% of the burden of disease.[2] The Australian guidelines to reduce harms from alcohol suggest that, to prevent chronic harm from alcohol consumption, intake should be restricted to no more than two standard drinks per day on average and to prevent acute harms, no more than four drinks on any single occasion, with a standard drink being defined as containing 10g of alcohol.[3] However, in the most recent national health survey, 16% of Australians reported that they exceeded the first chronic harm guideline in the preceding year.[1] Previous studies have suggested that alcohol is consumed by people with diagnosed chronic disease at similar rates to the general population.[4] Given that chronic disease is identified as the major contributor to disease burden in Australia,[2] the intersection of these two prevalent sources of morbidity is potentially important.

In Townsville, a regional city of Queensland, Australia, general practitioners have identified concerns about managing excess alcohol consumption in patients with chronic disease.[5] This is complicated by higher rates of alcohol consumption than the national average,[6] limited specialist drug and alcohol services[5,7] and perceived lack of resources and referral options.[5] This concern has been echoed by general practitioners elsewhere,[8] suggesting that it may be an issue for practitioners more widely.

Chronic disease management requires close collaboration between the health practitioner and the patient to successfully prevent complications and slow progression of the disease.[9] This essential collaboration between patient and health practitioner is potentially inhibited by alcohol consumption, which has been associated with poorer adherence to chronic disease-related self-care behaviours[10,11] as well as decreased practitioner motivation to engage with patients who are drinking to excess.[5,8] While there are limited studies on the reasons for this decrease in self-care and health-related behaviours and awareness, it has been demonstrated across a wide range of demographics in those with and without chronic disease.[12,13]

While both acute and chronic consumption of alcohol can be harmful,[3] the focus of this study was on chronic consumption above Australian guidelines, as this was felt to be most likely to reflect on chronic disease clinical outcomes, which are the accumulation of small gains or losses over extended time periods.[14] Alcohol consumption has the

1. College of Public Health, Medical and Veterinary Sciences, James Cook University, Queensland
2: College of Medicine and Dentistry, James Cook University, Queensland
Correspondence to: Dr Julie Mudd, College of Public Health, Medical and Veterinary Sciences, James Cook University, Douglas, Queensland; e-mail: Julie.mudd@jcu.edu.au
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potential to affect both the behavioural and physiological factors contributing to chronic disease,[12,14] both directly and via contributions to mental health challenges.[15] This research investigates the association between alcohol on the attainment of clinical practice guideline-based management goals and clinical outcomes of chronic disease in the general practice setting in regional north Queensland, where concerns about the issue have been raised.[5]

Methods

A retrospective chart audit was conducted at two large group general practices in Townsville, purposively selected to cover a broad geographical and demographic section and to maximize the sampling of potential clients. The collection period was twelve months (1 January 2015–31 December 2015) with data extraction undertaken between February 2016 and February 2017. Three indicator chronic diseases were chosen that were common and had clear evidence-based management guidelines for general practice: type 2 diabetes mellitus (T2DM),[16] chronic obstructive pulmonary disease (COPD)[17] and chronic kidney disease (CKD).[18]

Ethics approval was obtained from the James Cook University Human Research Ethics Committee [H6279]. Informed consent was obtained at the practice level with advertisements placed in the practice to allow people the option to request that their records not be included in the study. This was in addition to existing practice level consent for the use of records for quality improvement and clinical auditing purposes. Information sheets were made available through the chronic disease nurse for people who wanted further information; the chronic disease nurses and the general practitioners (GPs) also discussed the project with any client they felt may have been unable to read or interpret the information.

The chart audit was undertaken by a registered medical practitioner (JM), who did not work at either clinical practice, using a minimally intrusive approach. All records accessed were electronic. The key word and function searches within the software were used to find data to avoid unnecessary reading of patient consultation details. The eligible case list was cross-checked with the chronic disease nurse's database of active chronic disease patients to check completeness and maximise the number of eligible records. No identifying details were collected. A temporary record number was included to enable identification of duplicate records and deleted on completion of collection. To generate the patient list at each practice the electronic software was searched, as diagnosis and keyword, for the three indicator chronic diseases (T2DM, COPD and CKD), looking for records active (at least one visit) in the retrospective collection timeframe (2015). The generated list was verified by the chronic disease nurse at each practice. Patient lists were kept secured at the practice during collection and were destroyed at the completion of collection. No identifiable information left the practice.

Data (Box 1) from every second record were collected for T2DM and COPD, and due to lower patient numbers, all CKD records were considered. Records were first checked for exclusion criteria: 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). All records that were excluded due to no alcohol consumption data were incomplete; most commonly they related to a single visit from a person from out of area.

