Exploratory validation study of the individual AUDIT-C items among older people

Abstract

Aims: The AUDIT-C is a brief and commonly used alcohol screening tool, with few data available on the relative validity of the three individual items in older adult populations. The aim of this study was to explore the validity of the AUDIT-C items in identifying unhealthy drinking among older people, with a view to developing a single item screener.

Methods: A sample of 143 older adults (mean age=71) were recruited from non-clinical settings in the UK. AUDIT-C scores were compared to an unhealthy drinking reference category of consuming more than the UK recommended weekly units of alcohol. Standard analyses were conducted for men and women, and for those prescribed medications for long term conditions.

Results: The AUDIT-C items performed well in identifying unhealthy drinking in this sample of older people, with generally high sensitivity, specificity and area under the ROC curve. No significant differences were found in the validity of the three items, though the combined sensitivity and specificity scores and ROC values for item 3 were consistently slightly lower than for items 1 and 2. The findings were similar for men and women, and for participants prescribed medications for long term conditions.

Conclusions: AUDIT-C items 1 and 2 performed as well as item 3 in identifying unhealthy drinking among older people in this study. Both are reasonable single item screener candidates, especially given relative ease of administration, with further validation study needed to examine psychometrics and how alcohol screening for older people can best be implemented in clinical settings.

Short Summary

The AUDIT-C and its component items performed well in identifying unhealthy drinking in this sample of older people, with generally high sensitivity, specificity and area under the ROC curve. Items 1 and 2 performed as well as item 3 and both are reasonable single item screener candidates for further research.

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Introduction

Age is a determinant of disease burden, and this relationship is influenced by alcohol consumption in complex ways (Stewart and McCambridge, 2019). Alcohol is known to cause a wide range of health problems and to reduce life expectancy in the general population (Forouzanfar et al., 2015). It is the third biggest risk factor for ill health among those aged over 50 globally (GBD 2016 Alcohol Collaborators, 2018). High levels of unhealthy alcohol consumption (use that risks health consequences) are reported in older populations in the UK (Meng et al., 2014) and elsewhere (Gell et al., 2015; Grant et al., 2017), heightening the risks of direct harms to health (GBD 2016 Alcohol Collaborators, 2018), interactions with medications prescribed for (often multiple) chronic conditions (Moore et al., 2007), and relatedly, complicating clinical management (Stewart and McCambridge, 2019).

Screening for alcohol consumption is recommended to identify people for whom brief interventions may be applicable, in primary care and other healthcare settings (National Institute for Health and Clinical Excellence, 2010). Successful implementation relies upon accurate screening tools, and clinicians being willing to actively identify unhealthy drinking among their patients in ways which encourage subsequent discussion of drinking (Andréasson, 2017). In practice, relatively few patients are routinely identified by primary care clinicians as unhealthy drinkers (Cheeta et al., 2008), and only a small proportion of patients who drink excessively report receiving advice from a general practitioner about their alcohol consumption in the UK(Brown et al., 2016) and elsewhere (Nilsen et al., 2011). There are clear limitations to the existing alcohol screening and brief intervention literature, even in primary care where it is most developed, being mainly focussed on general adults (i.e. mixed ages) with relatively little attention paid to older people and receptivity to interventions (McCambridge and Saitz, 2017). This is important because of the known differences in patterns of drinking between younger and older age groups (Meng et al., 2014) and greater vulnerability to harm from alcohol at older ages (Stewart and McCambridge, 2019).

Abbreviated versions of the 10-item Alcohol Use Disorders Identification Test (AUDIT) are recommended for practice and research where time to administer a screening instrument is limited (National Institute for Health and Clinical Excellence, 2010), such as in busy clinical settings. The first three questions of the AUDIT, the AUDIT-C, concern alcohol consumption only and have been found to be as accurate as the full version in various populations (Bradley et al., 2003; Bradley et al., 2007; Bush et al., 1998; Kriston et al., 2008), including among older adults(Gómez et al., 2006). The AUDIT-C also compares favourably with much longer assessments of unhealthy drinking in older adults that take account of comorbidities, health issues, and medications (Towers et al., 2019). The search for ever briefer screening tools is attractive to practitioners in busy clinical contexts, particularly where there are imperatives to screen for multiple risk behaviours and health conditions. However, few studies have examined the performance of the individual AUDIT-C items, with most attention given to item 3, which asks about heavy episodic drinking, and has been validated as a single item screener (Canagasaby, 2005; Mitchell et al., 2014). The performance of item 3 may be importantly different among people who usually consume smaller quantities of alcohol relatively frequently, a pattern of consumption more typical at older ages (Britton et al., 2015). For this reason, it may be useful to explore usual frequency or usual quantity of drinking as candidates for single item screeners for use with older patient groups.

