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## Proactive care programs in the emergency department: effectiveness and feasibility

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## CHAPTER 2

# Evaluation of screening and brief intervention for hazardous alcohol use integrated into clinical practice in an inner-city emergency department

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## ABSTRACT

### Introduction

In small studies, Screening, Brief Intervention and Referral to Treatment (SBIRT) in Emergency Departments (EDs) is effective in reducing hazardous alcohol use.

### Objective

To examine the effectiveness of SBIRT in an inner-city ED in routine clinical practice.

### Methods

Of the 41,900 consecutive ED patients aged 18 years and older, 22,537 (53.8%) were screened using the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C). Patients with positive AUDIT-C scores (men  $\geq 5$  and women  $\geq 4$ ) received educational leaflets. Brief interventions were performed by ED personnel trained in motivational interviewing. At three months, patients were contacted by telephone and recent drinking pattern was assessed.

### Results

Out of 22,537 patients, 2209 (9.8%) had an elevated AUDIT-C score. Male sex, alcohol-related reason for ED visit, alcohol or other intoxication at ED visit, head injury, stomach or intestinal bleeding and wounds were significant predictors of hazardous alcohol use in both univariate (all  $p < 0.001$ ) and multivariate analysis. Out of 2209 AUDIT-C positive patients, 894 (40.5%) received an intervention: of these 894 patients, 70% received educational material only and 30% received both motivational intervention and educational material. In the subset of patients available for follow up, 34.9% either reduced or stopped alcohol use.

### Conclusion

Our study shows that in a large inner-city ED, SBIRT can be implemented in daily care. Screening uncovered large numbers of patients with hazardous alcohol use and identified several risk factors. Moreover, screening and intervention appeared to be effective in reducing alcohol intake.

## INTRODUCTION

Hazardous alcohol use is becoming a growing target of attention as many diseases and injuries are either caused or worsened by alcohol. In the Emergency Department (ED) population alcohol-related problems are prevalent and cover a wide spectrum of misuse, ranging from at-risk drinking patterns to dependence. Alcohol use not only affects the individual drinker, but also has far-reaching implications for families, communities, workplaces and the health care system [1]. Literature suggests that, during an ED visit, patients may be more receptive to education and help, and more open to seeing the connection between their drinking patterns and their consequences [2,3]. Therefore, EDs are excellent settings for detection of alcohol abuse and implementation of brief interventions by ED staff [4]. Several studies have reported that a standardized Screening (using a questionnaire), Brief Intervention and Referral to Treatment (SBIRT) intervention, performed at an ED, can effectively minimize future alcohol consumption, reduce injury recurrence, and decrease the number of repeat ED visits [5-8].

Despite the magnitude of the problem and the evidence that brief interventions are effective, few EDs actually screen for alcohol-related problems, much less intervene once misuse is identified [9]. In the Dutch EDs, screening for alcohol-related problems has only been done incidentally in case of evident alcohol-related injuries.

Clinical trials on the efficacy of SBIRT in EDs usually carry some factors that might hinder implementation in daily practice: some studies only screen 'at-risk' patients, which requires a continuous alertness of ED personnel on the risk factors for hazardous alcohol use [5,10]. Moreover, alcohol-related complaints and symptoms can be nonspecific and difficult to recognize [11]. Therefore, this approach carries the risk of missing at-risk subjects.

In several studies external personnel, for example, 'health advocates' or addiction experts, were introduced to perform the screening or the intervention [5,7,10,12]. Other trials only screened during a certain time of the day (afternoon or evening) [7,12,13]. These approaches evidently carry the risk of bias and missing subjects at risk that might present at night. Furthermore, introducing procedures only during certain shifts undermines the approach of making it part of the daily routine.

Some trials performed extensive screening or very time-consuming interventions [7,10,12]. Although 15-20 minutes might not seem to be long in addiction and mental health settings, it is considered to be a long period of time in a busy ED.