Management targets

The management targets for each disease were derived from the relevant guideline.[16-18] The number of targets acquired was divided by the total number of targets for that disease and expressed as a percentage to enable comparisons between diseases.

The management targets were:

- COPD: no smoking, spirometry within 12 months, influenza vaccination within 12 months, four or more visits per year.
- T2DM: BMI<25 kg/m^2, HbA1c< 53 mmol/mol, lipids in range (TC<4 mol/L, HDL>1 mol/L, LDL<2 mol/L), systolic BP<140 mmHg, influenza vaccination within 12 months, four or more visits per year, allied health involvement in 12 months, no smoking.
- CKD: Lipids in range, systolic BP<130 mmHg, ACR or PCR within 12 months, Hb >100 g/L, influenza vaccination within 12 months, four or more visits per year.

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 per Box 2.

Assessment of alcohol consumption

Alcohol consumption was assessed using the Alcohol Use Disorders Identification Test – Consumption (AUDIT-C) tool[19] (Box 3), as this was embedded into the practice software used at both practices and was therefore the most consistent and reliable method of measuring alcohol consumption. For each patient, this was confirmed by using

Box 1: Data points collected.

All conditions	Diagnosis, age, sex, Indigenous identification, medications, number of doctor visits, alcohol use (frequency, amount, frequency of >6 drinks), smoking status, and current influenza vaccination.
T2DM	Body mass index (BMI), last podiatry recorded, last optometry recorded, glycated haemoglobin fraction (HbA1c), total cholesterol (TC), low density lipoprotein (LDL), high density lipoprotein (HDL), last recorded systolic blood pressure (BP)
COPD	Date of last spirometry, forced expiratory volume-one second % predicted (FEV1 %), disease severity as determined by specialist (if unable to complete spirometry)
CKD	BMI, albumin creatinine ratio (ACR), estimated glomerular filtration rate (eGFR), haemoglobin (Hb), TC, LDL, HDL, systolic BP

Box 2: Assignment of severity for T2DM.

Number T2DM Medications	HbA1c (mmol/mol)		
	<53	54-85	>86
0-1	Mild	Mild	Severe
2	Moderate	Moderate	Severe
3+	Moderate	Severe	Severe
Insulin	Severe	Severe	Severe

a keyword search to look for evidence of alcohol assessment in the written notes.

As the AUDIT-C was being used as a proxy for consumption rather than a screening tool for dependence, five categories were considered to give the broadest range of potential results: score 0 (non-drinkers), score 1–4 (low-risk drinkers), score 5–8 (moderate-risk drinkers) and score 9+ (higher risk drinkers). A small number of people (n=10) who had an episodic-only heavy alcohol consumption pattern in the absence of regular consumption (less than monthly consumption of more than six drinks) and those with insufficient information to generate an AUDIT-C score (n=15) were excluded from the analysis, leaving 457 records.

Assessment of smoking

While the practice records recorded current, past (amount, duration and length of abstinence) or never smoked, due to the low group numbers only current smoking (yes/no) could be assessed and this is reported in Table 2.

Disease outcomes

The study used widely accepted markers of disease activity for the individual diseases: eGFR for CKD, FEV1% for COPD and HbA1c for T2DM. To increase the available sample size sufficiently to consider the impact of co-variables, the primary outcome was expressed as a percentage of the value obtained in an unaffected individual. The value that would be considered non-diagnostic (100% for FEV1%, 90 for eGFR and 31mmol/mol for HbA1c) was set as 100% and the worst outcome measure obtained was set at 0%. This value was termed % standard outcome.

Analysis

Statistical analyses were completed using SPSS Statistics 25.[20] Between-group comparisons of the AUDIT-C categories were made using independent samples t-tests or ANOVA for numerical variables. Where ANOVA was used, Bonferroni post hoc analyses were also completed. Categorical variables were analysed with chi-square tests and Fisher's exact tests where assumptions were violated. Analysis of covariance was then undertaken to assess the association between AUDIT-C score on each outcome measure (mean per cent management targets reached, mean per cent standardised disease outcome), adjusting for potential confounders: age, sex, Indigenous identification status, diagnosis, disease severity category and current smoking status. Those demographic factors that were identified to be associated with both AUDIT-C score and the disease outcome measures were included as covariates.

Box 3: AUDIT-C.

