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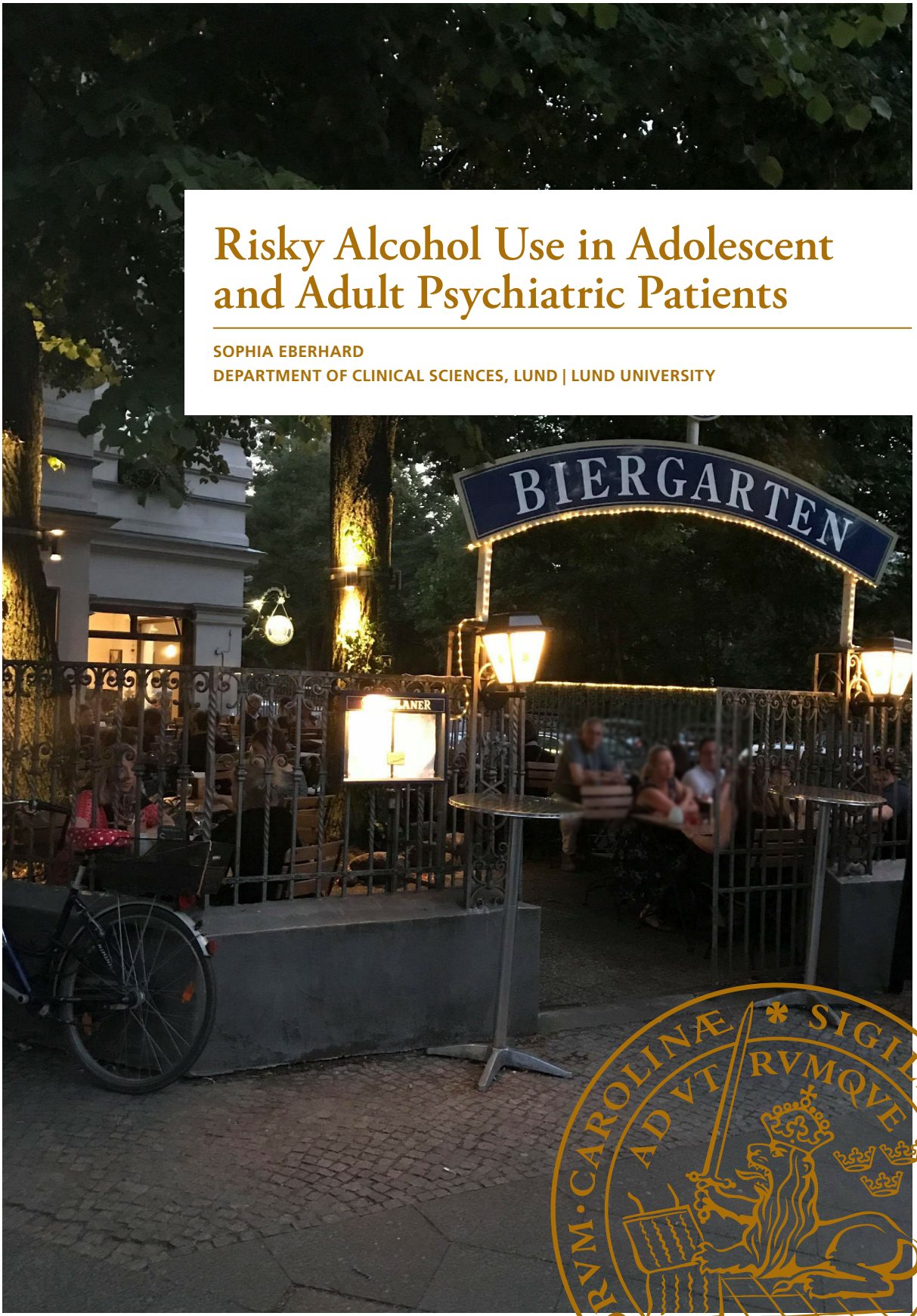

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Sophia Eberhard

LUND
UNIVERSITY

DOCTORAL DISSERTATION

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Title and subtitle Risky Alcohol Use in Adolescent and Adult Psychiatric Patients

Abstract

Background: Risky alcohol use is associated with an increased risk for developing alcohol use disorder, and may negatively affect the course of other psychiatric disorders. The importance of detection and intervention in risky alcohol use has repeatedly been underlined in the scientific literature, though less is written regarding general psychiatric populations. The overall aim of this thesis was to increase knowledge about risky alcohol use in general psychiatric patients, detection, prevalence and intervention, and to further explore the area of risky alcohol use in psychiatric patients of different age groups, with a focus on the use of new technologies.

Methods: Non-psychotic psychiatric outpatients (n =1670) completed two self-rating forms concerning alcohol and drug habits (AUDIT, DUDIT) (Study I). Participants with scores indicating risky alcohol use (n = 344) were randomised to intervention (immediate advice) or control (advice after 6 months) (Study II). To improve diagnostic accuracy, the decision was made to build a smartphone application for digitalised screening and follow-up. 'The Blue App' was developed in six stages, described in Paper III (Study III). Adolescents admitted to a child and adolescent emergency inpatient unit (n = 96) completed two computerised self-rating forms concerning alcohol and drug habits (AUDIT-C, DUDIT), using the Blue App (Study IV).

Results: In the adult psychiatric outpatient sample, risky alcohol use was prevalent in 22% of the women and 30% of the men, with the highest frequencies of risky and binge drinking in the youngest quartile (Study I). About half of the adult patients who received the brief intervention had reduced their consumption to non-risky levels by follow-up 6 months later (Study II). A sophisticated and easy-to-use web-based mobile phone application corresponding to the unit's needs was developed (Study III). In the adolescent psychiatric inpatient sample, risky alcohol use was prevalent in 33% of the girls and 22% of the boys, with rates at least as common as in adolescents in the general population. The diagnostic groups found to have the highest prevalence of risky alcohol use in the adolescent sample were anxiety and affective disorder (Study IV).

Conclusions: Risky drinking seems to be common in both the adolescent and adult general psychiatric sample; in the adolescent sample at least as common as in the Swedish general population, in the adult sample clearly above frequencies found in the Swedish general population. A brief intervention on risky alcohol use, based on motivational interviewing principles seems to be effective in adults.

New technology for psychiatric health care (eMental health) have shown promising results. A technically advanced and easy-to-use web-based mobile phone application (The Blue App) corresponding to the unit's needs for better methods for digitalized screening to improve diagnostic accuracy was developed.

Key words Risky alcohol use, psychiatric patients, smartphone application, adolescents, RCT, brief intervention, psychiatric disorders

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To my parents
Ingrid and Hermann Adolf Hummel-Liljegren

”Det är inte hur du har det, utan hur du tar det…”

Fritt efter Göran Regnéll, 1947 – 2018,
Överläkare i Psykiatri, St. Lars, Lund

Table of Contents

Abbreviations

AUD	Alcohol Use Disorders
AUDIT	Alcohol Use Disorders Identification Test
DSM	Diagnostic and Statistical Manual of Mental Disorders
DALYs	Disability Adjusted Life Years
DUDIT	Drug Use Disorders Identification Test
ECA	Epidemiologic Catchment Area
ICD	International Statistical Classification of Diseases
NIAAA	National Institute on Alcohol Abuse and Alcoholism
RCT	Randomised Controlled Trial
SUD	Substance Use Disorder
NERSAC	The National Comorbidity Survey
WHO	World Health Organization
YLDs	Years Lost to Disability

List of papers

This thesis is based on the following papers:

I. Eberhard S, Nordström G, Höglund P & Öjehagen A.
Hazardous alcohol use in general psychiatric outpatients
Journal of Mental Health 2015; 24:3, 162-167.

II. Eberhard S, Nordström G & Öjehagen A.
Secondary prevention of hazardous alcohol consumption in psychiatric outpatients: a randomised controlled study
Social Psychiatry and Psychiatric Epidemiology 2009; 44: 1013-1021.

III. Hansson K, Johansson BA, Andersson C, Råstam M & Eberhard S.
Development of and two research protocols for a smartphone app for assessment and post-discharge follow-up of child and adolescent psychiatric inpatients
Accepted for publication 30 July 2018, JMIR (Journal of Medical Internet Research Protocols)

IV. Eberhard S, Rask O, Höglund P, Råstam M & Johansson BA.
Risky alcohol use in a Swedish child and adolescent emergency psychiatric inpatient population
Submitted to BMC Psychiatry

General Introduction

Background

Mental disorders are common worldwide, and can affect us all, regardless of socioeconomic status, ethnicity or gender. A growing number of studies on the global burden of disease stress the magnitude of mental and substance use disorders, which were found to be the largest disease group contributing to non-fatal burden of diseases in 2016 (Vos et al., 2017; Whiteford et al., 2013). In a study published in the Lancet 2016 on estimating the true global burden of mental illness and substance use combined, these conditions are placed as 'a distant first' in global burden of disease in terms of years lost to disability (YLDs), and as a 'shared first', on the same level as cardiovascular and circulatory diseases in terms of disability adjusted life years (DALYs) (Vigo, et al., 2016, US Burden of Disease Collaborators, 2013).

The global burden attributable to mental illness and substance use in children and adolescents has received less attention than in adults. This is despite mental illness and substance use being ranked as the leading cause of disability in young people, accounting for a quarter of all YLDs (54.2 million). In terms of DALYs, they were ranked fifth (Erskine et al., 2015). Results from the National Comorbidity Survey (NCS-A), which provided the first prevalence data on a broad range of mental disorders in a nationally representative sample of US adolescents, showed that approximately one in every four to five young people in the US meets the criteria for a mental disorder with severe impairment across their lifetime (Merikangas et al., 2010).