The objective of this project was to investigate whether SBIRT could be implemented in the daily clinical practice of the ED, performed by the ED staff themselves, 24 hours a day, seven days a week and all year round. All adult ED patients were eligible for inclusion.

In this article we present the initial results of this project.

We present the demographic characteristics of the patients who were screened and the reasons why patients were not screened. We describe which patient characteristics were found to be associated with a risky drinking pattern. We show in how many cases an intervention was done. Finally, we evaluate the effect of screening and of brief intervention on hazardous alcohol use at three months follow up.

## **METHODS**

This study is an evaluation of the SBIRT protocol in the period from November 2012 to November 2013.

### **Setting**

In September 2010, the SBIRT approach was introduced at the ED of Medical Centre Haaglanden Westeinde (MCH Westeinde). The MCH Westeinde is an inner-city hospital in The Netherlands, with 50,000 ED visits annually. During implementation, all ED healthcare professionals (nurses, medical doctors, nurse practitioners) received a standardized training and were educated in techniques of motivational interviewing. SBIRT was adopted as a standard approach in the ED. A computerized instrument for screening was incorporated in the hospital electronic system. Referral options were coordinated within the project.

### **Study patients and procedures**

According to the protocol, all patients aged 18 years and older who presented to the MCH Westeinde ED were screened for hazardous alcohol use. Screening took place during triage (a brief, focused assessment after entering the ED, in which the urgency of the complaints is established) and was performed 24 hours a day, seven days a week.

Screening was performed using the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C). The AUDIT-C is a shortened variant of the AUDIT and is validated for ED settings [12,14]. An AUDIT-C score of five and higher is a positive result in men and an AUDIT-C score of four or more indicates a positive result in women [14].

For patients who were not screened, the reasons for not screening were noted: (a) patient is not capable to answer, (b) healthcare professional forgot to ask, (c) patient refuses cooperation and (d) screening has been performed recently (during a former visit to the MCH Westeinde ED, less than 6 months ago).

Patients with a positive AUDIT-C score received a leaflet. These leaflets provided information on the consequences of hazardous alcohol use, as well as relevant



Internet addresses, and addresses and telephone numbers of the addiction prevention centre and the addiction treatment centre in the city.

In addition, patients with a positive AUDIT-C score received a motivational intervention (MI). A MI was performed by an ED health care professional and consisted of feedback on the screening result and information on alcohol-related harm, related to the patient's complaints if applicable. The patient also received information on what is considered low-risk alcohol consumption. The advantages and disadvantages of alcohol use that the patient experienced were discussed in an open, respectful conversation. Coping strategies and high-risk situations for drinking were analysed. Feedback, support and motivation were provided when the patient became aware of thoughts and feelings about the alcohol use. The aim was to help the patient develop a personal plan to reduce alcohol consumption. This interview took about 5-10 minutes.

To evaluate the effect of the SBIRT approach, all AUDIT-C positive patients were contacted by telephone three months after their ED visit. The AUDIT-C score was repeated and answers were based on their alcohol use during the last three months. There were no financial consequences for participation in follow up.

The ethical review committee of the MCH (METC Zuidwest Holland, nr. 11-079) granted institutional review board exemption.

### **Data collection**

To identify patient and ED visit characteristics associated with hazardous drinking, the following data were extracted from the hospital's database for each adult registered patient: age, sex, chief complaint, triage level, alcohol-related or non-alcohol-related visit according to the triage nurse, living district, day and time of ED visit. Chief complaints were identified from the triage notes for each ED visit. Triage levels were assigned according to the five-level Manchester Triage System. Living districts were divided into disadvantaged and not-disadvantaged areas. Disadvantaged areas were defined as districts that have received additional government funding since 2007 to improve living conditions ("Actieplan Krachtwijken", Dutch Ministry of Housing, Spatial Planning and Environment, July 2007).

