

Motivation to change risky drinking and motivation to seek help for alcohol risk drinking among general hospital inpatients with problem drinking and alcohol-related diseases

Katharina Lau, Dipl. Psych.^{a,*}, Jennis Freyer-Adam, Ph.D.^b, Beate Gaertner, Ph.D.^b, Hans-Jürgen Rumpf, Ph.D.^c, Ulrich John, Ph.D.^b, Ulfert Hapke, Ph.D.^d

^aSHIP/Clinical–Epidemiological Research Unit, Institute of Community Medicine, Ernst-Moritz-Arndt University of Greifswald, 17487 Greifswald, Germany

^bInstitute of Epidemiology and Social Medicine, Ernst-Moritz-Arndt University of Greifswald, 17487 Greifswald, Germany

^cDepartment of Psychiatry and Psychotherapy, University of Luebeck, 23538 Luebeck, Germany

^dRobert-Koch Institute, FG 22, 13353 Berlin, Germany

Received 24 July 2009; accepted 2 October 2009

Abstract

Objective: The objective of this study was to analyze motivation to change drinking behavior and motivation to seek help in general hospital inpatients with problem drinking and alcohol-related diseases.

Method: The sample consisted of 294 general hospital inpatients aged 18–64 years. Inpatients with alcohol-attributable disease were classified according to its alcohol-attributable fraction (AAF; AAF=1, AAF<1 and AAF=0). Baseline differences in alcohol-related variables, demographics and motivation between the AAF groups were analyzed. Furthermore, differences in motivation to change, in motivation to seek help and in the amount of alcohol consumed from baseline to follow-up between the AAF groups were evaluated.

Results: During hospital stay, motivation to change was higher among inpatients with alcohol-attributable diseases than among inpatients who had no alcohol-attributable diseases [$F(2)=18.40$, $P<.001$]. Motivation to seek help was higher among inpatients with AAF=1 than among inpatients with AAF<1 and AAF=0 [$F(2)=21.66$, $P<.001$]. While motivation to change drinking behavior remained stable within 12 months of hospitalization, motivation to seek help decreased. The amount of alcohol consumed decreased in all three AAF groups.

Conclusions: Data suggest that hospital stay seems to be a “teachable moment.” Screening for problem drinking and motivation differentiated by AAFs might be a tool for early intervention.

© 2010 Elsevier Inc. All rights reserved.

Keywords: Motivation; Alcohol-related diseases; Alcohol-attributable fractions; General hospital

1. Introduction

In general hospitals, inpatients with problem drinking are frequently found to have alcohol-related diseases. A study conducted in Germany showed that 21% of the inpatients of one general hospital were treated for alcohol-related diseases [1]. Data of a study conducted by Jarque-Lopez et al. [2] revealed that 24% of the inpatients of a general hospital unit

for internal medicine in Spain were admitted due to alcohol-related disorders. In a study in Canada, 33.8% of malignant neoplasms and 57.9% of neuropsychiatric conditions in the male adult population were attributable to alcohol [3].

Due to the high proportion of general hospital inpatients with alcohol-attributable diseases, there is a need for appropriate treatment for three reasons. First, alcohol problem drinking may be expected to be practiced again after discharge. Second, alcohol problem drinking may lead to hospital readmission due to accompanying health problems. Third, being hospitalized due to alcohol-attributable disease may be a motivator to change problem drinking.

* Corresponding author. Tel.: +49 3834 8619571; fax: +49 3834 866684.

E-mail address: katharina.lau@uni-greifswald.de (K. Lau).

Therefore, the hospital stay may be used for providing a brief intervention based on the inpatients' alcohol problem and motivational level.

From the point of view of hospital care and public health, it is important to find ways to screen for problem drinking in a time-saving manner. One opportunity to add to screening and early intervention according to alcohol problems might be to use routine treatment diagnoses classified by alcohol-attributable fractions (AAFs). Diseases may be classified according to their AAFs into two groups [4]: (a) diseases totally attributable to alcohol by definition (AAF=1; e.g., alcoholic neuropathy or alcoholic gastritis) and (b) diseases partially attributable to alcohol (AAF<1; e.g., esophageal cancer or hypertension). AAFs have been defined as the proportion by which disease cases, injury events or deaths would be reduced if alcohol use and misuse were eliminated among the population [5]. Specific AAFs have been found by analyzing survey data on per-capita alcohol consumption and relative risks for chronic diseases and injuries [6]. AAFs may be used for screening and counseling purposes.