The aim of this study was to conduct a preliminary assessment of the validity of the AUDIT-C in identifying unhealthy drinking in a sample of older people, and to examine the performance of the three AUDIT-C items relative to each other with a view to developing a single item screener for this population. The high prevalence of long term conditions among older adults (Barnett et al., 2012) gives rise to concerns about the potential impact of alcohol consumption on the effectiveness of prescribed medications and other indirect harms to health and well-being (Stewart and McCambridge, 2019). Given the paucity of research in this field, we explored the AUDIT-C in sub-groups of participants prescribed medication for long term conditions or not, in part to gain insight into whether there may be distinct issues raised in connection with the validity of screening tools.

Method

Participants were recruited from non-clinical community groups for older people, including those that support people with specific chronic health conditions, over a two month period in 2018. Eligible participants were 50 years of age or older and self-reported being current drinkers, defined as having consumed alcohol within the past month.   The study was ethically approved by the University of York Department of Health Sciences. For each group, a date for the researcher's visit was arranged and a flyer for distribution to group members sent in advance. Our aim was to approach all potential participants, but we were guided by group leads as to whether any individuals on the day of the visit should not be approached (e.g. have expressed unwillingness to take part, lacking capacity to consent, or for some other reason e.g. distress). Since group attendance could not be known in advance, the researcher recruited participants opportunistically, ensuring that only those eligible and not previous participants at another group were invited to take part. Potential participants were provided with a study information sheet and the researcher answered any questions before a consent form was signed. Each participant completed a general health questionnaire (the alcohol focus of the research was not disclosed), including the AUDIT-C and a retrospective 7-day drinking diary (in that order). The questionnaire took approximately 10-15 minutes to complete. The three AUDIT-C questions (for the last 3 months), response categories and scoring were:

1. How often do you have a drink containing alcohol? Never (0), Monthly or less (1),2–4 times per month (2), 2–3 times per week (3), 4+ times per week (4).

2. How many units of alcohol do you drink on a typical day when you are drinking? 1–2 (0), 3–4 (1), 5–6 (2), 7–9 (3), 10+ (4).

3. How often have you had 6 or more units if female, or 8 or more if male, on a single occasion?

Never (0), less than monthly (1), monthly (2), weekly (3),daily or almost daily (4).

Total weekly alcohol consumption was calculated from quantities of specific beverages recorded for each day. The reference category was defined as drinking above UK recommended limits of 14 units per week (1 UK unit is 8 grams of ethanol) for both men and women (the threshold for men was revised downwards from 21 in 2016) (UK Chief Medical Officers, 2016). Participants also completed a 22 item checklist of common long term health problems (Barnett et al., 2012) for which they were prescribed medication, including the following British National Formulary categories of condition: cardiovascular, respiratory, musculoskeletal, Central Nervous System, endocrine system and malignant disease.

Analyses were conducted in Stata SE v15. Differences in sample characteristics were assessed by t-tests and χ^2 tests for continuous and binary variables respectively. Associations between alcohol consumption variables (positive screen, above median units per drinking day and drinking on 5 days or more per week) and use of medication for long term conditions were analysed by logistic regression, adjusted for age and gender and shown as adjusted odds ratios (AOR). Sensitivity (true positive rate) and specificity (true negative rate) for identifying drinking above recommended weekly limits were assessed for the total AUDIT-C and for the three individual items. As with previous AUDIT-C validation studies (Bradley et al., 2007; Khadjesari et al., 2017), we identified optimal cut-offs with the best balance of sensitivity and specificity. The sum of the sensitivity and specificity and the proportion of cases correctly classified were also calculated. The performance of cut-off scores was assessed by receiver-operating characteristic (ROC) curves. Chi-squared values are presented for comparative tests for the equality of the area under the curve. Analyses were conducted for the whole sample and for men and women separately, and for participants prescribed medications for long term conditions.