### **Statistical analyses**

In describing the general characteristics of our study population, to prevent skewing of the mean because of outliers, we present the age as the median plus the range in ages. The difference in median age between patients with a positive AUDIT-C score and patients with a negative AUDIT-C score was analysed using the Mann-Whitney-U test.

Differences between patients with a positive AUDIT-C score and patients with a negative AUDIT-C score in age categories, sex, chief complaint, alcohol-related and not-alcohol-related visits, living district, weekend and week visits, and the time of the day were analysed using  $\chi^2$  tests and were presented as odds ratios (ORs). As multiple testing was performed in the univariate analysis, Bonferroni correction was performed on the significant predictors. After this correction, characteristics with  $P$ -values of  $0.05/33 \leq 0.0015$  were considered to be significant predictors of hazardous alcohol use. In addition, all variables that were univariately associated with a positive AUDIT-C score were entered into a multivariate logistic regression model. The variables included in the model were sex, whether the ED visit was alcohol-related or not, visit at night, and the following chief complaints: alcohol or other intoxication, head injury, physical abuse, stomach or intestinal bleeding, trauma and wounds. Adjusted ORs [exp (B)] are provided with their 95% confidence intervals (CI). The calibration and overall discriminative capacity of the model was assessed with the Hosmer-Lemeshow test and the area under the receiver operating curve analysis.

Data were analysed using the statistical package for the social sciences (IBM SPSS Statistics for Windows, version 20.0, IBM Corp, Armonk, New York, USA).

## RESULTS

Of the 41,900 consecutive ED patients aged 18 years and older who presented at the ED in the period from November 2012 to November 2013, 22,537 (53.8%) were screened for hazardous alcohol use. The median age of the adult ED patients was 42 years and 50.9% were men. The proportion of patients who refused to cooperate in answering the questions on their alcohol use was negligible (0.7%). In 21.8% of cases, ED staff forgot to ask about the alcohol use. In other instances, patients were either not capable of answering (6.9%) or they had been screened recently (16.7%) (Table 1).

**Table 1.** Alcohol screening performed in consecutive patients attending the Emergency Department between November 2012 and November 2013

Number of patients	41900
Age [median (range)] (years)	42 (18-104)
Male sex [n (%)]	21339 (50.9)
Alcohol screening performed [n (%)]	22537 (53.8)
Alcohol screening not performed [n (%)]	
Patient not able to answer	2911 (6.9)
Forgotten by healthcare professional	9152 (21.8)
Recent alcohol screening done	7012 (16.7)
Patient refuses to cooperate	288 (0.7)



Patients who were screened differed from patients who were not screened in terms of the percentage of men (48.6% in screened patients versus 53.6% in unscreened patients,  $P<0.0001$ ), median age (41 years (range 18-99 years) in screened patients versus 43 years (range 18-104 years) in unscreened patients,  $P<0.001$ ) and time of ED visit (9.6% at night in the screened group versus 10.9% at night in the unscreened group,  $P<0.001$ ) (data not shown).

Elevated AUDIT-C scores were found in 2209 out of 22,537 ED patients screened (9.8%) (Table 2). In univariate analysis, several patient and ED visit characteristics were significantly associated with an elevated AUDIT-C score and some were associated with a low AUDIT-C score. As multiple testing was performed, Bonferroni correction was performed on the results of the univariate analysis (Table 2).