Data on alcohol-related diseases provided so far by general hospitals have been largely limited to inpatients with alcohol dependence or alcohol abuse according to *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* criteria [7]. However, the majority of general hospital inpatients with alcohol-attributable diseases are drinking an amount that is a risk for their health, but without fulfilling the criteria for alcohol dependence or abuse. Several definitions have been suggested for risky drinking. According to the definition of the British Medical Association (BMA) [8], an average daily alcohol consumption of more than 20 g for women and more than 30 g for men is regarded as risky drinking. Problem drinking may be defined as including risky drinking, as well as alcohol use disorders, according to *DSM-IV* criteria.

When screening for alcohol problem drinking and providing advice, inpatients' motivation to change drinking behavior and motivation to seek help for alcohol problems are important to consider. However, little is known about that among inpatients with problem drinking [9,10].

According to the Transtheoretical Model of Behavior Change (TTM), motivation to change drinking behavior may be conceptualized as a process differentiating the precontemplation, contemplation, action, preparation and maintenance stages [11]. Individuals in the precontemplation stage are either ignorant of their drinking problem or unwilling to change drinking. In the contemplation stage, individuals think seriously about change and evaluate the pros and cons both of the problem behavior and the change. Individuals in the preparation stage intend to take action in the immediate future, while individuals in the action stage modify their behavior or environment in order to overcome their problem. The maintenance stage is characterized by stabilizing behavior change and avoiding relapse.

From motivation to change, motivation to seek formal help for alcohol problems is distinguished. Motivation to

seek help can also be described using the stage model of behavior change. Freyer et al. [12] demonstrated that motivation to change drinking behavior and motivation to seek help were distinct, albeit positively correlated, measurement constructs among high-risk drinkers. Although several criticisms of the TTM's theoretical aspects have been published, it has been proven particularly practicable in medical settings where its advantage of saving time is of particular note (cf., meta-analysis by Noar et al. [13]).

Previous studies on motivation and alcohol-related diseases contain several limitations. First, only specific diseases or injuries were considered as trauma [14]. Second, data were limited to alcohol-dependent individuals [15] or to special wards as emergency departments [16]. Third, the study design was cross-sectional and used small samples [9].

To our knowledge, there has been no study providing data on motivation and alcohol-related diseases that encompasses the following criteria: (a) focusing on any alcohol-related diseases; (b) providing data from general hospitals, including a variety of clinical wards; (c) including individuals with alcohol dependence, alcohol abuse and risky drinking; and (d) using longitudinal data. The aims of the present study were to investigate, first, whether having an alcohol-attributable disease may have an impact on the motivation to change problem drinking and on the motivation to seek help for alcohol problems and, second, whether the degree to which diseases are attributable to alcohol may have an impact on the motivation to change problem drinking and on the motivation to seek help for alcohol problems. To achieve these aims, we utilized data from general hospital inpatients with problem drinking and alcohol-related diseases.

2. Methods

2.1. Sample recruitment

Data for this study were collected as part of the study 'Early Intervention in General Hospitals' (NCT 00423904, Research Collaboration on Early Substance Use Intervention, EARLINT) between April 28, 2002 and June 30, 2004 at four general hospitals in Mecklenburg-Western Pomerania, Germany. These four hospitals provide medical care for 198,745 inhabitants in the comprised geographical region [17]. A total of 29 wards, including internal medicine, surgical medicine, dermatology and orthopedic wards, as well as ear, nose and throat units, were included. Recruitment is described in more detail elsewhere [18].

Among consecutively admitted inpatients aged between 18 and 64 years and with a minimum stay of 24 h, 14,322 were screened using the German adaptation of the Alcohol Use Disorders Identification Test (AUDIT) [19] and the Luebeck Alcohol Dependence and Abuse Screening Test [20], with 8 or more points and 2 or more points, respectively, indicating a positive screening result. This