Q1: How often do you have a drink containing alcohol?				
Never (0)	≤ monthly (1)	2-4 /month (2)	2-3 / week (3)	4+ / week (4)
Q2: How many standard drinks do you have on a typical drinking day?				
1-2 (0)	3-4 (1)	5-6 (2)	7-9 (3)	10+ (4)
Q3: How often do you have 6 or more standard drinks?				
Never (0)	≤ monthly (1)	Monthly (2)	Weekly (3)	Almost daily (4)

Results

Data collection

Records were obtained from two large group practices with a combined client base of 19,704 or 11% of the total Townsville population, with 63% (12 377) of the client pool having been seen during the collection period. From these records, 482 patients were audited from a pool of 1,179 patients identified with T2DM, COPD or CKD (combined practice prevalence of 9.5%; Table 1). The data collected are summarised in Table 2.

Alcohol consumption: relationship to sample demographics

The associations between alcohol consumption as measured by AUDIT-C score and sample characteristics are shown in Table 2. Two demographic factors were significantly associated with AUDIT-C score category: sex ($X^2(3)=28.40$; $p<0.001$) and current smoking status ($X^2(3)=32.19$; $p<0.001$). AUDIT-C score category was not associated with chronic disease diagnosis ($X^2(6)=9.03$; $p=0.172$), age ($X^2(6)=4.21$; $p=0.650$), Indigenous identification ($X^2(3)=7.52$; $p=0.057$) or disease severity ($X^2(6)=8.30$; $p=0.217$).

The association between alcohol consumption and management targets

As shown in Figure 1, the mean percentage of management targets reached differed by AUDIT-C category ($F[3,453]=3.68$; $p=0.012$). Specifically, mean percentage of management targets reached was significantly lower in participants who scored AUDIT-C 9+ than in participants who scored AUDIT-C 5-8 ($p=0.03$), AUDIT-C 1-4 ($p=0.01$) and AUDIT-C 0 ($p=0.04$). As expected, attainment of management targets was positively correlated with standardised outcome ($r=0.29$; $p=0.01$).

Having established an association between alcohol consumption and management targets, analysis of covariance was performed to investigate contributing effects. Smoking could not be assessed as a covariate as non-smoking was a management target for all three chronic diseases, therefore the only variable adjusted for was sex. Differences between AUDIT-C groups and mean percentage management targets achieved remained after adjustment for sex ($F(3, 453)=3.14$; $p=0.025$).

Table 1: Records collected and exclusions.

	T2DM	COPD	CKD	All
Number of records identified	644	385	150	1,179
Exclusions				
Record incomplete	86	32	41	159
Disease evidence lacking	30	40	47	117
Ethical	1	0	1	2
Total exclusions	117	72	89	278
Total eligible	527	313	61	901
Sampling method	1 in 2	1 in 2	All valid	
Records collected	263	158	61	482
Post collection exclusion (insufficient alcohol data)	17	4	4	25
Final record count	246	154	57	457

Table 2: Demographics and Clinical Outcome Data by AUDIT-C Score.

Variable	AUDIT-C Score				All
	0	1-4	5-8	9+	
Number of records	198	158	58	43	457
Age in years, n (%)					
<50	15 (41%)	14 (38%)	6 (16%)	2 (5%)	37 (100%)
50-75	127 (44%)	95 (33%)	40 (14%)	27 (9%)	289 (100%)
>75	56 (42%)	49 (37%)	12 (9%)	14 (11%)	131 (100%)
Sex, n (%)					
Male	77 (33%)	80 (35%)	40 (17%)	32 (14%)	229 (100%)
Female	121 (53%)	78 (34%)	18 (8%)	11 (5%)	228 (100%)
Identification, n (%)					
Aboriginal &/or Torres Strait Islander	48 (57%)	21 (25%)	7 (8%)	8 (10%)	84 (100%)
Non-Indigenous	151 (42%)	133 (37%)	46 (37%)	31 (9%)	361 (100%)
Missing n=12					
Current smoking, n (%)					
Yes	41 (41%)	20 (20%)	18 (18%)	22 (22%)	101 (100%)
No	157 (44%)	138 (39%)	40 (11%)	21 (6%)	356 (100%)
Diagnosis, n (%)					
T2DM	110 (45%)	87 (35%)	30 (12%)	19 (8%)	246 (100%)
COPD	61 (40%)	47 (30%)	24 (16%)	22 (14%)	154 (100%)
CKD	27 (47%)	24 (42%)	4 (7%)	2 (4%)	57 (100%)
Severity category, n (%)					
Mild	79 (40%)	70 (35%)	29 (15%)	20 (10%)	198 (100%)
Moderate	78 (44%)	63 (36%)	23 (13%)	12 (7%)	176 (100%)
Severe	41 (49%)	25 (30%)	6 (7%)	11 (13%)	83 (100%)

Figure 1: Alcohol association with management targets (mean percentage).