■ **Table 2.** Analysis of factors associated with hazardous alcohol use

	AUDIT-C positive (N=2209) [n (%)]	AUDIT-C negative (N=20328) [n (%)]	OR (95% CI)	P-value
Male sex	1436 (65.0)	9518 (46.8)	2.11 (1.9-2.3)	<0.001 <sup>#</sup>
Age [median (range)] (years) <sup>^</sup>	41 (18-99)	41 (18-93)		0.091
Between 18-25	377 (17.1)	3556 (17.5)	0.97 (0.86-1.10)	0.62
Between 25-55	1260 (57.0)	10917 (53.7)	1.15 (1.05-1.25)	0.002
Older than 55	572 (25.9)	5855 (28.8)	0.86 (0.78-0.95)	0.004
Alcohol-related visit according to triage nurse				
Yes	357 (16.2)	208 (1.0)	18.7 (15.6-22.3)	<0.001 <sup>#</sup>
No	1720 (77.9)	20012 (98.4)		
Possibly	132 (6.0)	108 (0.5)		
Living in a disadvantaged area*	740 (33.5)	10716 (52.7)	0.45 (0.41-0.50)	<0.001 <sup>#</sup>
<u>Chief complaint</u>				
Abdominal pain, diarrhoea, vomiting	238 (10.8)	2990 (14.7)	0.70 (0.61-0.81)	<0.001 <sup>#</sup>
Abnormal behaviour, psychiatric illness	11 (0.5)	62 (0.3)	1.63 (0.86-3.11)	0.2
Alcohol or other intoxication	74 (3.3)	93 (0.5)	7.54 (5.5-10.3)	<0.001 <sup>#</sup>
Automutilation	1 (0.0)	12 (0.1)	0.77 (0.10-5.91)	0.8
Back pain	52 (2.4)	693 (3.4)	0.68 (0.51-0.91)	0.008
Burns, chemical injury	7 (0.3)	117 (0.6)	0.55 (0.26-1.8)	0.11
Collapse or near collapse	126 (5.7)	1360 (6.7)	0.84 (0.70-1.02)	0.08
Diabetes, haematological disease	6 (0.3)	80 (0.4)	0.69 (0.30-1.59)	0.38
Dyspnoea	94 (4.3)	1049 (5.2)	0.82 (0.66 - 1.01)	0.06
Ear, eye, nose, throat complaint	103 (4.7)	1150 (5.7)	0.82 (0.66 -1.00)	0.06
Head injury	77 (3.5)	275 (1.4)	2.6 (2.04-3.40)	<0.001 <sup>#</sup>

■ Table 2. Continued.

	AUDIT-C positive (N=2209) [n (%)]	AUDIT-C negative (N=20328) [n (%)]	OR (95% CI)	P-value
Headache	75 (3.4)	896 (4.4)	0.70 (0.60-0.97)	0.03
Limb complaints	489 (22.1)	4118 (20.3)	1.20 (1.01-1.24)	0.04
Physical abuse	41 (1.9)	164 (0.8)	2.32 (1.65-3.3)	<0.001 <sup>#</sup>
Pregnancy	2 (0.1)	267 (1.3)	0.07 (0.02-0.27)	<0.001 <sup>#</sup>
Seizure	11 (0.5)	107 (0.5)	0.95 (0.51-1.76)	0.86
Skin rash or infection	109 (4.9)	943 (4.6)	1.07 (0.87-1.31)	0.53
Stomach or intestinal bleeding	32 (1.4)	141 (0.7)	2.10 (1.43-3.10)	<0.001 <sup>#</sup>
Thoracic pain	238 (10.8)	2182 (10.7)	1.00 (0.87- 1.16)	0.95
Trauma	54 (2.4)	294 (1.4)	1.71 (1.27-2.29)	<0.001 <sup>#</sup>
Urinary tract or testis complaint	34 (1.5)	435 (2.1)	0.71 (0.50-1.02)	0.06
Vaginal bleeding	3 (0.1)	273 (1.3)	0.01 (0.03-0.31)	<0.001 <sup>#</sup>
Venereal disease	3 (0.1)	27 (0.1)	1.02 (0.31-3.37)	0.97
Wound	196 (8.9)	1160 (5.7)	1.61 (1.37-1.89)	<0.001 <sup>#</sup>
Other	133 (6.0)	1440 (7.1)	0.84 (0.70-1.01)	0.06
Visit in weekend	1022 (46.3)	8824 (43.4)	1.10 (1.03- 1.23)	0.01
Time of visit				
Day	1403 (63.5)	12423 (61.1)	1.2 (1.0- 1.2)	0.03
Evening	527 (23.9)	6032 (29.7)	0.74 (0.67-0.82)	<0.001 <sup>#</sup>
Night	279 (12.6)	1873 (9.2)	1.42 (1.25-1.63)	<0.001 <sup>#</sup>