was obtained for 2337 inpatients. They were asked for further study participation. Those giving informed consent were then assessed with respect to a diagnosis of alcohol use disorders according to *DSM-IV* [7] using the alcohol section of the German adaptation of the computerized Munich-Composite International Diagnostic Interview (M-CIDI) [21,22]. The alcohol section of the M-CIDI provides a lifetime diagnosis of alcohol abuse and dependence and whether the criteria for alcohol abuse or dependence have been fulfilled during the last 12 months prior to the interview. At-risk drinking was defined following the recommendations of the BMA [8] using data on inpatients' average daily alcohol consumption in the last 12 months prior to the interview. According to Babor and Grant [23], another criterion for risky drinking was heavy episodic drinking, which was assessed with the question 'How often within the past 12 months did you drink five (for women) or eight (for men) drinks on one occasion?' One standard drink corresponded to approximately 12 g of pure alcohol. Inpatients reporting at least two-times-per-month drinking above the criterion were also considered risky drinkers. With the use of the M-CIDI, 26.0% ($n=608$) were classified as false positives, 19.2% ($n=448$) met criteria for lifetime alcohol dependence but not in the past 12 months and 54.8% ($n=1281$) were considered current alcohol problem drinkers (alcohol dependence, alcohol abuse or risky drinking). Of these, 91.0% ($n=1166$) gave informed consent for further participation in an intervention study. The patients received motivational-interviewing-based counseling [24] either by a specialized liaison service or by hospital physicians, or received hospital treatment as usual without additional counseling. As we aimed to investigate the natural course of motivation to change and the natural course of motivation to seek help, we only used inpatients from the treatment-as-usual group ($n=446$). One year later, follow-up interviews in which 312 subjects (70.0% of eligible participants) took part were conducted. Of the 312 individuals with follow-up data, 18 lacked hospital diagnoses. These cases were excluded from our analyses, leaving 294 individuals for the resulting analytical sample.

2.2. Hospital diagnoses

To classify inpatients into three groups of AAFs, we used one routine principal diagnosis and one routine secondary diagnosis of the hospital for each inpatient. The diagnoses were based on *International Classification of Diseases, Tenth Revision (ICD-10)* [25]. Classification of the hospital diagnoses was performed according to their relation to alcohol following the approach of Rehm et al. [6]. *ICD-10* codes indicating diseases that are 100% attributable to alcohol by definition were assigned an AAF of 1 (AAF=1). *ICD-10* codes indicating diseases that are partially attributable to alcohol were assigned an AAF of less than 1 (AAF<1). Diseases with no relation to alcohol or diseases where alcohol was found to have potentially a preventive effect (e.g., diabetes mellitus) [26] were assigned an AAF of 0.

2.3. Measures

The Readiness to Change Questionnaire (RCQ) [27] was used to assess motivation to change. It was developed as a short measure of the general stages of change. It consists of 12 items, four for each scale, representing precontemplation (e.g., "Drinking less alcohol would be pointless for me"), contemplation (e.g., "My drinking is a problem sometimes") and action (e.g., "I am trying to drink less than I used to"). The 5-point Likert scale ranges from *strongly disagree* (-2) to *strongly agree* (2). The quick method allocates individuals to three stages (precontemplation, contemplation and action) based on the highest scale scores. In the case of between-scale ties, individuals are allocated to the higher motivational stage. Heather et al. [28] reported a good validity of the RCQ in predicting behavior change over time.

The Treatment Readiness Tool (TReAT) [12] was administered to assess motivation to seek formal help for alcohol problems. It is a short reliable measure based on the stages of change of the TTM [29,30]. It has 12 items, four for each readiness scale: precontemplation (e.g., "I do not think that other people can help me"), contemplation (e.g., "I eventually may want help but not now") and preparation (e.g., "I have decided to seek appropriate treatment"). The instruction refers to formal help for alcohol-related problems (including both professional treatment and self-help groups) on a dichotomous item response scale (true/not true). In conformity with the quick method of the RCQ [27], subjects are allocated to stages based on their highest scale score. In case of between-scale ties, subjects are allocated to the one further along on the motivational process. In the case of zero scores on all three scales, participants are assigned to precontemplation [31]. In contrast to persons in precontemplation or contemplation stage, persons in preparation stage intend to utilize formal help.

Alcohol consumption was assessed using the quantity–frequency questions of the M-CIDI. We did not use standard drinks to assess the quantity of alcohol consumption. Instead, an open question assessed the quantity of alcohol consumed on a typical drinking day, which was converted (beverage specific) into index units (one unit corresponded to 9 g of pure alcohol). Frequency was assessed using five categories: *almost daily, three to four times a week, one to two times a week, one to three times a month and less than once a month*. A quantity–frequency index was computed using the mean of the frequency categories. Outliers regarding daily alcohol consumption were determined using the mean plus three standard deviations (mean+3 S.D.). Cases above the threshold values of 500.41 g at baseline (seven outliers) and 346.54 g on follow-up (four outliers) were assigned these scores as maximum consumption. Due to skewed data, the variable was log transformed for analyses. The following demographics were assessed: age, having an intimate partner, having own children, employment status and school education.