Results

Characteristics and drinking patterns of the 143 participants are shown in Table 1. The mean age of the sample was 71. Men reported consuming significantly more units of alcohol per week, drinking on more days per week, consuming more units of alcohol per drinking day, with a higher proportion of men than women reported drinking on 5 days or more per week. These gender differences were also reflected in mean total and individual AUDIT-C item scores. Prescription medications for long term conditions were reported by 70% of the sample, with cardiovascular disease the most prevalent, and no statistically significant differences between men and women. Participants with long term conditions consumed less alcohol and drank less frequently than the remainder of the sample but these differences were not statistically significant. Respective results were: 21.0% vs 27.9%, AOR =0.86 (95% CI=0.34, 2.22, p=0.760) for screening positive for unhealthy drinking; 40.0 % vs 44.2%, AOR = 1.28 (95% CI=0.51, 3.24, p=0.598) for above median units per drinking day; and 20.0% vs 27.9%, AOR=0.56 (95% CI=0.23, 1.37, p=0.208) for drinking on 5 days or more per week.

-Table 1 about here -

Total AUDIT-C scores

The optimal cut-off for the whole sample was ≥5, with 88% sensitivity and 85% specificity, correctly classifying 85% of cases (Table 2). The area under the ROC curve was not significantly different between men and women (χ^2 [2]=0.24, p=0.625; Figure 1). The optimal cut-off was ≥5 for both men and women. Overall, optimal cut-offs did not change when analyses were restricted to participants who were prescribed medications, nor was there a significant difference in the area under the ROC curve between men and women within this group (χ^2 [2]=1.14, p=0.286). However, the optimal cut-off for total AUDIT-C among women reduced to ≥4, with 100% sensitivity and 80% specificity.

AUDIT-C item scores

For the whole sample, the area under the ROC curve was similar for the three items: 0.85, 0.87 and

0.82 (χ^2[2]=1.76, p=0.415)(Table 3). For usual frequency of drinking (item 1), the optimal cut-offs

were ≥3 and ≥4, with little difference between them, although a higher proportion of correctly

classified cases were found for scores of ≥4 (83% vs 71% respectively). For usual quantity of drinking

(item 2), the optimal cut-off was ≥1, with a sensitivity of 91% and specificity of 75%. For heavy

episodic drinking (item 3), the best balance between sensitivity and specificity was at ≥1, but the

combined score was higher at ≥2, for which the most cases were correctly classified (85%).   No

significant difference in the area under the ROC curve was found when analyses were restricted to

men (χ^2[2]=0.65, p=0.723) or women (χ^2[2]=0.69, p=0.710).

There was greater distinction in the optimal cut-offs for items 1 and 2 among women compared to

men (Table 3). For women, the optimal cut-off for usual drinking frequency was ≥4 and it was ≥1 for

usual quantity. For men, there was little difference between ≥3 and ≥4 for usual frequency, but the

optimal cut-off for usual quantity remained ≥1. For heavy episodic drinking, the ≥2 cut-off score was

optimal for men, whilst ≥1 was the optimal threshold score for women.

For participants with long term conditions, the optimal cut-offs remained highest at ≥4 for usual

frequency and ≥1 for the usual quantity and heavy episodic drinking items. For men, the optimal

cut-off for item 1 was more clearly ≥3. Again, there was no significant difference between the area

under the ROC curves for the three items (χ^2[2]=1.30, p=0.522).

Discussion

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This exploratory study examines the performance of the AUDIT-C and its individual items among a community sample of older people in the UK, identifying that the AUDIT-C performs best overall, and that items 1 and 2 are at least as promising single-item screeners as item 3 in this population. We found the AUDIT-C to perform well in identifying unhealthy drinking among older men and women, with an optimal cut-off of ≥5 for both men and women. This is lower than the only other UK validation study of the instrument (Khadjesari et al., 2017), but that study was of a younger average age sample of people seeking help for their drinking and used the previous UK recommended weekly consumption limits as a reference category (21 units for men and 14 for women). Findings for the sensitivity and specificity of the AUDIT-C are broadly comparable with those reported in systematic reviews of non-UK validation studies in young people (Toner et al., 2019), in primary care patients and in other clinical settings (Kriston et al., 2008; Reinert and Allen, 2007). However, these studies using a variety of reference categories have found lower optimal AUDIT-C cut-offs and greater differences for men and women than reported here (Kriston et al., 2008; Reinert and Allen, 2007). With these caveats in mind, it is also interesting that there have been calls for consideration of lower recommended drinking thresholds for older adults (Crome et al., 2011), because physiological changes from ageing, more complex health problems and potential interactions with medications heighten the risk of harm from alcohol (Crome et al., 2012).