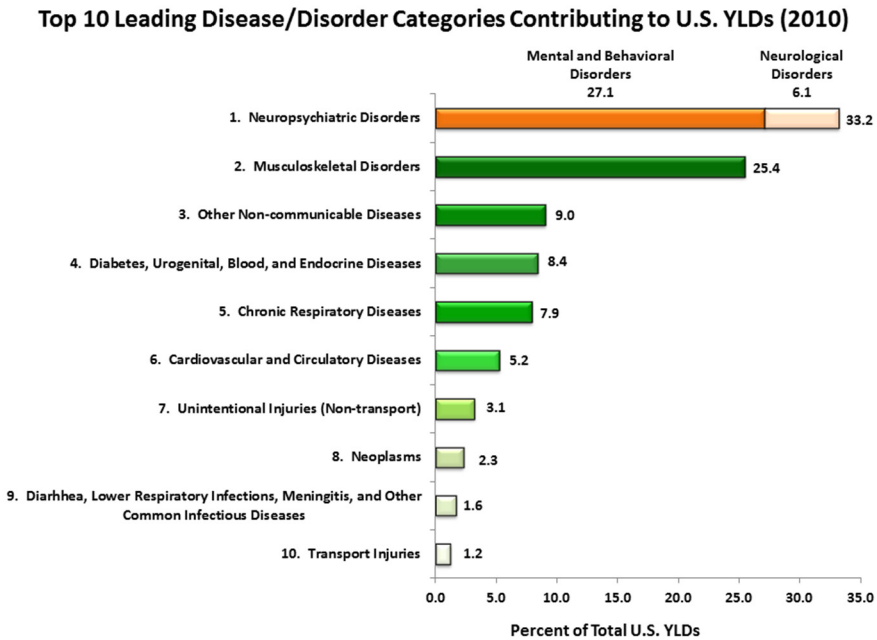

Figure 1
Data courtesy WHO, printed with permission of the WHO

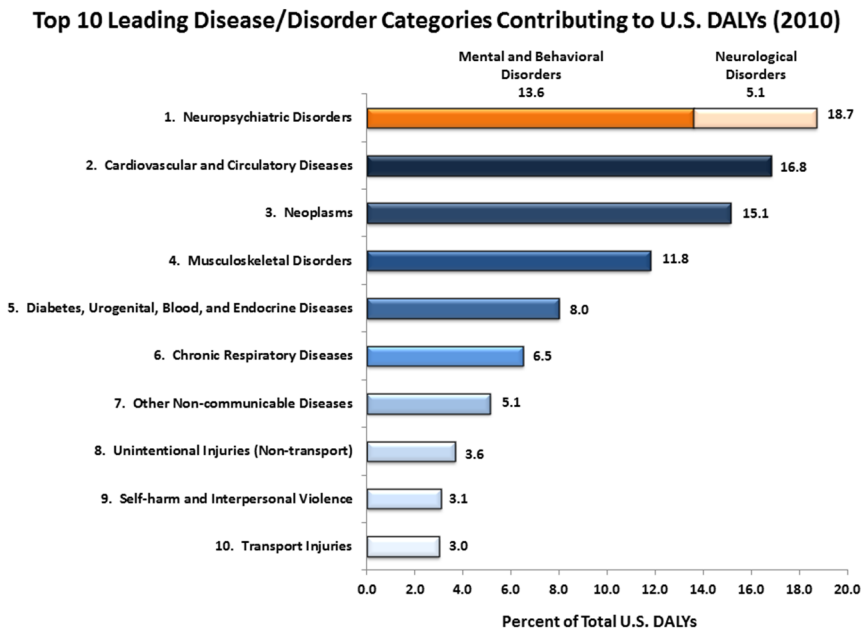

Figure 2
Data courtesy WHO, printed with permission of the WHO

Findings from several community surveys based on retrospectively collected data (e.g. the International Consortium of Psychiatric Epidemiology, ICPE, Surveys, and the German National Health Interview and Examination Survey – Mental Health Supplement, GHS-MHS), consistently demonstrate that mental illness during adulthood frequently has its onset in childhood and adolescence, with a median age of onset by age 20 (Jones et al., 2015; Jacobi et al., 2004). The first three decades of life are therefore an important risk period for the onset of mental disorders and substance use. Several recent publications underline the need for a change in adolescent psychiatric services, from the common focus on treatment of youth to that of prevention and early intervention (Dom et al., 2015; Merikangas et al., 2010).

Definitions

Risky alcohol use

In this thesis, the terms *risky alcohol use* and *risky drug use* will be used when describing alcohol or drug consumption above recommended daily, weekly, or per-occasion amounts (Fiellin et al., 2000). This decision was made to correspond with recent literature, where the term 'hazardous alcohol use' is often replaced with 'risky alcohol use' and 'risk drinking' (Dawson et al., 2011). The term 'hazardous alcohol use' was used in Papers I and II.

Risky drinking is usually defined by establishing a threshold amount of alcohol consumption, and is also referred to as problem, problematic, hazardous (used by the WHO), heavy, excessive, risk, or at-risk drinking (Dawson et al., 2011). Definitions of risk drinking, as applied by the US and several European countries, are generally in line with levels of risk observed in the scientific literature. Risky alcohol use is not a term used in the ICD-10 or DSM-5.

In her summary 'Defining Risk Drinking' from 2011, Dawson concludes: "Although estimated correlation of alcohol consumption with mortality and chronic conditions vary as a function of level of adjustment and reference group, the average daily volume at which an increased risk of mortality is apparent generally lies in the range of 35 g to 45 g, or 245 g to 315 g per week, and the risk of many chronic medical conditions is significantly increased (albeit quite modestly in many cases) at daily volumes as low as 25 g, or 175 g per week. The weekly drinking limits for the majority of countries lie within this range. Evidence for gender differences in the association of drinking volume and chronic harm is both sparse and inconsistent but suggests that risk thresholds may be somewhat lower for women than men, at least for some conditions." (Dawson, 2011).

Risky alcohol use is a risk factor for developing an alcohol use disorder (AUD) in both adolescent and adult psychiatric patients (Caetano, 1999, Caetano et al., 2002; Rehm et al., 2005). In adolescents, premature risky alcohol drinking has repeatedly been shown to

predict 'heavy alcohol consumption' as well as alcohol abuse at a later age, and to be a gateway to various serious consequences (Bonomo, 2004; Merline et al., 2008; Pitkänen et al., 2005). Tanaree and co-workers demonstrated that early onset drinkers (aged < 15 years at drinking onset) were significantly more likely to experience AUDs, psychotic symptoms, intermittent explosive disorder and panic disorder (Tanaree et al., 2017).

Binge drinking

Binge drinking, i.e. irregular heavy drinking, is an important aspect of risky alcohol use. It has been demonstrated in both population-based and clinical samples that risky alcohol use in general and binge drinking in particular are risk factors for developing a substance use disorder (Dawson et al., 2008; Andersson et al., 2008). Strong evidence indicates the adverse effects of binge drinking, such as a generally increased risk of complications, an increased risk of suicide and suicide attempts, and an increased risk of developing a substance use disorder (Caetano 1999, 2002; Dawson et al., 2008; Andersson et al., 2008).

Substance use disorders

The criteria of the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) are used in this thesis to define substance-related diagnoses. The DSM-5 diagnoses for alcohol use disorders were created to address the difficulties arising in the DSM-IV diagnoses for alcohol abuse and dependence respectively. In studies I and II, diagnoses were made according to the 4th version of the DSM that applied at the time. Changes in the diagnostic alcohol use disorder criteria are shown in Figure 3.

A Comparison Between DSM–IV and DSM–5

DSM–IV			DSM–5	
In the past year, have you:			**In the past year, have you:**	
Any 1 = ALCOHOL ABUSE	Found that drinking—or being sick from drinking—often interfered with taking care of your home or family? Or caused job troubles? Or school problems?	1	Had times when you ended up drinking more, or longer, than you intended?	The presence of at least 2 of these symptoms indicates an **Alcohol Use Disorder (AUD).** The severity of the AUD is defined as: **Mild:** The presence of 2 to 3 symptoms **Moderate:** The presence of 4 to 5 symptoms **Severe:** The presence of 6 or more symptoms
	More than once gotten into situations while or after drinking that increased your chances of getting hurt (such as driving, swimming, using machinery, walking in a dangerous area, or having unsafe sex)?	2	More than once wanted to cut down or stop drinking, or tried to, but couldn't?	
	More than once gotten arrested, been held at a police station, or had other legal problems because of your drinking? ****This is not included in DSM–5****	3	Spent a lot of time drinking? Or being sick or getting over other aftereffects?	
	Continued to drink even though it was causing trouble with your family or friends?	4	Wanted a drink so badly you couldn't think of anything else? ****This is new to DSM–5****	
Any 3 = ALCOHOL DEPENDENCE	Had to drink much more than you once did to get the effect you want? Or found that your usual number of drinks had much less effect than before?	5	Found that drinking—or being sick from drinking—often interfered with taking care of your home or family? Or caused job troubles? Or school problems?	
	Found that when the effects of alcohol were wearing off, you had withdrawal symptoms, such as trouble sleeping, shakiness, restlessness, nausea, sweating, a racing heart, or a seizure? Or sensed things that were not there?	6	Continued to drink even though it was causing trouble with your family or friends?	
	Had times when you ended up drinking more, or longer, than you intended?	7	Given up or cut back on activities that were important or interesting to you, or gave you pleasure, in order to drink?	
	More than once wanted to cut down or stop drinking, or tried to, but couldn't?	8	More than once gotten into situations while or after drinking that increased your chances of getting hurt (such as driving, swimming, using machinery, walking in a dangerous area, or having unsafe sex)?	
	Spent a lot of time drinking? Or being sick or getting over other aftereffects?	9	Continued to drink even though it was making you feel depressed or anxious or adding to another health problem? Or after having had a memory blackout?	
	Given up or cut back on activities that were important or interesting to you, or gave you pleasure, in order to drink?	10	Had to drink much more than you once did to get the effect you want? Or found that your usual number of drinks had much less effect than before?	
	Continued to drink even though it was making you feel depressed or anxious or adding to another health problem? Or after having had a memory blackout?	11	Found that when the effects of alcohol were wearing off, you had withdrawal symptoms, such as trouble sleeping, shakiness, restlessness, nausea, sweating, a racing heart, or a seizure? Or sensed things that were not there?	

Figure 3

A comparison between DSM-IV and DSM-5
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Alcohol use and alcohol use disorders

Alcohol is commonly used all over the world. Findings from the WHO (World Health Organization) World Mental Health Survey (Kessler et al., 2005; Rehm et al., 2009) demonstrate that a majority of survey participants in Europe, US, New Zealand and Japan had used alcohol, while the proportions in the Middle East, Africa and China were smaller.

Europe is the heaviest-drinking region in the world – 80-90% of Europeans consume alcohol from time to time, and consumption per alcohol drinking European is 15 litres/year (Alcohol in Europe, 2010; Kessler et al., 2004). Alcohol plays an important role in western culture, and is often part of celebrations. When asked about their expectations of the effects of alcohol, Europeans usually mention more positive than negative experiences and sensations, such as enhanced physical and social pleasure, sexual experience, increased power, and reduced tension (Alcohol in Europe, 2010).

At the same time, the WHO reports that, among the 2 billion alcohol users worldwide, more than 76 million people have alcohol use disorders (AUD) (WHO Global Status Report on Alcohol, 2004). Although the prevalence of AUDs differs across studies and countries, the lifetime prevalence for AUDs is around 10%. Results from *The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)* show a lifetime prevalence of around 18% for alcohol abuse and 12% for alcohol dependence (Hasin et al., 2007). Similarly, the ten-year follow-up survey of *The National Comorbidity Survey (NCS-2*) demonstrated a lifetime prevalence for alcohol abuse of about 13% and for alcohol dependence according to DSM-IV of about 5% (Kessler et al., 2005).

Despite their impact, AUDs have the largest treatment gap among all psychiatric disorders, with 78% of patients affected remaining untreated (Kohn et al., 2004). Also, 50-70% of those with an AUD will suffer from a comorbid psychiatric disorder during the course of their lives (Kessler et al., 1997).

Alcohol use in Sweden

Until 1995, when Sweden joined the European Union, Swedish figures on alcohol consumption were lower than most European countries, due to the restricted availability. After 1995, major changes in policies resulted in a greater availability of alcohol, both in Sweden and from neighbouring countries with lower prices, and led to increasing alcohol consumption, with a peak in 2004 of 10.4 litres pure alcohol per inhabitant. Since then, Swedish alcohol consumption has declined steadily, by 8% over the last ten years. The latest figures on Swedish annual consumption are for 2016, reporting an annual consumption of 9 l/capita, lower than the European average per year (Trolldal et al., 2017).