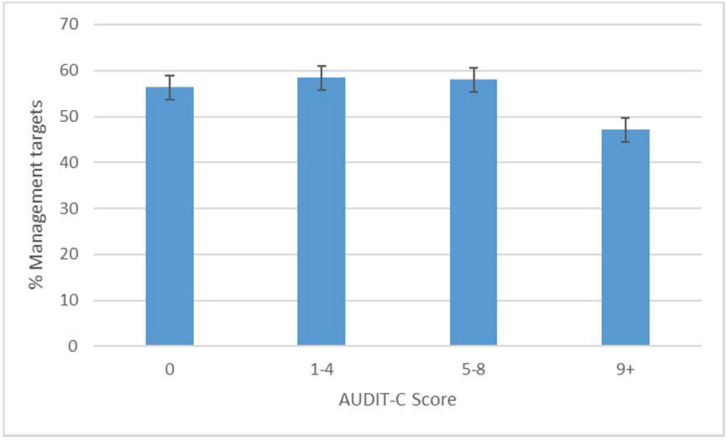
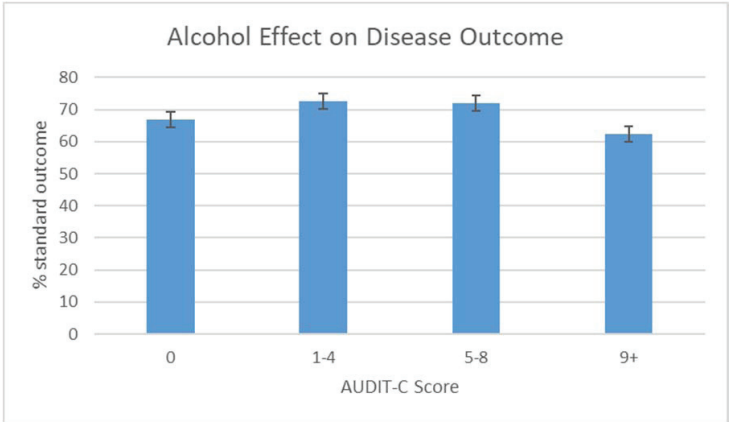


Figure 2: Alcohol association with standardised disease outcome (mean standardised %).



The association between alcohol consumption and disease outcomes

Mean standardised disease outcome percentage differed significantly by AUDIT-C category ($F(3,403)=2.86$; $p=0.037$; see Figure 2). There were no significant between-group differences in post- hoc analysis, likely due to the low number of observations in some categories, but participants in the AUDIT-C 9+ category had the lowest mean standardised disease outcome (62.2), and the highest was in the AUDIT-C 1-4 category (72.6). The association remained after adjusting for sex and current smoking status ($F(3, 403)=2.87$; $p=0.04$).

Discussion

Overall, alcohol had a measurable association with the management of chronic disease across both domains studied (reaching management targets and standardised primary outcome). In general, increased alcohol use was associated with reduced mean per cent of management targets reached and worse standardised primary disease outcomes.

Alcohol consumption patterns

AUDIT-C was originally intended and verified as a screening tool for alcohol dependence and alcohol-related harm, rather than as a stand-alone measure of consumption; however, it performs well in detecting hazardous drinking.[21] All AUDIT-C scores were verified by checking the written notes. Consumption in participants who scored nine or more ranged from 5–6 drinks, 4+ days/week with 6 or more weekly to 10+ drinks per day. AUDIT–C scores higher than five are consistent with drinking in excess of Australian alcohol consumption guidelines, with scores of four equivocal. Using a cutoff of five, rather than the more commonly used four, lowers the sensitivity for detecting hazardous alcohol consumption but raises the specificity.[21] Furthermore, it better aligns with the Australian guidelines that were in use at the time of the data collection, as many participants who scored four reported daily drinking of 1–2 standard drinks. Based on this, 30% of the patients in this study were drinking above the regular consumption guideline, compared with 17% of the general Australian population in 2015.[1] This rate was higher in patients with COPD (39%). Abstinence rates of the sample were 40%,

which is substantially higher than the general Australian population (19.4%).[1] The reason for the higher abstinence rate cannot be definitively determined from this sample but likely reflects an alteration in risk behaviours as a result of their chronic disease diagnosis on the recommendation of their doctor.[14] This sample also contains a high proportion of people with T2DM, which has been associated with higher than normal alcohol abstinence rates in some studies.[22]

Generalisability of the findings

The overall proportion of people with COPD and T2DM reflects the proportions in the Australian population.[1] The proportion for CKD is substantially lower than anticipated by national rates, especially in the mild range. It is possible that a proportion of the excluded CKD records, where insufficient evidence was available to support the diagnosis (47/150), would have met mild CKD criteria, but in the absence of overt clinical illness, this was not being closely monitored at the time and hence there was no evidence in the patient's record.