<sup>^</sup> Mann-Whitney U-test

<sup>\*</sup> Disadvantaged areas are defined as districts that have received additional government funding since 2007 to improve living conditions. In popular press they are called “Vogelaarwijken”: Laakkwartier, Binckhorst en Spoorwijk, Bouwlust/Vrederust, Moerwijk, Morgenstond, Stationsbuurt, Schilderswijk, Transvaal, Groente en Fruitmarkt.

<sup>#</sup> Statistically significant after Bonferroni correction.

AUDIT-C, Alcohol Use Disorders Identification Test-Consumption; *n*, number; OR, odds ratios.

After multivariate analysis, male sex ( $P<0.001$ ), alcohol-related ED visit according to the triage nurse ( $P<0.001$ ), alcohol or other intoxication ( $P<0.001$ ), head injury ( $P<0.001$ ), stomach or intestinal bleeding ( $P$  0.008) and wounds ( $P<0.001$ ) were significant predictors of hazardous alcohol use (Table 3). The goodness of fit of the logistic model was strong ( $P<0.001$ ), whereas the area under the curve of the receiver operating characteristic curve showed a moderate discriminative ability [0.67 (95% confidence interval 0.64-0.69)].

Of the 2209 AUDIT-C positive patients, 894 (40.5%) received an intervention: 70% was given a leaflet and 30% received both a motivational interview and a leaflet. The remaining 1315 (59.5%) patients with an elevated AUDIT-C score did not receive any intervention beyond screening (Figure 1).

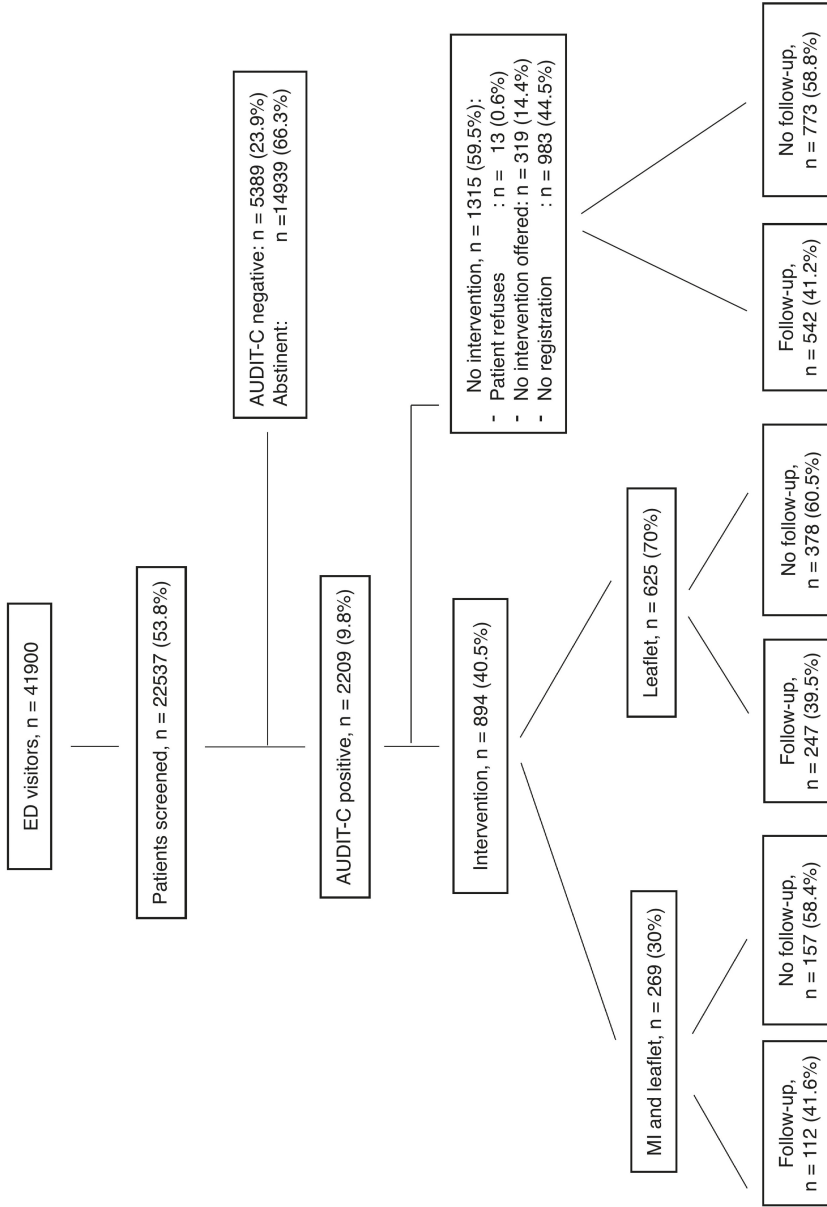
■ **Table 3.** Multivariate model analysis of factors associated with a positive AUDIT-C score