2.4. Data analysis

Descriptive statistics and three one-way analyses of variance (ANOVA) with repeated measures adjusted for differences between the AAF groups at baseline were conducted using STATA Version 10 (StataCorp., College Station, TX). As the complex sampling strategy in this study required adjustments in calculating standard errors, all analyses were calculated using svyset commands, with hospital ($n=4$) as strata and ward ($n=29$) as primary sampling unit. Svyset in STATA allows considering sample survey data with cluster sampling, as used in this study. With the use of ANOVA and chi-square statistics, group differences in alcohol-related variables, demographics, motivation to change and motivation to seek help between inpatients with diseases with AAF=1, inpatients with diseases with AAF<1 and inpatients with diseases with AAF=0 were analyzed. To identify group differences, we conducted Scheffé post hoc analyses for continuous variables. Two repeated-measures ANOVA adjusted for age, gram of alcohol per day, smoking, having own children, employment status and hospital were used to verify significant differences in motivation to change and motivation to seek help across time. To analyze differences in average daily alcohol consumption across time, another repeated-measures ANOVA, adjusted for age, smoking, having own children, employment status and hospital, was conducted. Individuals with missing values were deleted listwise.

3. Results

3.1. Description of the total sample

Ninety-one percent ($n=268$) of the inpatients were male, and the mean age was 40.59 years (S.D.=11.97). Thirty-one percent of the inpatients suffered from a disease with AAF=1, and 19% had a disease with AAF<1. Among the sample, 50% were alcohol dependents, 12% were alcohol abusers and 38% were risky drinkers.

The frequent diseases of inpatients according to ICD-10 [25] are displayed in Table 1. Regarding the principal diagnosis and the secondary diagnosis, the most common disease groups were injury and poisoning, mental and behavioral disorders, and diseases of the circulatory system.

3.2. Characteristics of the AAF groups at baseline

Table 2 depicts the characteristics of the AAF groups regarding alcohol-related variables and demographics at baseline. Significant differences were found for all variables, except school education and having an intimate partner. Inpatients with AAF=1 reported a higher average alcohol consumption than those with AAF=0. Compared to inpatients with AAF<1 and AAF=0, those with AAF=1 included the highest proportion of jobseekers and current smokers. Inpatients with AAF<1 were older, and more of them had children than inpatients in the other groups.

Table 1
Occurrence of diseases of inpatients according to ICD-10

Disease categories	Principal diagnosis		Secondary diagnosis	
	<i>n</i>	%	<i>n</i>	%
Certain infectious and parasitic diseases	3	1.2	1	0.4
Neoplasms	15	5.8	9	5.6
Endocrine, nutritional and metabolic diseases	2	0.8	16	6.3
Mental and behavioral disorders	60	23.3	63	24.9
Diseases of the nervous system	6	2.3	8	3.2
Diseases of the circulatory system	28	10.9	33	13.0
Diseases of the respiratory system	14	5.4	13	5.1
Diseases of the digestive system	21	8.1	38	15.0
Diseases of the skin	8	3.1	5	2.0
Diseases of the musculoskeletal system	16	6.2	6	2.4
Injury, poisoning	65	25.2	41	16.2
Others	20	7.7	20	5.9

3.3. Motivation to change and motivation to seek help at baseline

Baseline differences in motivation to change and motivation to seek help between the AAF groups are shown in Table 3. The three groups differed significantly in motivation to change and in motivation to seek help. Regarding motivation to change, the highest proportion of inpatients with AAF=1 were found to be in contemplation stage, while the highest proportion of inpatients with AAF<1 were found to be in action stage. Among inpatients with AAF=0, the highest proportion was found to be in precontemplation stage. Regarding motivation to seek help, the highest proportion of inpatients with AAF=1 were found to be in preparation stage, and the highest proportion of inpatients with AAF<1 and AAF=0 were found to be in precontemplation stage.

3.4. Motivation to change and motivation to seek help across time

The distribution of motivation to change and motivation to seek help in the AAF groups at baseline and on follow-up is displayed in Table 4. Motivation to change and motivation to seek help were used as continuous variables, with larger means indicating higher motivation. Two repeated-measures ANOVA were conducted to analyze differences in motivation to change and in motivation to seek help across time between the three groups. Corresponding to motivation to change drinking behavior, we analyzed changes in daily alcohol consumption.

3.4.1. Motivation to change

Motivation to change did not significantly change across time in any of the three AAF groups [$F(1)=0.21$, $P=.64$]. We observed a main effect for group [$F(2)=18.40$, $P<.001$] indicating that motivation to change differed between the three AAF groups, with inpatients with AAF=1 and AAF<1 having a larger mean at both time points than inpatients with AAF=0. The Group×Time interaction was nonsignificant [$F(2)=3.05$, $P=.05$].