The individual AUDIT-C items performed similarly well in identifying unhealthy drinking in this sample, with no significant difference in the area under the ROC curve. Across analyses, the optimal cut-offs were usually drinking at least twice per week, usually drinking at least three units per drinking day or any heavy episodic drinking. Comparisons between AUDIT-C total scores and individual items scores in tables 2 and 3 respectively indicate that the total scores do add to the performance of screening in comparison to individual items. These findings thus indicate that the full AUDIT-C is superior for use with older adults. Nonetheless, the validity of the AUDIT-C items as single screening questions is promising in this study and call into question somewhat the efficiency of common approaches to alcohol screening that utilise a single combined quantity and frequency

question to identify unhealthy drinking among older people. For time pressured practitioners use of a single usual frequency or quantity of drinking screening question is likely to be appealing. The former avoids lengthier discussion about what constitutes a unit or standard drink and complications arising from making calculations. This may be useful for overcoming perceived barriers to screening and raising the subject of alcohol in clinical consultations, particularly where they involve the management of multiple health problems (Rapley et al., 2006). For all the attractiveness, however, the implications of false results need to be considered carefully. The complexities inherent in adjusting the usual quantity and heavy episodic drinking items of the AUDIT-C to take account of national variations in standard drinks have previously been described, alongside recommended changes to improve screening accuracy (Higgins-Biddle and Babor, 2018). A frequency only question avoids such issues. The levels of sensitivity and specificity in identifying unhealthy drinking in this sample compare favourably to those reported for pooled analyses of other single item screening questions to identify alcohol use disorders (Mitchell et al., 2014), in studies of the SASQ to identify hazardous drinking or harmful drinking in hospital settings (Canagasaby, 2005; Williams and Vinson, 2001), and in identifying heavy drinking among older male primary care paitents (Bradley et al., 1998). There are, however, diagnostic accuracy issues also to consider, where the purpose is screening to identify alcohol problems (Mitchell et al., 2014).

The optimal cut-offs for total and individual item scores were little changed when analyses were restricted to participants taking medications for long term conditions, indicating that the AUDIT-C, and a usual frequency of consumption question in particular, could be suitable for identifying unhealthy drinking in older clinical populations with long term conditions. There are many reasons for healthcare professionals to routinely ask about alcohol consumption with people prescribed medications for multiple morbidities (Stewart and McCambridge, 2019), particularly for medications known to interact with alcohol (Holton et al., 2017). For such populations, the implications of a positive screen for their health and care present significant challenges for both practitioners and health service systems (Stewart and McCambridge, 2019). Whilst alcohol screening and brief

psycho-social interventions have been trialled in different countries and health service settings, evidence specific to older people is much more limited (Kaner et al., 2018; Kelly et al., 2018b). Future development of screening and intervention programmes will need to take account not only of extensive multimorbidity among older people, but also variations in the experiences and understanding of alcohol and medication risks (Rao et al., 2016), such as knowledge (or lack of) of the potential harms from alcohol, mixed perceptions of the effects of alcohol on their own health, and views on the health and social benefits of alcohol consumption (Bareham et al., 2019; Kelly et al., 2018a; Madden et al., 2020).