In women, drinking habits have changed over recent decades, with increased consumption since the 1960s, contributing to a convergence of alcohol habits in women and men, and

between 2003 and 2007, rates of alcohol dependence increased by 50% in women and 25% in men (Andreasson, 2006). Women are considered to be more vulnerable to the effects of alcohol than men, at least partly due to a lower percentage of body water and their lower body weight, and lower levels of drinking are recommended for women (Dawson, 2011).

Alcohol use in adolescents

Adolescence, the transition period between the start of puberty and adult life, is characterised by significant biological, psychological, behavioural, and social changes (WHO, 2004; Spear et al., 2014). Although adolescence theoretically ends after the consolidation of physical development (on average between the ages of 17 and 21), the brain continues to develop until the age of 25 (Toga et al., 2006; Giedd, 2004). During adolescence, the developing brain appears to be particularly susceptible to alcohol's harmful effects (Bava et al., 2010; Crews et al., 2000; De Bellis et al., 2000; White et al., 2005).

In both Europe and the US, adolescents consume high levels of alcohol, and alcohol is the most widely used substance of abuse in young people between the ages of 12 and 20 (Curie et al., 2014; Jeanblanc, 2015), and has repeatedly been ranked as one of the most harmful drugs (Nutt et al., 2015). In the US, the highest prevalence of AUDs is found among young people aged 18-20, who typically start using alcohol years earlier (Grant et al., 2004). However, adolescents' drinking habits differ from those of adult consumers; they drink less frequently but drink more on each episode of consumption (Sanhueza, 2011; Peeters et al., 2014). The physical consequences of adolescents' alcohol use include injury, disability, and death. Alcohol also contributes to risky sexual behaviour and antisocial behaviour, and is associated with accidents, injuries, and suicide (Burton et al., 2018).

In a review, McCambridge and co-workers investigated the adult consequences of adolescent alcohol use, and found a strong association between alcohol consumption during adolescence and AUDs as well as anxiety and depressive disorders in adulthood (Andreasson et al., 2009; Rohde et al., 2001; Wells et al., 2004; Mason, 2008; McCambridge et al., 2011; Jeanblanc, 2015). Young people who engage in drinking before the age of 15 are said to be four times more likely to fulfil criteria for alcohol dependence at some point of their lives (Grant and Dawson, 1997).

As well as in adults, the amount of alcohol consumed by adolescents in Sweden has declined markedly over the last decade: consumption for young people aged 15 fell by 50%, and for those aged 17 by 35%, a trend also observed in several other European countries (CAN 2017; Kraus et al., 2016; Englund et al., 2008). In the most recent annual national Swedish survey assessing alcohol and drug habits in the general population, 40 percent of adolescents aged 15 to 16 reported using alcohol during the past year (CAN, 2017). The figures have remained stable for the past few years. The annual Swedish survey also maps binge drinking. In the national survey in the general population in 2017, about 8% of young people aged 15-16 reported binge drinking at least once a month (CAN 2017).

Mental illness and alcohol use

In recent decades, several large epidemiological studies from the US and Europe have generated knowledge about relationships between mental illness and substance use, and have changed how we look at psychopathology. The US studies included *The Epidemiological Catchment Area Project (ECA)* during the 1980s (Regier et al., 1984; Regier et al., 1990), *The National Comorbidity Survey (NCS)* during the 1990s (Kessler et al., 1996; Kessler, 2005), and *The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)* during the 2000s (Grant et al., 2004; Huang et al., 2006; Goldstein et al., 2007; Hasin et al., 2005). The European studies included *The Netherlands Mental Health Survey and Incidence Study (NEMESIS) (*Bijl et al., 1998; de Graaf et al., 2010) and the German *Early Developmental Stages of Psychopathology Study (EDSP)* (Wittchen et al., 20011; Perkonigg et al., 2008).

The landmark five-site *Epidemiological Catchment Area Study (ECA)* gave a first broad picture on prevalence and incidence of specific, psychiatric disorders, based on a sample of 15,000 respondents. The results demonstrated a life-time prevalence of 'any alcohol drug or mental disorder', based on DSM-III criteria, in about one-third of the population. Mental disorders were found among 22,5%, and were thereby among the most prevalent classes of chronic diseases in the general population (Regier et al., 1990). Another finding was that mental illness typically had much earlier ages of onset than other chronic diseases. Anxiety disorders had median ages of onset in the early to late teens, while mood and substance use disorders had median ages of onset in the early to mid-twenties (Insel et al., 2005).

A decade later, *The National Comorbidity Survey (NCS)* and the ten-year follow-up survey (*NCS-2*) was the first to assess the prevalence of DSM-III-R mental disorders in a nationally representative US sample, and to study the co-occurrence of substance use disorders and other psychiatric disorders. The study also examined the prospective associations of mental disorders with transitions to substance use disorders over a ten-year period. More than half of the sample with a mental disorder had a lifetime substance use disorder, and half of the sample with a substance use disorder were likely to develop a mental disorder (Kessler et al., 1996; Kessler 2004). Behavioural disorders and pre-existing substance use conditions emerged as the strongest and most consistent predictors of these transitions. Mood or anxiety disorders were frequently linked with the onset of substance dependence over the study period. The findings confirm that mental disorders can be conceptualised as risk factors, as they precede substance use disorders, and are associated with increased probability of onset of substance use disorder (Kraemer et al., 1997; Offord et al., 2000).

The National Comorbidity Survey (NERSAC) was conducted by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) in 2001-2002, to examine the differences between substance-induced states and independent psychiatric co-morbidity (Grant et al., 2004; Kessler et al., 2005). Strengths of the NESARC study included the large sample size (n = 43,000), reliable and valid measures of AUDs and other psychopathological conditions, and rigorous study methods. In that survey, AUDs were associated with other substance

use disorders, depressive and bipolar I disorders, antisocial and borderline personality disorders, and anxiety disorders. The different waves of the NESARC have contributed to major epidemiological research in the field of psychiatric co-morbidity (Hasin et al., 2015; Grant et al., 2015).

In Europe, *The Netherlands Mental Health Survey and Incidence Study (NEMESIS)* monitored a representative population sample (18-64 years) with repeated measures in 1996 and 1999, with a follow-up (*NEMESIS-2*) conducted 2007-2012 (Bijl et al., 1998; De Graaf et al., 2010). The results added knowledge regarding first incidence of substance use and psychiatric disorders, and specifically regarding associations between substance use and obsessive-compulsive disorders in the general population (Blom et al., 2011).

Another European longitudinal study, *The Early Developmental Stages of Psychopathology Study (EDSP)* monitored a cohort of young adults and adolescents (aged 14-24) on four occasions, using DSM-IV diagnostic interviews, as in the NERSAC surveys. The results have generated further information on relationships between substance use and psychiatric symptoms (Wittchen et al., 2007; Wittchen et al., 2008; Perkonigg et al., 2008).

These large epidemiological studies have provided a vital basis for understanding the relationships between mental illness and substance use. Many mental disorders are associated with an increased risk of later substance use conditions, and vice versa. The co-occurrence of alcohol (or drug) use disorders in psychiatric patients is a risk factor for a worsened outcome. Such comorbid conditions prolong the duration of the psychiatric disorder, increase the frequency of admissions, and lead to lower quality of life and social complications (Kavanagh 2014; Farren et al., 2014; Urbanoski 2007; Hulse et al., 2002).

Mental illness and substance use in adolescents

A substantial co-morbidity for mental illness and substance use in adults has repeatedly been reported in the large epidemiological studies described above. In adolescents, mental illness and substance use disorders are the leading causes of disability worldwide (Erskine et al., 2015; Swedsen et al., 2012; Merikangas et al., 2010).

Longitudinal studies confirm that prior mental illness such as anxiety and behavioural disorders in those under 18 represent risk factors for the development of co-occurring substance use disorders in adolescence and adulthood (Armstrong & Costello, 2002; Costello et al, 2003; Hodgins et al., 2007). These results are consistent with previous findings that both externalising and internalising behaviour are strongly associated with the development of substance use problems in adolescence (Chan et al., 2008; Castellanos Ryan et al., 2013). Powell et al. suggested that "prevention against alcohol consumption in adolescents in general but specifically in populations at risk for any of the major psychiatric diseases may be important to improve patients' care at adulthood" (Powell et al., 2007; Davis et al., 2018).

Risky alcohol use in psychiatric populations

Risky alcohol use has repeatedly been demonstrated to have a negative impact on individuals with psychiatric disorders (Barry et al., 2006; National Institute on Alcohol Abuse and Alcoholism, 2005). In publications addressing risky alcohol use in psychiatric populations, focus traditionally has been on severe mental illness such as schizophrenia, and less has been published regarding general psychiatric outpatients. However, over the past two decades, substantial knowledge has been added regarding common mental illnesses such as depression and anxiety disorders.

Several studies report on the association between the consumption of even low volumes of alcohol and mental illness severity in both women and men, as it seems to affect antidepressant response, increase side effects and reduce treatment adherence (Goldstein et al., 2006; McDermut et al., 2001). Risky alcohol use seems to be a risk factor for non-recovery from common mental illness (Haynes et al., 2008). A population-based study found an association between elevated depression symptoms and heavy drinking (O´Donnell et al., 2006).

In a psychiatric emergency ward in London (including psychotic patients), risky alcohol use was found in 49% of patients (Barnaby et al., 2003). Tait and Hulse screened psychiatric in-patients with the AUDIT and found risky drinking in about 23% of the patients (Tait and Hulse, 2006). Satre and co-workers examined patterns of alcohol use in psychiatric outpatients with a depression diagnosis, and found that among those consuming any alcohol over the last year (74%) binge drinking was reported by 33% of the women and 48% of the men (Satre et al., 2011). In Sweden, alcohol consumption and problems related to alcohol in patients with mild to moderate depression were substantially higher than in the general adult population (Åhlin et al., 2015).

Risky alcohol use has been demonstrated to be a risk factor for developing an AUD in clinical as well as in general population samples, and in both adolescents and adults (Tanaree et al., 2017; Bonomo, 2004; Merline et al., 2008; Haynes, 2008; Goldstein et al., 2007).

Summary and rationale for the thesis

Mental illness and substance use disorders are severely disabling and common conditions, together ranked number one in the global burden of diseases in terms of YLDs. When combined, they can lead to impaired outcome, with prolonged duration of the psychiatric disorder, increased frequency of admissions, lower quality of life and social complications.

Risky alcohol use has been demonstrated to be a risk factor for developing an AUD. Identifying psychiatric patients at risk of developing an AUD, and being able to divert that development, is vital (Tanaree 2017; Andreasson et al., 2008). In recent decades, a large

body of scientific literature has underlined the importance of detection of and intervention in risky alcohol use in order to prevent the development of an AUD.

The overall objective of this thesis was to add more knowledge about risky alcohol use in psychiatric patients in all age groups, with a focus on detection, prevalence and intervention.

Aims

The importance of detection of and intervention in risky alcohol use has repeatedly been underlined in the scientific literature, though less is written regarding psychiatric populations. The overall objective of this thesis was to add knowledge about risky alcohol use in psychiatric patients, with a focus on detection, prevalence and intervention, and to further explore the area of risky alcohol use in psychiatric patients of different age groups, with a focus on the use of new technologies.