	Exp(B)	95% CI	P
Male sex	1.80	1.64-1.99	<0.001
Alcohol-related visit according to triage nurse	6.41	5.62-7.32	<0.001
Chief complaint			
Alcohol or other intoxication	8.17	3.52-17.31	<0.001
Head injury	1.91	1.44-2.54	<0.001
Physical abuse	1.39	0.86-1.93	0.23
Stomach or intestinal bleeding	1.80	1.17-2.77	0.008
Trauma	1.25	0.90-1.74	0.18
Wound	1.31	1.13-1.50	<0.001
Visit at night	0.71	0.60-0.83	<0.001

Model characteristics: -2 log likelihood 13088; AUC of the ROC 0.67 (95% CI 0.64-0.69;  $P<0.001$ )  
*AUC*, area under the curve; *AUDIT-C*, Alcohol Use Disorders Identification Test-Consumption; *CI*, confidence interval; *ROC*, receiver operating characteristic curve.

The proportion of patients with a positive AUDIT-C score reached for follow-up was 55.3%. Of these patients, 74% were able and willing to cooperate. These patients were more often women and were older ( $P<0.005$ ) than patients who were not reached (data not shown).

Of patients available for follow-up, 34.9% had either reduced or stopped alcohol consumption three months after the ED visit ( $P<0.005$ ) and 34.3% no longer had a positive AUDIT-C score ( $P<0.005$ ). Of the patients who did not receive any intervention beyond screening, 31.4% reduced or stopped alcohol intake. In all, 64.2% of patients who received a leaflet either reduced or stopped alcohol intake at the three-month follow-up ( $P<0.005$ ) and 41.7% no longer had a positive AUDIT-C score ( $P<0.005$ ). These proportions were even higher among patients who also received a MI (87.2%, respectively, 62.5%,  $P<0.005$ ) (data not shown).



**Figure 1.** Flow chart showing screening, recruitment and follow-up rates of ED patients during the 1-year study period. *AUDIT-C*, Alcohol Use Disorders Identification Test-Consumption; *ED*, Emergency Department; *MI*, motivational intervention.

## DISCUSSION

SBIRT in ED settings has been shown to be effective in several clinical trials. This study was designed to investigate the feasibility of incorporating SBIRT into the daily routine of the ED, to identify the proportion and characteristics of ED patients with hazardous alcohol use and to assess the effectiveness of SBIRT in this clinical setting.