The study has limitations that are important to consider. This was a small, convenience sample that was not recruited from clinical services, although the majority were receiving treatments for long term conditions. These factors limit the generalisability of the findings, as does the lack of information about people who did not volunteer to participate. This was an exploratory study that establishes the need for further research and should not be interpreted to mean that we recommend that a single usual consumption screening question should be adopted by practitioners. In undertaking further study, the high sensitivity and specificity of the AUDIT-C items reported in this exploratory study warrant further investigation in larger samples, and more specifically, to confirm the utility of usual consumption single screening questions asked of older people in health care settings. Since the AUDIT-C is a measure of alcohol consumption, rather than a direct measure of alcohol related harm, we used recommended weekly limits of alcohol consumption as a reference category. Whilst appropriate for the identification of a level of risk warranting consideration in clinical consultations, this means that participants should not be classified as problem drinkers (Higgins-Biddle and Babor, 2018). We have given equal weight to sensitivity and specificity in this study; there may be circumstances in which one is more important than the other. Finally, a short recall period may minimise bias (Rehm, 1998), but the retrospective 7 day drinking diary used for the measurement of the reference category in this study may have included or missed less frequent heavy episodic drinking patterns that fell outside of this period.

Conclusion

The possibility of using a single usual consumption screening question may be attractive to practitioners and to older people, perhaps particularly a frequency question about how often one drinks; this approach to screening does not in any way impede more detailed discussion of alcohol during clinical consultations. Further investigation by practitioners would be needed to identify risk and specific alcohol related problems more carefully, and the AUDIT-C or the full AUDIT could be used when judged useful for those who screen positive, should further evidence support use of a single usual consumption question in this population. The main contribution of this study is not to overlook simple existing questions in further research on the identification of potentially unhealthy drinking among older people.

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Table 1: Sample characteristics and alcohol consumption

	All (n=143)	Men (n=53)	Women (n=90)	P[1]
Age (SD)	70.79 (10.67)	69.63 (10.63)	71.46 (10.69)	0.320
White UK n(%)	141 (98.6)	52 (98.1)	89 (98.9)	0.703
Medications for all LTCs n(%)	100 (69.9)	39 (73.6)	61 (67.8)	0.465
Mean (SD) units of alcohol in past week	11.10 (17.38)	16.65 (20.14)	7.84 (14.69)	0.003
Cardiovascular	70 (49.0)	26 (49.1)	44 (48.9)	0.985
Endocrine	25 (17.5)	5 (9.4)	20 (22.2)	0.052
Respiratory	21 (14.7)	8 (15.1)	13 (14.4)	0.916
CNS	17 (11.9)	7 (13.2)	10 (11.1)	0.708
Musculoskeletal	15 (10.5)	3 (5.7)	12 (13.3)	0.148
Mean (SD) drinking days in past week	2.66 (2.23)	3.55 (2.27)	2.14 (2.05)	<0.001
Drinking 5 days per week or more n(%)	32 (22.4)	19 (35.6)	13 (14.4)	0.003
Mean (SD) units per drinking day	3.73 (3.97)	4.72 (4.25)	3.08 (3.67)	0.027
Positive screen[2] n(%)	33 (23.1)	20 (37.7)	13 (14.4)	0.001
Mean (SD) total AUDIT-C score	4.03 (2.80)	5.15 (3.07)	3.38 (2.42)	<0.001
Mean (SD) AUDIT-C item 1 (frequency) score	2.50 (1.13)	2.92 (1.09)	2.26 (1.09)	<0.001
Mean (SD) AUDIT-C item 2 (quantity) score	0.73 (1.11)	1.17 (1.31)	0.48 (0.89)	<0.001
Mean (SD) AUDIT-C item 3 (heavy episodic) score	0.80 (1.20)	1.06 (1.32)	0.64 (1.08)	0.045

Note: [1]P values are for comparisons of men and women; [2]Drinking above UK recommended limits of 14 units for men and women.

Table 2: Total AUDIT-C thresholds for a positive screen[1]