The specific aims were:

- To investigate the prevalence of risky alcohol and drug use in an adult Swedish psychiatric outpatient population, and to study patterns of risky drinking, including binge drinking, in terms of consumption levels, signs of addiction and harm in relationships to sex, age and psychiatric diagnoses (**Study I**).
- To investigate whether risky alcohol consumption in psychiatric outpatients in Sweden could be reduced to non-risky levels using a brief intervention by telephone (**Study II**).
- To describe the development of a new smartphone application designed by the research group and to present two research protocols aimed at evaluating the application (**Study III**).
- To investigate alcohol use, including the prevalence of risky alcohol use, in a Swedish child and adolescent psychiatric inpatient population, and to study patterns of risky drinking, including binge drinking, in relation to sex, age, concurrent drug use and psychiatric diagnoses (**Study IV**).

Methods

Study design

Studies I and II are based on the same sample of 1679 adult general psychiatric patients visiting the outpatient units in Lund and Uppsala over a ten-week period in 2004. Study III is a research protocol, describing the development of a smartphone application, 'The Blue App', and presenting a pilot study and two research protocols aimed at evaluating the application. Study IV is based on a sample of 96 adolescents visiting the child and adolescent psychiatric emergency inpatient unit in Malmö over a nine-month period in 2017-2018.

Table 1
Summary of general aspects of study designs and samples in each paper.

	Study I	Study II	Study III	Study IV
Sample	Adult psychiatric outpatients aged >18	Adult psychiatric outpatients aged >18	Pilot study, adolescent psychiatric inpatients, aged 12-17	Adolescent psychiatric inpatients aged 12-17
	n = 1679	n = 344	n = 14	n = 96
Study design	Cross-sectional	Randomised controlled trial on brief intervention, follow-up time 6 months	Description of app development, pilot study	Cross-sectional
Outcome	Prevalence of risky alcohol use in the sample	Prevalence of risky alcohol use in the sample at follow-up	The Blue App, feasibility of the assessment	Prevalence of risky alcohol use in the sample
Assessment	AUDIT, DUDIT, psychiatric examination as normal	AUDIT, DUDIT, psychiatric examination as normal	The Blue App	AUDIT-C, DUDIT, psychiatric examination as normal
Statistical analyses	Chi-squared test, Mann-Whitney U-test, Student´s t-test, Asymptotic linear-by-linear Association Test	Fisher's exact test, Mann-Whitney U-test, Wilcoxon matched pairs test, Woolf's test, ITT analysis	Power calculations	Chi-squared test, Mann-Whitney U-test, Fisher's exact test

Participants

Study I

Patients in the adult sample (studies I and II) were recruited over a ten-week period in 2004; all patients visiting the 15 adult general psychiatric units in Lund and Uppsala, at registration for their routine visit were offered screening of their alcohol and drug habits. To qualify for inclusion the patients had to be able to understand Swedish. In the emergency department a nurse evaluated whether patients should be asked to participate. Those with an identified substance use disorder and those judged to be psychiatrically too ill to participate were excluded. A total of 1746 adult patients gave their consent to participation. Of those giving consent, 1679 patients were eligible, 1207 female, and 472 male. The mean age for women was 37 years (SD = 13 years, range 17-81) and 39 years for men (SD = 14 years, range 18-79) (Figure 4).

Study II

All patients in the adult screening sample with AUDIT scores indicating risky alcohol use (n=344) were randomised to intervention (immediate advice) or control (advice after six months). In total, 344 adults were eligible for randomisation (233 women, 111 men). Of these, 177 were allocated to the intervention group (132 female, 45 male), and 167 were allocated to the control group (122 women, 45 men). After six months, 291 patients were followed up. Outcome analysis was made according to intention to treat (Figure 4).

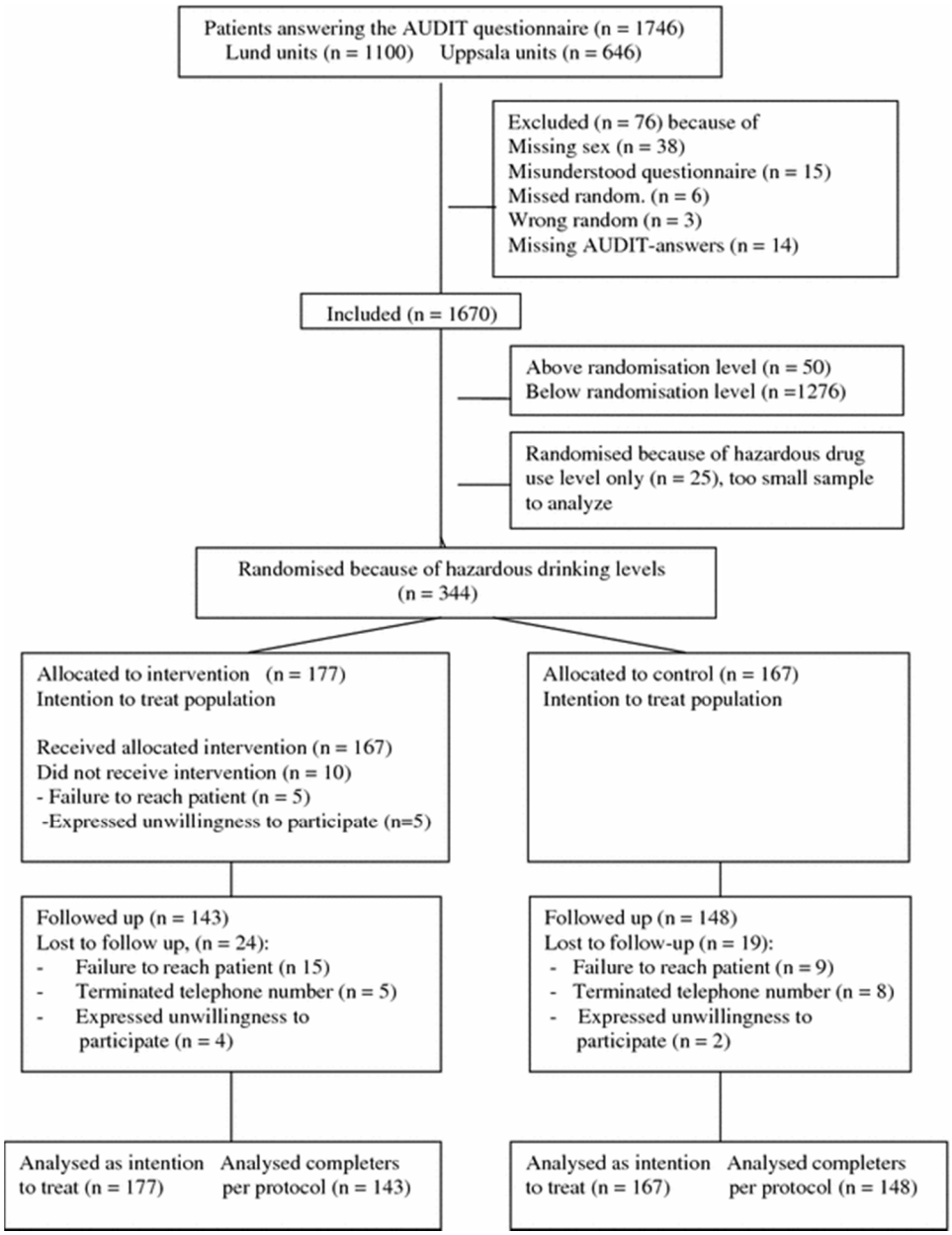

Figure 4
Flow chart; patients in studies I and II

Study III

Patients in the adolescent pilot study sample were recruited in February and March 2014, from those admitted to the regional child and adolescent psychiatric emergency inpatient unit in Malmö, and fulfilling the inclusion criteria (>11 years old, Swedish speaking, admitted min. 24h). Twelve adolescents and their parents/guardians consented to participate in the pilot study. Of those, two patients were discharged before the full assessment was undertaken, ten patients completed the full assessment (Figure 5).

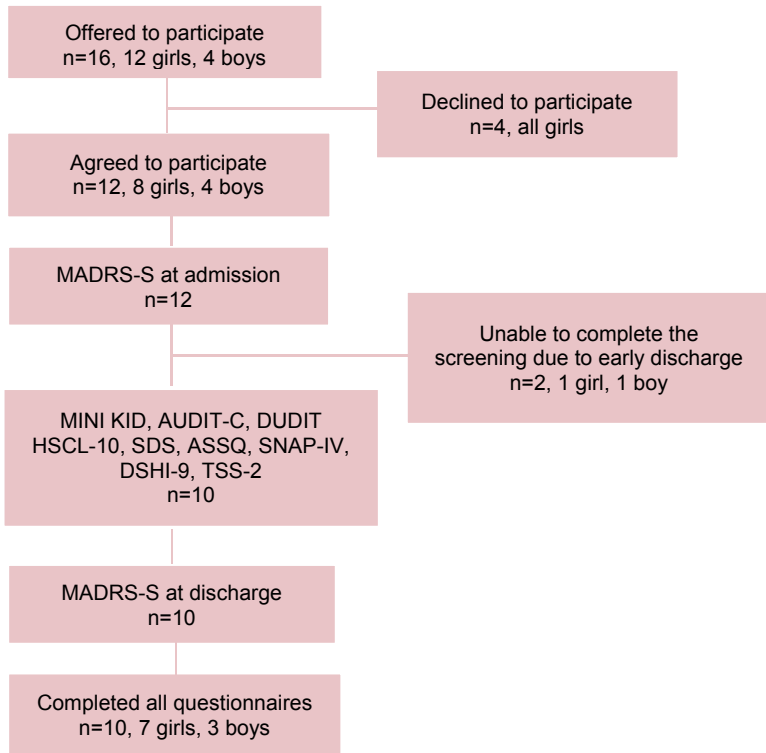

Figure 5
Flow chart: patients in the pilot study, study III

Study IV

Patients in the adolescent screening sample were recruited over a nine-month period in 2017-2018. All patients admitted to the regional child and adolescent psychiatric inpatient unit in Malmö and fulfilling the inclusion criteria (>11 years old, Swedish speaking, admitted min. 24h) were offered screening of their alcohol and drug habits. A total of 96 adolescents and their parents/guardians gave their consent, 73 female, and 23 male. The median age in the study sample was 15.8 years for girls (14.9-16.8) and 16.4 years for boys (15.2-17.2) (Figure 6).