Table 2
Characteristics of the sample at baseline based on groups with different AAFs of hospital diagnoses^a

Variables	<i>n</i>	AAF=1	<i>n</i>	AAF<1	<i>n</i>	AAF=0	Design-based <i>F</i> (<i>df</i>)	<i>P</i>
Age [mean (S.D.)] ^b	90	42.63 (7.35)	55	45.22 (11.23)	149	37.64 (13.63)	8.50 (2, 27)	<.01
Grams of alcohol per day [mean (S.D.)] ^c	84	152.99 (125.81)	54	114.02 (121.25)	147	81.05 (103.75)	12.64 (2, 27) ^d	<.001
Smoking status (%)								
Current	77	86.5	33	61.1	108	72.5	4.02 (3.28, 81.90)	<.01
Former	5	5.6	14	29.9	29	19.5		
Never	7	7.9	7	13.0	12	8.1		
Has intimate partner (% yes)	47	56.0	34	64.2	83	58.9	0.48 (1.71, 42.69)	NS
Has own children (% yes)	61	68.5	42	76.4	84	56.8	3.83 (1.87, 46.82)	<.05
Employment status (%)								
Job-seeking	51	58.6	27	49.1	55	37.4	3.05 (3.18, 79.58)	<.05
Full time or part time	17	19.5	15	27.3	60	40.8		
Others (e.g., retired, housewives)	19	21.8	13	23.6	32	21.8		
School education (%)								
<10 years	37	42.1	20	37.7	54	36.5	0.93 (3.60, 90.11)	NS
10–11 years	45	51.1	24	45.3	70	47.3		
>11 years	6	6.8	9	17.0	24	16.2		

NS, not significant.

^a Using svyset commands (strata=hospital; primary sampling unit=clinical wards).

^b Scheffé test shows AAF=1, AAF<1>AAF=0.

^c Scheffé test shows AAF=1>AAF=0.

^d Due to skewed data, the variable was log transformed for analysis.

3.4.2. Motivation to seek help

Motivation to seek help significantly decreased in the three AAF groups across time [$F(1)=21.03$, $P<.001$]. There was a significant main effect for group [$F(2)=21.66$, $P<.001$] indicating that motivation to seek help differed between the three AAF groups, with inpatients with AAF=1 having a larger mean at both time points than inpatients with AAF<1 and AAF=0. The Group×Time interaction was nonsignificant [$F(2)=1.08$, $P=.34$].

3.4.3. Daily alcohol consumption

The average daily alcohol consumption significantly decreased in the three AAF groups across time [$F(1)=52.37$, $P<.001$]. There was a significant main effect for group [$F(2)=2.87$, $P<.05$] indicating that the average daily alcohol consumption differed in the three AAF groups, with inpatients with AAF=1 having a larger mean at both time points than inpatients with AAF<1 and AAF=0. A significant Group×Time interaction [$F(2)=3.80$, $P<.05$] indicating different time courses in the AAF groups was observed.

4. Discussion

The main findings of our study are as follows. First, the three AAF groups differed significantly in motivation to change and in motivation to seek help while hospitalized, indicating that motivation and the degree to which diseases are attributable to alcohol are positively associated. Second, motivation to change remained at the same levels after 12 months in the three AAF groups, while motivation to seek help decreased. Third, inpatients in all three AAF groups decreased their alcohol consumption within 12 months after hospitalization.

The high proportion of inpatients in precontemplation stage in terms of motivation to change and motivation to seek help among those with AAF=0 on hospitalization might be explained by the fact that these inpatients do not suffer from health consequences due to their alcohol consumption. As they have not yet suffered from alcohol-related health consequences, they are possibly not aware of their problem drinking or they neglect it. Therefore, they are neither

Table 3
Motivation to change (RCQ) and motivation to seek formal help (TReaT) at baseline based on groups with different AAFs of hospital diagnoses^a

	AAF=1	AAF<1	AAF=0	Design-based <i>F</i> (<i>df</i>)	<i>P</i>
RCQ (column %)					
Precontemplation	11 (12.2)	10 (18.2)	60 (40.3)	6.71 (3.46, 96.99)	<.001
Contemplation	47 (52.2)	19 (34.6)	46 (30.9)		
Action	32 (35.6)	26 (47.3)	43 (28.9)		
TReaT (column %)					
Precontemplation	20 (22.7)	26 (48.2)	89 (60.5)	16.17 (3.53, 98.93)	<.001
Contemplation	17 (19.3)	11 (20.4)	39 (26.5)		
Preparation	51 (58.0)	17 (31.5)	19 (13.0)		

^a Using svyset commands (strata=hospital; primary sampling unit=clinical wards).