		Whole sample (n=143)					Long term conditions (n=100)[2]				
	Score	Sen %	Spe %	Sen + spe	Cor %	ROC (95% CI)	Sen %	Spe %	Sen+ spe	Cor %	ROC (95% CI)
All	>= 3	100	47	147	59	0.94 (0.89, 0.98)	100	48	148	59	0.93 (0.88, 0.98)
	>= 4	97	69	166	76		100	71	171	77	
	>= 5	88	85	172	85		90	84	174	85	
	>= 6	76	89	165	86		71	86	158	83	
	>= 7	67	95	162	89		62	95	157	88	
	>= 8	52	97	149	87		48	96	144	86	
Men	>= 3	100	39	139	62	0.91 (0.84, 0.98)	100	40	140	62	0.88 (0.78, 0.98)
	>= 4	100	55	155	72		100	52	152	69	
	>= 5	90	76	166	81		93	72	165	79	
	>= 6	75	82	157	79		71	76	147	74	
	>= 7	65	94	159	83		57	92	149	79	
	>= 8	55	97	152	81		50	96	146	79	
Women	>= 3	100	51	151	58	0.94 (0.87, 1.00)	100	52	152	57	0.95 (0.89, 1.00)
	>= 4	92	75	168	78		100	80	180	82	
	>= 5	85	88	173	88		86	89	175	89	
	>= 6	77	92	169	90		71	91	162	89	
	>= 7	69	96	165	92		71	96	168	93	
	>= 8	46	97	144	90		43	96	139	90	

Note: [1]Drinking above UK recommended limits of 14 units for men and women; [2]Includes 39 men and 61 women; ROC= area under the receiver-operating characteristic curve.

Table 3: AUDIT-C item thresholds for a positive screen[1]

	Item	Score	Whole sample (n=143)					Long term conditions (n=100)[2]			
			Sen %	Spe %	Sen+ spe	Cor %	ROC (95% CI)	Sen %	Spe %	Sen+ spe	ROC (95% CI)
All	1	>= 1	100	0	100	24	0.85 (0.79, 0.92)	100	0	100	0.86 (0.77, 0.95)
		>= 2	97	32	129	47		95	29	124	
		>= 3	94	64	158	71		95	66	161	
		>= 4	70	87	157	83		76	86	162	
	2	>= 1	91	75	165	78	0.87 (0.80, 0.94)	90	73	164	0.85 (0.76, 0.94)
		>= 2	55	92	146	83		48	90	137	
		>= 3	33	98	132	83		29	97	126	
		>= 4	21	100	121	82		19	100	119	
	3	>= 1	79	72	151	73	0.82 (0.73, 0.91)	76	70	146	0.79 (0.67, 0.90)
		>= 2	64	92	155	85		57	91	148	
		>= 3	48	95	143	84		43	94	137	
		>= 4	15	100	115	80		14	100	114	
Men	1	>= 1	100	0	100	38	0.80 (0.69, 0.91)	100	0	100	0.79 (0.66, 0.91)
		>= 2	100	27	127	55		100	28	128	
		>= 3	100	45	145	66		100	48	148	
		>= 4	65	79	144	74		71	72	143	
	2	>= 1	90	64	154	74	0.84 (0.73, 0.95)	86	56	142	0.79 (0.64, 0.94)
		>= 2	65	82	147	75		57	80	137	
		>= 3	40	100	140	77		43	100	143	
		>= 4	25	100	125	72		29	100	129	
	3	>= 1	75	67	142	70	0.80 (0.67, 0.93)	71	64	135	0.75 (0.59, 0.92)
		>= 2	65	91	156	81		57	88	145	
		>= 3	50	97	147	79		43	96	139	
		>= 4	15	100	115	68		14	100	114	
Women	1	>= 1	100	0	100	14	0.85 (0.72, 0.98)	100	0	100	0.85 (0.62, 1.00)
		>= 2	92	34	126	42		86	30	115	
		>= 3	85	71	156	73		86	74	160	
		>= 4	77	91	168	89		86	93	178	
	2	>= 1	92	79	172	81	0.88 (0.79, 0.97)	100	81	181	0.90 (0.83, 0.97)
		>= 2	38	96	135	88		29	95	124	
		>= 3	23	97	120	87		0	96	96	
		>= 4	15	100	115	88		-	-	-	
	3	>= 1	85	74	159	76	0.84 (0.72, 0.97)	86	72	158	0.84 (0.67, 1.00)

>= 2	62	92	154	88		57	93	150
>= 3	46	94	140	87		43	93	135
>= 4	15	100	115	88		14	100	114

Note: [1]Drinking above UK recommended limits of 14 units for men and women; [2]Includes 39 men and 61 women; ROC= area under the receiver-operating characteristic curve.

Figure 1: Receiver-operating characteristic curve for total AUDIT-C

Figure 2: Receiver-operating characteristic curve for AUDIT-C items