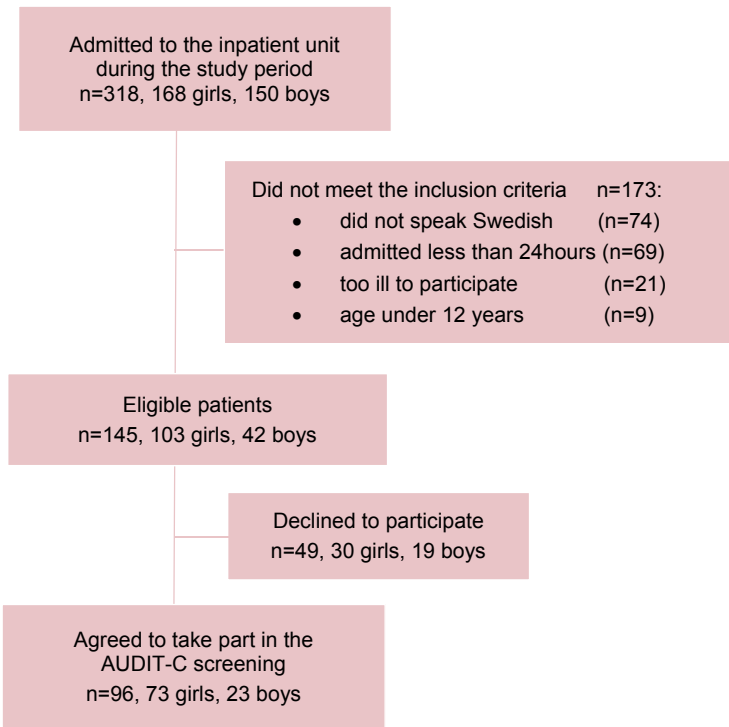

Figure 6
Flow chart: Patients in study IV

Procedure

Study I

During the study period, 97% of the patients seen at the units were given the two self-rating screening questionnaires regarding alcohol and drug use (AUDIT and DUDIT). Of these, 74% completed the questionnaires and agreed to participate in the study. The patients in the sample were clinically assed as usual by their routine outpatient caregivers and were diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) and the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). The patients gave consent to access their psychiatric diagnosis from their medical records. Screening for alcohol and drug habits was not part of the routine assessment at the units.

Study II

All patients in the adult screening sample with AUDIT scores indicating risky alcohol use (n=344) were randomised to intervention (immediate advice) or control (advice after six months) (Babor et al., 2001). Patients in the intervention group were phoned as soon as possible and given brief advice, including feedback regarding their AUDIT screening results. Six months later an attempt was made to phone and screen the patients again. AUDIT scores were obtained from 291 patients (85% of the baseline sample) and compared with their initial scores, see Figure 1. The nurse who administered the intervention also performed the follow-up interview. This procedure was chosen to allow for the possibility of patients requiring additional advice, including that some patients would need to be directed to specialised interventions in the event of severe problems.

The intervention: The intervention, approximately 15 minutes, was given by phone, and consisted of feedback on the AUDIT and/or DUDIT screening and advice. The intervention was given in a standardised, manual-based way, based on the motivational interviewing technique, by four nurses specialised in psychiatry. The nurses were all trained by the same teachers according to the manualised protocol. According to that protocol, patients received individualised interventions tailored according to their willingness to curb their alcohol and/or drug use. The specific elements of the technique used varied according to the clinical judgement of the nurse (Miller et al., 1991; Prochaska et al., 1986)

Study III

The study is a process description of the development of a smartphone application, 'The Blue App', at the regional child and adolescent psychiatric emergency inpatient unit in Malmö, Sweden. The development was prompted by recognised shortcomings at the unit regarding identified comorbidity. At the same time, smartphones were becoming more common among adolescents. In 2013, the decision was made to build a smartphone application to address the need for improved diagnostic screening and the desire for a more sophisticated follow-up tool. Success factors, as well as areas of concern regarding the development of new technology in healthcare, are highlighted in the study.

As part of study III, a pilot study was performed, to assess the feasibility of the screening procedure with the ten questionnaires regarding psychiatric morbidity and comorbidity to be included in The Blue App. In the pilot, the questionnaires were administered using pen and paper. For information on the list of questionnaires chosen, see '*Results, study III*'. All patients who had consented to take part in the pilot study and who had not been discharged prior to the screening completed the screening procedure.

Study IV

Over the study period, 66% (n=96) of the eligible patients agreed to take part in the study. During their stay they completed the two computerised self-rating screening questionnaires regarding alcohol and drug use (AUDIT-C and DUDIT), using the smartphone application, The Blue App, previously developed by the research group (study III). Patients in the adolescent sample were diagnosed according to the agreed routine diagnostic procedure at the emergency unit. The assessments were carried out by a multidisciplinary team, and consisted of a clinical, neuropsychiatric examination by a senior child and adolescent psychiatrist at admission, and an evaluation by a well-trained, interdisciplinary, clinical team, including blood sample and toxicology screening. Consensus diagnoses according to DSM-5 were then assigned by the team. Screening for alcohol and drug habits was not part of the routine assessment at the unit. The study design did not allow for the correlation of results from the routine toxicology screening at the unit with the AUDIT-C and DUDIT results.

The diagnoses obtained during the inpatient stay when the questionnaires were completed were taken from the medical records, with the consent of participating patients and their parents/guardians.

Measurements

AUDIT

The Alcohol Use Disorders Identification Test (AUDIT) was developed by Saunders and Babor, in collaboration with the WHO (Saunders et al., 1993), as a screening instrument for hazardous and harmful alcohol consumption and possible dependence (Babor et al., 2001). It consists of ten questions regarding risky alcohol consumption, frequency of intoxication, drinking patterns, and adverse consequences. Each question scores between 0 and 4 points, so the maximum score is 40 points. It has been translated into Swedish and validated (Bergman & Källmén 2002). In this study we used the recommended cut-off scores of $\geq$6 for women and $\geq$8 for men (Babor et al., 2001; Bergman & Källmén, 2002).

A score of 19 or higher on the AUDIT indicates 'alcohol-related problems including dependence' (Claussen & Aasland, 1993). All patients with scores of 19 or higher in studies I and II were contacted and offered information about treatment available. The third item in the AUDIT concerns binge drinking. The definition of binge drinking used in this thesis

was having six or more drinks/occasion at least once a month (corresponding to 2 and more points in item 3 of the AUDIT questionnaire) (study I and II).

DUDIT

The DUDIT questionnaire comprises eleven questions that correspond to the AUDIT items (Berman et al., 2005). The maximum score for each item is 4. In a study on the general Swedish population, the preliminary recommendation was a lower cut-off score of $\geq$ 2 for women and $\geq$ 6 for men to identify risky drug use (Bergman & Källmén 2002), and we used 18 as the upper cut-off for both females and males. Patients reporting drug habits above the upper cut-off were contacted and treatment was recommended (studies I, II and IV).

AUDIT-C

In the past two decades, the short version of the AUDIT, the three-item AUDIT-C, has been increasingly utilised in adolescent populations (Davis et al., 2018; Chung et al., 2000; Knight et al, 2003). The AUDIT-C, comprising the three AUDIT consumption items on frequency of drinking, typical number of drinks consumed when drinking, and frequency of binge drinking (defined as < 5 drinks on any occasion), has proved almost as effective as the ten-question AUDIT in screening for risk drinking and AUDs in the general population and subpopulations such as patient samples (Aertgeerts et al., 2001; Bradley et al., 2003; Dawson, 2011; Chung et al., 2002; Thomas and McCambridge, 2008; Seguel et al., 2013).

Each question in the AUDIT-C scores between 0 and 4 points, so the maximum score is 12 points. We used the cut-point for risky alcohol use of $\geq$3 of the total score for both girls and boys, as recommended in the validations of the AUDIT in adolescent samples (e.g. Davis et al., 2018; Liskola et al., 2018; Santis R et al., 2009; Knight et al., 2003; Cortés et al., 2016) (study IV).

Statistical analyses

The level of significance was set to $p < .05$. The statistical analyses in studies I and II were carried out using SPSS v.15 for Windows, and in study IV using SPSS v.24.

Study I

Differences in proportions were analysed with the Chi-squared test. Comparisons of ratings between subgroups were carried out with the Mann–Whitney U-test. The age difference between women and men was tested by Students t-test. For comparison between AUDIT subscales, a non-parametric variance analysis was used, and for testing linearity in the distribution of risky drinking, an asymptotic Linear-by-Linear Association Test was used.

Study II

Differences in proportions were analysed with Fisher's exact test. Comparisons of ratings between subgroups was carried out with the Mann–Whitney U-test. The Wilcoxon matched pair test was used to investigate differences within patients in changes of AUDIT scores between baseline and follow up, also when controlling for baseline scores in the outcome analyses. Woolf's test was used for analysis of heterogeneity for sex and geographic region (Woolf, 1954). Since regional differences were not anticipated, this test was not predefined. Primary efficacy analysis was based on the intention to treat (ITT) population (all randomised patients), using last rank carried forward to compensate for dropouts. In the ITT analysis, the baseline rank from each dropout patient was used, and replaced with the corresponding AUDIT level according to O'Brian et al. (O'Brian et al., 2005) to assess if attrition affected the findings. When 1-3 questions were not completed (n=14), missing data were imputed with the mean for this question in the corresponding subgroup for sex and age. By using the mean, a conservative estimate was used, and those patients could obtain a total AUDIT score and be included in the analysis.

Study III

As part of study III, two research protocols aimed at evaluating the application were generated, and a power calculation was undertaken (see Paper III).

Study IV

The Mann-Whitney U-test was applied for continuous data. Differences in proportions were in analysed with the Chi-squared test and Fisher's exact test.

Ethical considerations

Studies I and II received ethical approval from the Research Ethics Committee of Lund University / Uppsala University (Dnr: Lund 693-03, Uppsala 03-479). Written information about the study and the study design was given, and informed consent was obtained from the participating patients. All participants were informed of their right to withdraw from the studies at any time without giving a reason. The nurses who delivered the intervention were able to direct patients to specialised interventions in the event of severe problems.

Studies III and IV received ethical approval from the Lund Regional Ethics Review Board (Dnr: 423/2013). Written information about the study and the study design was given, and written informed consent was obtained from all participating patients and their parents/guardians. All participants (study IV) were informed of their right to withdraw from the studies at any time without giving a reason. The team at the adolescent emergency inpatient unit was prepared to address any substance-related problems, and to direct patients to specialised interventions when needed.

Results

Study I

In this study, 1679 adult general psychiatric outpatients qualified for inclusion, 72% women (n=1207) and 28% men (n=472), which was fairly representative of the Lund units. The response rate was 74%. The mean age in the screening sample was 37 years for women and 39 years for men.

Risky alcohol use was found in 30% of the male and 22% of the female sample, see Figure 7.

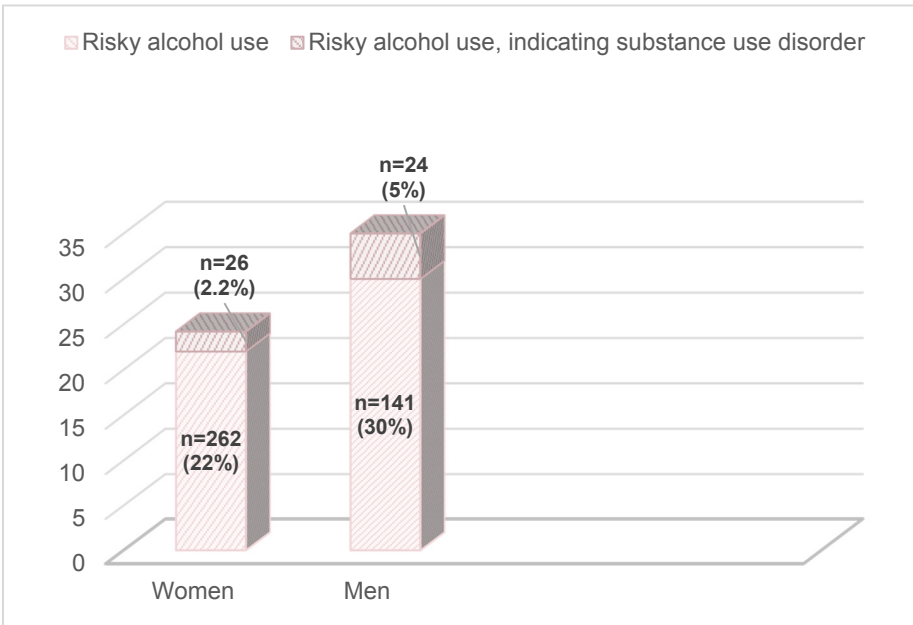

Figure 7
Risky alcohol use in the sample

Among those with AUDIT scores above cut-off for risky alcohol use, 42 women (16%) and 15 (10%) men also scored above cut-off in the DUDIT questionnaire, indicating a concurrent risky drug use.