Table 4
Motivation to change, motivation to seek help and average daily alcohol consumption at baseline and on follow-up in the AAF groups

	<i>n</i>	Baseline		Follow-up	
		Mean	S.D.	Mean	S.D.
Motivation to change ^a					
AAF=1	74	2.20	0.66	2.34	0.80
AAF<1	51	2.33	0.74	2.33	0.86
AAF=0	140	1.88	0.82	1.64	0.78
Motivation to seek help ^a					
AAF=1	77	2.32	0.83	1.96	0.91
AAF<1	49	1.84	0.90	1.46	0.71
AAF=0	137	1.52	0.71	1.32	0.57
Daily alcohol consumption ^b					
AAF=1	80	149.95	121.80	61.83	94.72
AAF<1	53	115.66	121.81	44.98	69.04
AAF=0	141	75.83	94.08	48.51	58.93

Data are adjusted means.

^a Adjusted for age, gram of alcohol per day, smoking, having own children, employment status and hospital.

^b Adjusted for age, smoking, having own children, employment status and hospital.

motivated to change their drinking behavior nor motivated to seek help.

The highest proportion of inpatients with AAF<1 were found to be in the action stage to change drinking behavior on hospitalization. This finding suggests that these inpatients might be aware of their disease being associated with their alcohol consumption. Even for inpatients with AAF<1, the experience of being admitted to a hospital seems to support motivation to change drinking behavior. Being confronted with a somatic sequela from drinking is a factor that may stimulate processes of change, such as consciousness raising and self-reevaluation [32]. Similar results have been reported by Longabaugh et al. [10], who investigated readiness to change in minor-injury patients at an emergency department. In this study, the more severe had been the injury, the more likely was the patient to report readiness to change. Regarding motivation to seek help while being hospitalized, the highest proportion of inpatients with AAF=1 was found to be in preparation stage. One plausible explanation for this finding is that the group AAF=1 includes inpatients with alcohol dependence or severe psychiatric and somatic disorders caused by alcohol (e.g., alcoholic polyneuropathy and alcoholic gastritis). The high proportion of individuals in preparation to seek help among those with AAF=1 indicates that hospitalization due to alcohol-related diseases is a “teachable moment” that should be used for interventions.

Our data further show that motivation to change remained stable in the three AAF groups within 12 months after hospitalization, while motivation to seek help for alcohol problems decreased. Similar results have been reported by Freyer et al. [31], who investigated motivation to change and motivation to seek help in a sample of alcohol-dependent individuals. They found that 42% of the individuals were characterized by different levels of

motivation to change and motivation to seek help. The authors argue that a high self-efficacy might explain the combination of high motivation to change and low motivation to seek help. Another possible explanation for the present finding might be that inpatients who were highly motivated to change their drinking behavior on hospitalization and who managed to reduce their consumption or to become abstinent no longer considered that external help is still necessary for them. Thus, this finding supports the idea of using hospital stay as an opportunity to strengthen motivation to change and to advance motivation to seek help for alcohol problems.

The average daily alcohol consumption had decreased significantly 12 months after hospitalization in the three AAF groups. This result suggests that hospital stay might support a decrease in the amount of drinking. Also, having been interviewed extensively about drinking behavior might have stimulated contemplation about drinking and might have supported a decrease in drinking. Furthermore, under-reporting of drinking amounts may have played a role in all patients who took part in follow-up inquiry.

The data on the proportions of alcohol-attributable diseases among this sample of problem drinkers indicate that an approach to restrict the screening for alcohol problem drinking to inpatients with alcohol-attributable diseases does not suffice. A considerable part of the inpatients has no alcohol-attributable diagnosis and would be dismissed. A standard screening and diagnostic procedure in general hospitals is needed to find problem drinkers among the inpatients.

We analyzed the patients in three AAF groups, assuming equal distances between the single AAF groups with increasing degree of alcohol involvement. To analyze the inpatients’ motivation to change and to seek help, an obvious strategy would be a two-step procedure: First, to compare all inpatients with any alcohol-attributable disease versus all inpatients without any alcohol-attributable disease and, second, to analyze the subgroup of inpatients with alcohol-attributable disease along the AAF.