The total patient pool in this study was more than 12,000, which equates to 7% of the population in Townsville. Hence, this sample is likely to be representative of the Townsville chronic disease population who seek medical treatment. Comparison of the demographics of the T2DM sample with a national diabetes audit sample of more than 5,000 people showed similar means and overlapping ranges for age, sex distribution, blood pressure readings, lipid levels and HbA1c,[23] suggesting that the findings are likely to be generalisable to the Australian chronic disease population with respect to these characteristics. The Townsville sample had a higher representation of people who identified as Aboriginal or Torres Strait Islander, a reflection of higher than national average percentage locally.[6] The national audit sample, while very comprehensive in many regards, did not include information about alcohol consumption.[23]

Alcohol association with management targets

The key finding of decreased attainment of management targets associated with increased alcohol consumption is consistent with other literature looking at the relationship between alcohol on self-care behaviours.[10,24] The ability to meet management targets is a complex interplay between physician or practice-led initiatives and individual health behaviours, including the person's self-efficacy to initiate changes. While self-care behaviours are integral to chronic disease management, there is also evidence that clinicians are less inclined to engage with people who are drinking to excess.[5,8] This study does not distinguish the stage or stages of the management pathway that are being impacted. It does, however, suggest that if a patient is not meeting management targets, alcohol consumption is one of the areas that may need to be more thoroughly assessed.

The impact of smoking could not be independently assessed as 'not smoking' was a management target for all three chronic diseases.

Association of alcohol consumption with disease outcomes

As chronic diseases are generally progressive, many factors impact on disease outcome. Throughout the literature, evidence of the impact of alcohol on disease outcomes varies considerably and is complicated by data collection and coding issues. In this study, there was a small but measurable association between alcohol consumption and disease outcomes above and beyond the effects of demographics with independent associations with both outcome variables. Due to the small effect, demonstrating the difference within single disease cohorts was more problematic and may well be the domain of large national audits.

This study used a primary disease outcome that was readily available in most records and reflected guidance to GPs about monitoring of that disease. FEV1 % predicted and GFR are well-established markers of disease progression. HbA1c monitors glucose control over a three-month period and is therefore a less sensitive measure of progression of disease. However, it is well associated with adverse outcomes of diabetes and is widely used and accepted in the literature.[25] More accurate markers for diabetes, such as HbA1c trends or disease complications, were not able to be consistently obtained from the records without overly obtrusive inspection.

Limitations

Practice data are designed for clinical care of individuals, not for research. Not all data that would have been useful for this study were available or searchable. For example, letters stored as scanned documents are not generally searchable. The data were collected as entered in the practice records, however, where possible, verification was sought from the consultation notes. These limitations are offset by clear inclusion criteria, consistency of collection and a sample size that exceeded the minimum 360 records suggested by sample size calculations.

While the data come from only two practices in one regional city in north Queensland, Australia, the sample covers the practice of more than twenty doctors and 7% of the population of that city. The pool of patients from which the sample is collected is socioeconomically and geographically distributed across the town, increasing the likelihood that it is representative. The similarity in demographic and clinical data with large national samples increases the generalisability of the findings.

Alcohol consumption is measured by AUDIT-C, which is collected at a point in time. Unlike smoking status, which is routinely recorded as current smoker, ex-smoker or never smoked, alcohol consumption was routinely recorded in the software as a single entry. Not all records distinguished between recent ex-drinkers, long-term ex-drinkers or those who never drank alcohol. Recent substantial changes in alcohol consumption may not be reflected. This means that the AUDIT-C '0' category needs to be interpreted with caution.

Conclusions

In this study, increased alcohol consumption was associated with a reduced ability to meet management targets for chronic disease and with poorer disease outcomes. It is recommended that clear advice on alcohol assessment and management should be included in all chronic disease management guidelines. Higher-risk alcohol consumption should routinely be further explored in patients living with chronic disease who demonstrate an inability to meet targets in management guidelines, and as a potential contributor to unexplained poor outcomes. The modification of practice software to better monitor alcohol use over time could assist GPs in this task.

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