Fourteen percent of all patients (n=239) presented AUDIT scores of zero, i.e. did not use alcohol.

Table 2
Distribution of risky drinking in age quartiles in men and women (%)

Age	Women Above cut-off n=261a	Women Below cut-off n=930 a	Men Above cut off n=141b	Men Below cut-off n=321b
Quartile ♀17-26 ♂18-27	46.7% n=122	19.7% n=183	39.7% n=56	19.6% n=63
Quartile ♀27-34 ♂28-36	23.0% n=60	24.3% n=226	21.3% n=30	24.3% n=78
Quartile ♀35-45 ♂37-49	14.6% n=38	27.3% n=254	22.7% n=32	27.4% n=88
Quartile ♀46-81 ♂50-79	15.7% n=41	28.7.% n=267	16.3% n=23	28.7% n=92

Statistics: Chi-squared test, 3 df. a p <0.001, b p =0.002
a Comparison, women above vs. below cut-off
b Comparison, men above vs. below cut-off
Asymptotic Linear-by-Linear Association Test: p=<.0001 in women and men

Risky drinking was more common in young adults, and an inverse relationship was found between occurrence of risky alcohol use and age in the Linear-by-Linear Association Test (Table 2).

The mean scores on the consumption subscales were significantly higher than the mean scores on the other subscales. The highest scores were found for item 1 ('How often do you drink alcohol?') in both men and women, followed by the other consumption items. The lowest scores were found in the dependence scores. For all items, there was a significant difference between men and women. The scores for men were significantly higher than for women in all the subscales.

Nine percent of the women in the sample met the AUDIT criteria for binge drinking compared to 22% of the men (p<.001). The frequency of binge drinking differed significantly between younger and older patients in both men and women. In the youngest quartile, 19% of the women reported binge drinking compared to 5.8% within the oldest (p<.001). The corresponding figures for the men were 34% and 13%, respectively (p<.002).

Three hundred and forty (28%) women and 170 (36%) men scored one point on the binge drinking item, corresponding to six drinks on the same occasion, but with a frequency of less than one occasion per month.

Risky alcohol use and psychiatric diagnoses

Table 3
Distribution of psychiatric diagnoses (percent) in relation to risky drinking in men and women (the Lund sample).

Psychiatric diagnosis	All Women	All Men	Womenbelow cut-off	Women above cut off	Men below cut-off	Men above cut off
n	n=755	n=307	n=602	n=153	n=213	n=94
Affective disorder	39.1	36.5	39.2	40.9	33.8	42.7
Anxiety disorder	25.2	24.4	24.9	27.7	27.2	19.5
Adjustment disorder	10.2	11.7	10.8	8.0	10.8	14.6
Personality disorder	6.8	4.6	5.0	14.6 *	5.2	2.4
Schizophrenia	2.4	4.6	2.8	0.7	4.7	4.9
Other	6.5	7.5	6.2	4.3	7.0	6.1
No diagnosis in the records	9.9	10.7	11.1	3.6	11.3	19.5

Statistics: Chi-squared test 6 df, in women: * p<.001
Personality disorder was more common in women above cut-off

The main diagnoses in the Lund sample are listed in Table 3. Women with risky alcohol use had a higher frequency of personality disorder diagnosis compared to other women (Table 3).

In the female patients, the highest frequency of risky drinking was found in patients with a personality disorder, (40%); in men, the highest frequency was found in the affective disorder group (31%). In the women, the highest frequency of abstainers was found among patients with an affective disorder (30%), and in men in the anxiety disorders group (26%).

Binge drinking was more frequent in men with an adjustment disorder (30%) or an affective disorder (20%). In women, the highest frequency of binge drinking was found among patients with a personality disorder diagnosis (21%), followed by patients with an affective disorder (8%).

Risky drug use

The response rate in the DUDIT screening was slightly lower than the in AUDIT screening (n=1649). The frequencies of patients scoring above cut-off are presented in Table 4. Among patients scoring above cut-off on the DUDIT, 42 women (61%) and 15 men (65%) had a concurrent risky use of alcohol.

Table 4
Risky drug use in two age groups (median years) in men and women

	Women <35 years n=627	Women >36 years n=468	Men <36 years n=211	Men >37 years n=213
No/low risk	n=577 92.0 %	n=452 96.5 %	n=194 9 1.9%	n=208 97.7%
Risky drug use	n=50 8.0%	n=16a 3.5%	n=17 8.1%	n=5b 2.3%

Statistics: Chi-squared test
a Comparison rates of risky use between younger and older women, p=.000
b Comparison rates of risky use between younger and older men, p <0.05

In both women and men, risky drug use was more common among younger than older patients (Table 4). Due to small sample sizes, no further analyses were carried out.

Study II

The aim of study II was to investigate whether risky alcohol consumption could be reduced to low-risk levels by way of a brief intervention by telephone. The study sample in study II consisted of the patients with risky alcohol consumption identified in study I (n=344), which were included in the RCT. Following randomisation, 177 patients were contacted and received intervention. See Figure 1 for further information on patient flow and regarding dropouts.

The main finding was that approximately half of all patients in the intervention group had reduced their alcohol scores below cut-off for risky consumption at the six-month follow-up (AUDIT <6, <8) (see Figure 8).

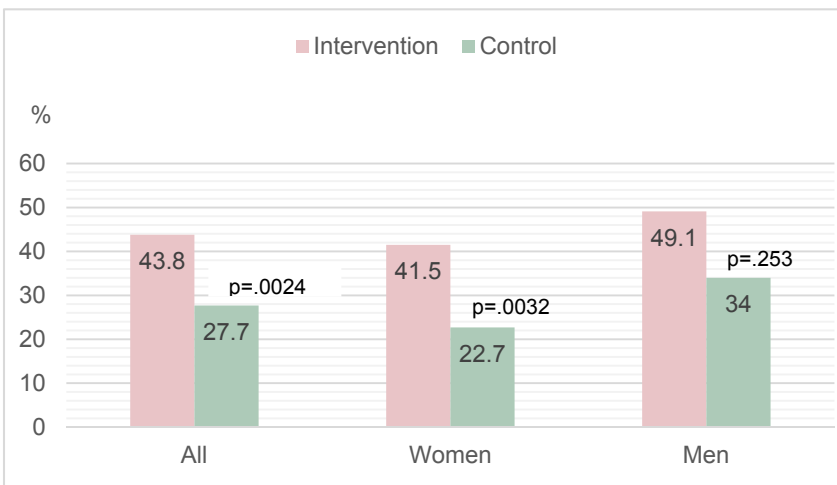

Figure 8
Patients scoring under cut-off at follow-up, intervention and control group in percent, ITT analysis

The women in the intervention group reduced their consumption to non-risky levels more often than women in the control group. In men, due to the smaller size of the male sample, the higher frequency of patients reporting reduced consumption in the intervention sample failed to reach a statistically significant level.

Changes from baseline to follow-up were analysed, using total AUDIT scores. Comparing total AUDIT scores at follow-up between the intervention and the control group, and controlling for baseline AUDIT scores, all patients in the intervention group had a greater reduction then those in the control group. This difference proved to be significant for the whole sample (p=.033), as well as in women (p=.025).

It was decided to screen for drug as well as alcohol habits, since drug use disorders are common in psychiatric patients. Intervention was designed to be relevant to risky use of alcohol or drugs, or both. Another reason for screening for drug use was to control for this confounding factor in the risky alcohol use population. Fifty-three of the screened patients reported risky drug use at baseline. Of these, 38 also reported risky alcohol use. The latter patients were randomised to drug as well as alcohol intervention. Twenty-five patients reported risky drug use only. These patients were randomised to intervention (n=6) or control (n=14) conditions. Only one patient in each group reported a reduction to non-risky drug use at follow-up. In conclusion, we found lower levels of risky drug use in the screened population than expected but, due to the very small sample sizes, no further analyses were carried out.

Study III

Study III is a process description of the development of a new smartphone application, The Blue App, at the regional child and adolescent psychiatric emergency inpatient unit in Malmö, Sweden. The aim was to improve identification of comorbidity, promote outpatient compliance, and improve treatment outcome. Another aim was to allow mapping of changes in symptom severity before and after admission. Success factors, as well as areas of concern regarding the development of new technology in healthcare, were highlighted.

The following eleven validated screening questionnaires were chosen in collaboration with national experts and with regard to frequent comorbid states in child and adolescent psychiatry.

- Montgomery Åsberg Depression Scale (MADRS-S), a nine-item diagnostic self-rating questionnaire measuring depressive symptoms during the last three days (Svanborg et al., 1994).
- Mini-International Neuropsychiatric Interview for Children and Adolescents (MINI-KID), a semi-structured diagnostic interview, concerning the core psychiatric disorders among children and adolescents (Sheehan et al., 2010).

- Alcohol Use Disorders Identification Test – Consumption (AUDIT-C), a three-item screening questionnaire regarding alcohol use (Bush et al., 1998).
- Drug Use Disorders Identification Test (DUDIT), an eleven-item screening questionnaire regarding drug use (Berman et al., 2005).
- Hopkins Symptom Checklist-10 (HSCL-10), a symptom inventory that measures signs of anxiety and depression (Strand et al., 2003).
- Sheehan Disability Scale (SDS) a scale assessing functional impairment in the domains of work/school, social and family life (Sheehan et al., 1983).
- Autism Spectrum Screening Questionnaire (ASSQ), a 27-item checklist assessing symptoms characteristic of high-functioning autism spectrum disorders (Ehlers et al., 1999).
- Swanson Nolan and Pelham Questionnaire (SNAP-IV), a 30-item questionnaire assessing ADHD symptoms and behaviour problems (Bussing et al., 2008).
- Deliberate Self-Harm Index-9 (DSHI-9), a scale about frequency of different ways to self-harm (Lundh et al., 2007).
- Treatment Satisfaction Scale 2 (TSS-2), a six-item measure of treatment effectiveness. This was included to evaluate the satisfaction with treatment but was not part of the research protocols (Clinton et al., 2004).

To evaluate the feasibility of the screening procedure, a pilot study was carried out with adolescents admitted to the unit. Ten out of 16 patients completed all questionnaires. Nine of ten diagnoses at discharge were confirmed by the MINI-KID. Additionally, the MINI-KID identified an average of five diagnostic areas of potential psychiatric interest. including risky use of alcohol or substance use, which had neither been clearly addressed during the inpatient stay nor mentioned in the psychiatric records. There were no dropouts due to unwillingness to complete the screening procedure, although the patients were severely ill. This seems to indicate that the design chosen was feasible in a child and adolescent emergency population.