The strength of this study is that four general hospitals that provide inpatient medical treatment for an entire area of residence have participated in the diagnostic process that has been used. The limitations of the study are as follows. First, it has been conducted in a high-per-capita-consumption country; hence, proportions of patients with risky drinking or alcohol use disorders and alcohol-attributable disease may be expected to be particularly high compared to countries with a lower per-capita consumption. Second, our final sample is restricted to a treatment-as-usual group in an intervention study that, in addition, provided information in a 12-month follow-up. This may have increased sample selection bias towards better-off individuals in terms of disease and problem drinking. Third, the proportion of women was only 9% in the present study. This may be explained by the use of a non-gender-specific recommended AUDIT cutoff value of 8 [33], which might have caused an

underrepresentation of women with less severe alcohol problems. We decided not to drop the women from the analyses, as the study was designed to identify inpatients with an AUDIT score of 8 or higher. However, our analyses are not generalizable to women with problem drinking. Fourth, routine treatment diagnoses may have been biased by the treating physician and/or diagnostic-related groups as the leading diagnostic system is the leading principal for the reimbursement of treatment costs. Fifth, the proportion of alcohol-attributable diagnoses may have been confounded by the quality of addiction treatment services. The study region was largely rural in its nature and localized in Eastern Germany, where the addiction treatment system with outpatient counseling facilities and self-help groups is not as well developed as in other areas in Germany. Sixth, sociodemographic factors such as a high rate of unemployment may have biased the high proportions of inpatients with alcohol-attributable diseases and motivation to change drinking behavior.

In conclusion, as both motivation to change and motivation to seek help and the degree to which the inpatients' diseases were attributable to alcohol were positively associated on hospitalization, hospital stay should be used for interventions. Also, the hospital stay itself seems to have an intervention effect, showing a reduction in drinking amount in all three AAF groups. The use of AAFs might be an approach to detect inpatients with problem drinking and to provide interventions addressing the inpatients' alcohol problem. As inpatients' alcohol problems include alcohol dependence, abuse and risky drinking, there is a need for special interventions considering also the inpatients' motivational level. These interventions are aimed at different targets (e.g., raising awareness on alcohol problems in individuals with risky drinking and referral to treatment for inpatient detoxification to achieve abstinence in individuals with alcohol dependence). However, a brief intervention differentiated by the three groups of problem drinkers is not yet sufficiently comprehensive for use in general hospital care.

Acknowledgment

This study, as part of the Research Collaboration in Early Substance Use Intervention (EARLINT), has been funded by the German Federal Ministry of Education and Research (grants 01EB0120 and 01EB0420) and the Social Ministry of the State of Mecklenburg-Western Pomerania (IX 311a 406.68.43.05).

The authors wish to thank Karin Paatsch, Dr. Barbara Wedler, Christine Fehlhaber, Birgit Hartmann and Katrin Stegemann for implementing the study; the medical and nursing staff of the University Hospital Greifswald, the Hanse Hospital Stralsund, the District Hospitals Demmin and Malchin/Dargun for cooperation with the project; and the patients for participation.