The proportion of patients being screened was 53.8%, which is comparable to most clinical trials (especially those including all ED visitors) [6,10]. Refusal rate was strikingly low. This might be explained by the fact that the screening process was part of the triage procedure. In all, 9.8% of patients being screened were AUDIT-C positive, which is rather low compared to some clinical trials [5,7,10,12,13], but is in accordance with data from a study on alcohol use performed in three EDs in the Netherlands [15]. Screening of all patients visiting the ED, and not just patients at risk, might be an explanation for this.

We identified several risk factors for hazardous alcohol use (male sex, alcohol-related ED visit, alcohol or other intoxication, head injury, stomach or intestinal bleeding and wounds). These findings are in accordance with previous studies [1,3,5,15].

According to the literature, most intervention studies have been restricted to risk groups. However, it is apparent from our data that a substantial number of patients with hazardous alcohol use did not belong to any of these risk groups. Therefore, we are currently analysing our data, focusing on patients with a positive AUDIT-C score, to study whether the height of their score is related to specific risk factors, the intervention that was carried out and their response to intervention and follow-up. This is relevant to fully evaluate the need for screening all patients as we did in our practice.

The number of interventions that was performed was limited compared to previous studies [5,7,10,12,13], although it was higher than that in one of the few other studies in which the ED staff performed the entire process of SBIRT, as in our study [16].

The follow-up rate was rather low compared with other studies [5,6,10,13]. The absence of a financial reward for patients who participated at follow-up might be an explanation for this. Another explanation might be that the hospital is situated in a disadvantaged area, where the rate of migration may be high and individuals might not be reachable by telephone.

The overall proportion of patients either reducing or quitting alcohol use at follow-up was 34.9%. This number is considerable compared with most clinical trials [6,7,10,12,13]. However, in the light of the number of patients unavailable for follow-up, it is difficult to draw definite conclusions from this number, particularly because, as

we have described, there are demographic differences (age and sex) between patients reached for follow-up and patients not reached. Nevertheless, among patients who were reached for follow-up, just screening already resulted in reduced alcohol use in a notable number of patients. However, intervention, and particularly MI, resulted in a greater reduction in alcohol use. This may have occurred because of the fact that ED personnel performed the screening and intervention. The advantage of ED personnel performing the MI is that they can incorporate it into the process of the ED visit as well as relate the patient's complaints to their alcohol use. Consequently, the moment of awareness that is created by visiting the ED is well used.

### **Limitations**

This study was a single-centre study and the follow-up duration was rather short. More research is needed involving multiple centres and longer follow-up times. Currently, SBIRT is performed at both locations of our hospital, situated in different parts of the city. We are planning to carry out future analysis on the results of these two locations.

We restricted our project to patients 18 years of age and older. As hazardous alcohol use is also prevalent in younger populations, we have started to include 16 and 17-year-old individuals in our current SBIRT protocol. This change was made after the completion of this study.

Although comparable to other studies, the proportion of patients screened, the number of patients who received an intervention and the number of patients reached by follow-up were rather low. We are currently analysing the entire process of the study, focusing on these three crucial stages of the SBIRT process. In our database, we are looking for patient factors that are positively or negatively associated with being screened, receiving an intervention and being reached for and cooperating with follow-up.

This study was not designed as a clinical trial. Therefore, the design was not randomised.

It is conceivable that MI was offered more often to patients with a good understanding of the Dutch or English language, who were not terminally ill and who were more open about their alcohol use and receptive to changing their habit.

Multiple testing was performed. We corrected for this by using rigid Bonferroni correction.

## **Strengths**

In this study, we show that SBIRT can be adopted in daily clinical practice. All ED visitors  $\geq 18$  years were included, 24 hours a day, seven days a week, all year round. The screening and interventions were performed by ED personnel and were incorporated in the ED care process.

## **CONCLUSION**

In this large study in the Netherlands, we show that SBIRT can be implemented as part of the daily routine in a large inner-city ED. We found that 9.8% of ED visitors had a positive AUDIT-C score. Screening and performing interventions, by offering educational material and by motivational interviewing, appeared to be effective in reducing alcohol intake and therefore in reducing an important health risk factor.



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