A feasibility study was then carried out to clarify the requirements of The Blue App, and to identify cost-benefit as well as safety aspects to generate a basis for decision making for the funding body. The feasibility study resulted in a thorough description of the technical requirements in 90 user cases, including mock-ups, flowcharts and wireframes, and concluded that no existing solution was available on the market. The board gave approval for funding in May 2015. After a public procurement process, with the researchers involved in the decision, the company Stretch Öresund was chosen.

The work proceeded with biweekly workshop sessions, allowing the app architects to gain an understanding of psychiatric care, and enabling them to adapt the solution to the unit's requirements. Feedback from the end users was collected in a workshop. They found the application easy to navigate. Some minor improvements were suggested by the participating adolescents, such as integration of graphic design.

The result was The Blue App, a computerised tool for systematic screening, including questionnaires relevant for the psychiatric conditions most frequently presented in the emergency unit, mainly depression, suicidal ideation and anxiety. The tool could be used to complement the clinical assessment. During the development process, a small pilot study assessed the feasibility and relevance of the systematic screening, with study IV a larger study was planned to assess risky alcohol and drug habits using The Blue App.

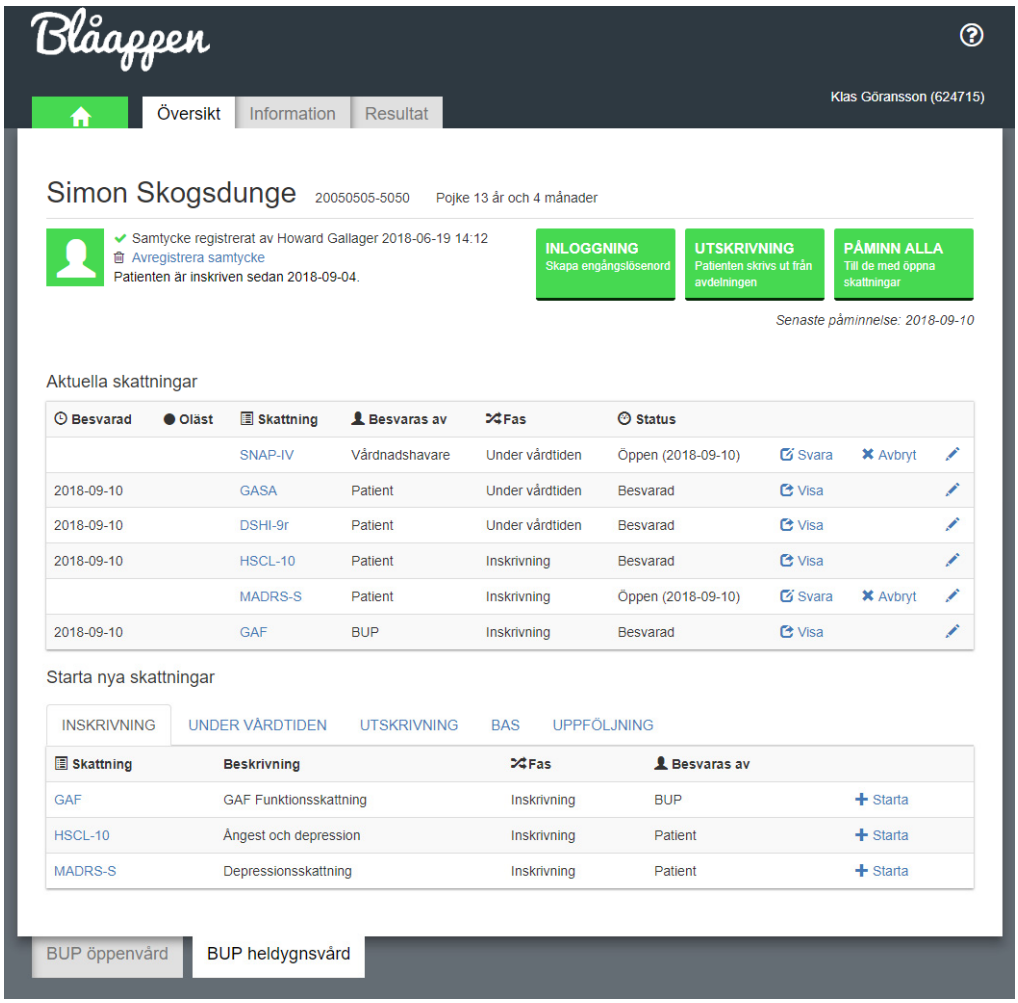

Figure 9
The Blue App, tablet layout, overview in Swedish

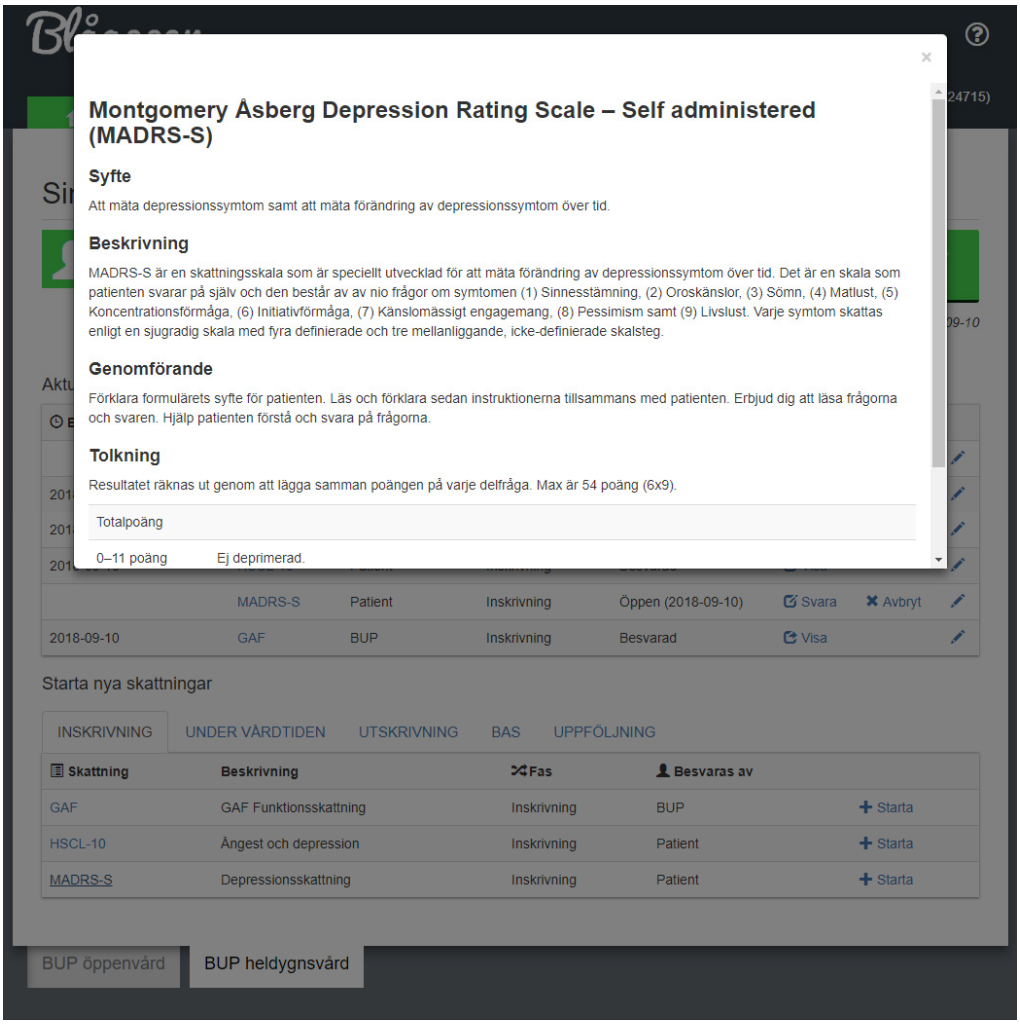

Figure 10
The Blue App, tablet layout, additional information available regarding the chosen questionnaire, overview in Swedish

Figure 11
The Blue App, smartphone layout, examples Study IV

Study IV

Ninety-six of the 145 patients (66%) eligible for inclusion in study IV agreed to participate, and the study sample (n= 96) consisted of 73 girls (76%) and 23 boys (24%).The median age in the study sample was 15.8 years for girls (14.9-16.8) and 16.4 years for boys (15.2-17.2). No significant differences were found between boys and girls regarding the distribution of diagnoses, age, or duration of the inpatient stay.

The study sample was reasonably representative compared to the 49 decliners in terms of distribution of diagnoses, except for affective disorder (49% in our sample, 31% of the decliners, p=.035) and autism (11% in the sample, 0% of the decliners). No significant differences were found regarding age, gender, or length of the hospital stay. There was no coercive treatment in the decliners, and 10% among those included (p=.027).

Risky alcohol use

Table 5 shows the distribution of scores on the AUDIT-C in the sample. Twenty-four of the 73 girls in the sample (32.8%) had AUDIT-C scores indicating risky alcohol use, compared with 5 of the 23 boys (21.7%) (p=.45).

Table 5
AUDIT-C scores

AUDIT-C scores	0	1	2	3	4	5	6	7	8	9	10	11	12
Girls, n=73	42	4	3	8	3	4	5	1	0	3	0	0	0
Boys, n=23	14	3	1	1	1	1	2	0	0	0	0	0	0

Risky alcohol use ≥ 3, screening results from the Regional Child and Adolescent Emergency Inpatient Unit in Malmö, 2017-2018.

Risky alcohol use and psychiatric diagnoses

The highest frequency of risky alcohol use was found in girls with an anxiety disorder (7 of 19 girls, 36.8%), followed by girls with an affective disorder (10 of 30, 33.3%). In boys, the highest frequency of risky alcohol use was found in those with an affective disorder (3 of 9 boys, 33.3%). No significant difference was found between girls and boys (p=.162), Table 6.

Fifty-eight percent of all patients (n=56) presented AUDIT-C scores of zero, i.e. did not use alcohol. There were more abstainers in boys, 61% (n=14) than in girls, 57% (n=42).

The main psychiatric diagnoses in the sample are listed in Table 6.

Table 6
Distribution of psychiatric diagnoses and risky drinking

Diagnostic groups	All girls n=73* (%)	All boys n=23 (%)	Girls above risky drinking cut-off n=24 (%)	Boys above risky drinking cut-off n=5 (%)
Affective disorder n=39	30 (33.3)	9 (39.1)	10 (33.3)	3 (33.3)
Anxiety disorder n=26	19 (26.0)	7 (30.4)	7 (36.8)	1 (14.3)
Eating disorder n=8	7 (9.6)	1 (4.3)	0	0
ADHD n=9	7 (9.6)	2 (8.7)	4 (66.6)	0
Autism n=7	5 (8.2)	2 (8.7)	2 (4.0)	0
Substance use disorder n=4	2 (2.7)	2 (8.7)	0	1 (50.0)
Psychosis n=1	1 (1.4)	0	0	0
Personality disorder n=1	1 (1.4)	0	1 (100)	0
No diagnosis obtained n=1	1 (1.4)	0	0	0
Risky drug use, DUDIT n=13	8 (10.1)	5 (21.7)	6 (75.0)	2 (40.0)

Screening results from the Regional Child and Adolescent Emergency Inpatient Unit in Malmö, 2017-2018.
* DUDIT n=72

Risky alcohol use in the sample was significantly more common among the older adolescents (Table 7).