References

- [1] Gerke P, Hapke U, Rumpf HJ, John U. Alcohol-related diseases in general hospital patients. *Alcohol Alcohol* 1997;32(2):179–84.
- [2] Jarque-Lopez A, et al. Prevalence and mortality of heavy drinkers in a general hospital. *Alcohol Alcohol* 2001;36(4):335–8.
- [3] Taylor B, Rehm J, Patra J, Popova S, Baliunas D. Alcohol-attributable morbidity and resulting health care costs in Canada in 2002: recommendations for policy and prevention. *J Stud Alcohol* 2007;68(1):36–47.
- [4] Rehm J, Room R, Graham K, Monteiro M, Gmel G, Sempos CT. The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease: an overview. *Addiction* 2003;98(9):1209–28.
- [5] Shultz JM, Rice DP, Parker DL, Goodman RA, Stroh Jr G, Chalmers N. Quantifying the disease impact of alcohol with ARDI software. *Public Health Rep* 1991;106(4):443–50.
- [6] Rehm J, Patra J, Popova S. Alcohol-attributable mortality and potential years of life lost in Canada 2001: implications for prevention and policy. *Addiction* 2006;101(3):373–84.
- [7] American Psychiatric Association, editor. *Diagnostic and statistical manual of mental disorders (DSM-IV)*. Washington (DC): American Psychological Association; 1995.
- [8] BMA. *Guidelines on sensible drinking*. London: British Medical Association; 1995.
- [9] Apodaca TR, Schermer CR. Readiness to change alcohol use after trauma. *J Trauma* 2003;54(5):990–4.
- [10] Longabaugh R, Minugh PA, Nirenberg TD, Clifford PR, Becker B, Woolard R. Injury as a motivator to reduce drinking. *Acad Emerg Med* 1995;2(9):817–25.
- [11] DiClemente CC, Proschaska JO. Toward a comprehensive, trans-theoretical model of change: stages of change and addictive behaviors. In: Miller WR, Heather N, editors. *Treating addictive behaviors*. 2nd ed. New York: Plenum Press; 1998. p. 3–24.
- [12] Freyer J, Tonigan JS, Keller S, John U, Rumpf HJ, Hapke U. Readiness to change versus readiness to seek help for alcohol problems: the development of the Treatment Readiness Tool (TRaT). *J Stud Alcohol* 2004;65:801–9.
- [13] Noar SM, Benac CN, Harris MS. Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychol Bull* 2007;133(4):673–93.
- [14] Bombardier CH, Rimmele CT. Alcohol use and readiness to change after spinal cord injury. *Arch Phys Med Rehabil* 1998;79(9):1110–5.
- [15] Figlie NB, Dunn J, Laranjeira R. Motivation for change in alcohol dependent outpatients from Brazil. *Addict Behav* 2005;30(1):159–65.
- [16] Leontieva L, Horn K, Haque A, Helmkamp J, Ehrlich P, Williams J. Readiness to change problematic drinking assessed in the emergency department as a predictor of change. *J Crit Care* 2005;20(3):251–6.
- [17] Statistisches Landesamt MV. *Statistisches Jahrbuch Mecklenburg-Vorpommern 2005 (Statistical yearbook Mecklenburg Western-Pomerania 2005)*. Schwerin: Statistisches Landesamt Mecklenburg-Vorpommern [Statistical office Mecklenburg-Western Pomerania]; 2005.
- [18] Freyer-Adam J, Coder B, Baumeister SE, Bischof G, Riedel J, Paatsch K, et al. Brief alcohol intervention for general hospital inpatients: a randomized controlled trial. *Drug Alcohol Depend* 2008;93(3):233–43.
- [19] Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption II. *Addiction* 1993;88:791–804.
- [20] Rumpf HJ, Hapke U, Hill A, John U. Development of a screening questionnaire for the general hospital and general practices. *Alcohol Clin Exp Res* 1997;21(5):894–8.
- [21] Lachner G, Wittchen HU, Perkonig A, Holly A, Schuster P, Wunderlich U, et al. Structure, content and reliability of the Munich-

- Composite International Diagnostic Interview (M-CIDI) substance use sections. *Eur Addict Res* 1998;4(1–2):28–41.
- [22] Wittchen HU, Pfister H. *DIA-X-Interviews: Manual für Screening-Verfahren und Interview. (DIA-X-Interviews: Manual for Screening and Interview)* Frankfurt, Germany: Swets and Zeitlinger; 1997.
- [23] Babor TF, Grant M, editors. *Programme on substance abuse: project on identification and management of alcohol-related problems. Report on phase II: a randomized clinical trial of brief interventions in primary health care.* Geneva: World Health Organization; 1992.
- [24] Miller WR, Rollnick S. *Motivational interviewing: preparing people for change.* New York: Guilford Press.; 2002.
- [25] World Health Organization. *International Classification of Diseases, 10th revision, chapter 5. Mental and behavioural disorders due to psychoactive substance use.* Geneva: World Health Organization; 1992.
- [26] Ashley MJ, Rehm JBS, Single E, Rankin J. Beyond ischaemic heart disease: are there other health benefits from drinking alcohol? *Contemp Drug Probl* 2000;27:735–77.
- [27] Rollnick S, Heather N, Gold R, Hall W. Development of a short 'readiness to change' questionnaire for use in brief, opportunistic interventions among excessive drinkers. *Br J Addict* 1992;87(5):743–54.
- [28] Heather N, Rollnick S, Bell A. Predictive validity of the Readiness to Change Questionnaire. *Addiction* 1993;88:1667–77.
- [29] Prochaska JO, DiClemente CC. *The transtheoretical approach: crossing the traditional boundaries of therapy.* Malabar (FL): Krieger; 1984.
- [30] Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot* 1997;12(1):38–48.
- [31] Freyer J, Tonigan JS, Keller S, Rumpf H-J, John U, Hapke U. Readiness for change and readiness for help-seeking: a composite assessment of client motivation. *Alcohol Alcohol* 2005;40(6):540–4.
- [32] Rumpf HJ, Hapke U, Meyer C, John U. Motivation to change drinking behavior: comparison of alcohol-dependent individuals in a general hospital and a general population sample. *Gen Hosp Psychiatry* 1999;21(5):348–53.
- [33] Babor T, Higgins-Biddle JC, Saunders J, Monteiro M. *The Alcohol Use Disorders Identification Test: guidelines for use in primary health care.* Geneva: World Health Organization; 2001.