Table 7
Risky alcohol use and age

Age (years) ♀ median 15.8 ♂ median 16.4	Girls below cut-off n=49 *	Girls above cut-off n=24 *	Boys below cut-off n=18 ¤	Boys above cut-off n=5 ¤
17	9	10	5	3
16	13	8	5	2
15	14	3	3	0
14	3	3	3	0
13	8	0	0	0
12	2	0	2	0

Screening results from the Regional Child and Adolescent Emergency Inpatient Unit in Malmö, 2017-2018.
Statistics: Chi-squared test, 6df. *: p=0.031, ¤: p=0.308
*Comparison girls above vs below cut-off
¤ Comparison boys above vs. below cut-off

Binge drinking

The definition of binge drinking used in this study was having six or more drinks/occasion at least once a month (corresponding to 2 and more points in item 3 of the AUDIT-C questionnaire). Seven patients (all girls) fulfilled the definition of binge drinking. Twenty-

one of the 96 patients (17 girls and 4 boys) scored 1 point on this item, indicating binge drinking, but did not fulfil the frequency criteria.

Risky drug use

The results of the DUDIT screening are presented in Table 8.

Screening results from the Regional Child and Adolescent Emergency Inpatient Unit in Malmö, 2017-2018.

The DUDIT screening was completed by 72 of the 73 girls and all 23 boys. No significant difference in distribution of DUDIT scores was found between boys and girls (p=.144).

Seventeen of the girls in the sample (23%) had DUDIT scores indicating risky drug use, and 5 of 23 boys (22%) (p=.144). Of the patients with scores above cut-off for risky drug use, 11 patients (8 girls and 3 boys) also scored above cut-off in the AUDIT-C questionnaire, indicating concurrent risky alcohol use.

Seventy-six percent of patients in the study sample presented DUDIT scores of zero, indicating no use of drugs.

Table 8

DUDIT scores in the sample, cut-off for risky drug use ≥2 for girls, ≥6 for boys

DUDIT score	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19- 44
Girls n=72	55	0	1	1	4	2	0	2	1	0	0	1	3	0	0	1	1	0	0	0
Boys n=23	18	0	0	0	0	0	2	0	0	1	0	1	0	0	0	0	0	0	1	0

Discussion

Methodological considerations

New technology (Study II, III and IV)

In study II and IV, new methods for screening, data collection and intervention were applied: in study II, the brief intervention was given by phone, and in study IV, The Blue App was used for data collection. The new technology applied was well accepted, as reflected by the response rate of 85% at follow up in study II, and the almost 100% participation in study IV.

The phone-based intervention proved effective in study II. Interventions delivered by telephone, as used in study II are easy to perform, and have been used in different contexts with positive results, regarding for example AUDs, medication adherence in schizophrenia, and suicide attempts (Brown et al., 2007; Beebe et al., 2017; Vaiva et al., 2006).

Regarding the feasibility of the The Blue App, the oral feedback was not collected in a systematic procedure, which is a limitation, but further validation with two planned studies, described in Paper III, is ongoing. Additional validation from other groups are needed. However, there is already some evidence favouring the use of computerised screening (Chisolm et al., 2008; Davis et al., 2018).

Both the WHO, OECD and multiple national initiatives acknowledge eHealth (the use of information and communication technologies) as playing a major role in improving public health (WHO, 2018; OECD, 2013; E-hälsomyndigheten (The Swedish eHealth Agency, 2018). The WHO 2018 "urges Member States to prioritize the development and greater use of digital technologies in health as a means of promoting Universal Health Coverage and advancing the Sustainable Development Goals" (WHO 2018).

Psychiatry may be particularly well-suited for e-Health solutions for a number of reasons:

- Psychiatry largely uses audio-visual information as diagnostic and therapeutic tools and does not require the same amount of physical examinations or technical equipment for tests or procedures as other medical specialities (Norman, 2006).
- With growing demands worldwide on mental health care, psychiatry needs to be more cost-effective; e-Health initiatives are said to improve the operations and financial efficiency of health care systems (Lal et al., 2014; WHO, 2016).
- Historically, psychiatry has been surrounded by stigma, and research and development in psychiatry has often been underfunded compared with other medical specialities (Borelius et al., 2014). The addition of new, patient friendly methods could send important signals to patients, relatives, care providers and researchers.

To date, few psychiatric e-tools have been well studied or validated up to now, and little is known regarding their effect when implemented on a broad scale (Lal et al., 2014; Marcano et al., 2015). Weiss Roberts and co-workers call for systematic research and a framework that allows to evaluate efficiency (Weiss Roberts et al., 2018).

Participants and measures (Study I and II)

Studies I and II are based on the same sample. Study I assessed the prevalence of risky alcohol and drug use in an adult, general psychiatric outpatient sample from two sites (Lund and Uppsala), using a cross-sectional design. Patients scoring above cut-off for risky use in study I (n=344) were offered participation in study II.

Strengths of study I were the large sample size (n=1670), the satisfactory response rate (74%), and the use of a well-validated questionnaire regarding alcohol use (AUDIT). The AUDIT has been comprehensively validated for detecting risky alcohol use and has shown good feasibility (Berner et al., 2007). In study I the response rate was 74%, confirming good feasibility of using AUDIT in clinical practice. The DUDIT was used to screen for risky drug use. Less has been published regarding the validity of DUDIT for detecting risky drug use, the cut-offs applied were suggested by Berman and co-workers in a study on the Swedish population (Berman et al., 2005).

It was only possible to obtain the distribution of psychiatric diagnoses from the units in Lund (n=1065), comprising 64% of the total number of patients in sample, which is a limitation of studies I and II. According to the study design, collection of baseline data for every patient regarding diagnosis was scheduled after closing the enrolment. This was not possible for the Uppsala units for technical reasons. Studies I and II were

carried out in two Swedish university towns (Lund and Uppsala). The two sites are similar in several aspects, e.g. size, demography and social structure. In comparison with nationwide data, there was a similar distribution regarding the two major diagnostic groups, depression and anxiety disorders, a somewhat higher frequency of adjustment disorder in Lund, and similar frequency of personality disorder (National Board of Health and Welfare, 2008).

In study II, a randomised controlled design was used to examine, whether risky alcohol use in adult psychiatric outpatients could be reduced to non-risky levels with a brief intervention by telephone. The patients in study II mainly suffered from affective disorders or anxiety disorders, so the results obtained in this study may not be valid for other kinds of psychiatric populations. In the randomised controlled trial, 85% of the patients were followed up and included in the analyses. The study population was a doubly disadvantaged group, with a present psychiatric disorder concurrent with risky alcohol consumption, so the attrition rate should be regarded as satisfactorily low.

The male population in the RCT was small (n=90) in comparison to the female (n=254). The smaller sample size may explain why the reduced alcohol consumption at follow-up failed to reach statistical significance in men. When planning the study, a more even distribution of men and women in the outpatient units included was expected. The adult sample consisted of 72% women and 28% men, which was fairly representative of the Lund units during the study period in 2004. National Swedish statistics show that gender differences have been found between the diagnostic groups among psychiatric patients. Women are more often diagnosed with affective disorders and anxiety disorders than men, and less often with substance use disorder diagnoses. The latest figures (from 2016) on the gender distribution at all adult psychiatric units in Skåne is 47% men, 53% women (SKL., 2016).

The patients from the Lund units (n=1065) comprised 64% of the total number of patients. An analysis of heterogeneity regarding baseline and outcome in AUDIT scores regarding the two sub-populations (Lund and Uppsala) revealed no significant differences (ITT p=.6401).

The design chosen for study II, where selection for the study was based on participation in Study I, might affect inclusion and therefore be regarded as weakness. On the other hand, participation in study I gave a thorough assessment of comorbidity at baseline, which is a strength.

Participants and measures (Study IV)

The study sample consisted of 73 girls (76%) and 23 boys (24%). During the study period, 318 patients were admitted to the unit, 168 girls (53%) and 150 boys (47%). The largest group that did not fulfil the inclusion criteria (about one in four) were non-Swedish speaking patients (n=74), and all except one of them were boys. Since 2015,

Sweden has had high numbers of unaccompanied minors seeking asylum, most of them boys. Some of them are seen at the unit, presenting severe mental disorders requiring psychiatric inpatient care. The finding also exemplifies the ethnic diversity found in Swedish healthcare today: about 19% of the 10 million people living in Sweden today were born in other countries than Sweden (Statistics Sweden, 2017). Lack of access to the computerised questionnaires in other languages than Swedish was a limitation. This will be addressed in the next version of the Blue App, where questionnaires in the four languages most common at the unit (English, Dari, Arabic and French) will be added.

Thus, study IV assessed the prevalence of risky alcohol and drug use in an adolescent emergency psychiatric inpatient sample (n=96) from Skåne, using a cross-sectional design. In the screening for risky alcohol use, the short version of AUDIT, the AUDIT-C, was used, measuring alcohol consumption and consumption patterns (frequency, quantity, and binge drinking, defined as < 5 drinks on any occasion). The AUDIT-C has been validated in its detection of risky alcohol use in adolescents (Davis et al., 2018; Liskola et al., 2018; Knight et al., 2003; Santis et al., 2009).

Cut-offs for risky alcohol use in adolescents

Traditionally, the established AUDIT cut-offs for adults have been used in studies on adolescents. In study IV, lower cut-offs on AUDIT-C-scores, as proposed by earlier studies in adolescents, were used (Davis et al., 2018; Liskola et al., 2018; Knight et al., 2003; Santis et al., 2009). The adolescent brain is not fully developed and continues to develop until the age of 25 (Toga et al., 2006; Gogtay et al., 2004). The developing adolescent brain appears to be particularly vulnerable to alcohol's harmful effects, predisposing the teenage drinker to alcohol and mental health problems that could persist into adulthood (Hanson et al., 2011; Welch et al., 2013). It was decided to use the cut-point for risky alcohol use of ≥ 3 in total score for both girls and boys, as determined for example in the validations of the AUDIT-C in adolescent samples (Davis et al., 2018; Liskola et al., 2018; Santis R et al., 2009; Knight et al., 2003).

In study IV, item 3 of the AUDIT-C, concerning binge drinking ('How often do you have six or more drinks on one occasion?') was analysed separately, as binge drinking has been proposed to be the most dangerous aspect of risky drinking, and a strong risk factor for a variety of drink-related complications (Graham et al., 2007; Kuntsche et al., 2004; Room et al., 2005; Andersson, 2008).

Efforts have been made to specify the cut-off point for binge drinking in adolescents more accurately, and/or to consider improvements in the wording of the consumption items, to better identify underage binge drinking. To date, no consensus has been reached: "None of the suggested improvements has been overwhelmingly accepted by researchers, perhaps because they do not comply with a consensual definition of binge drinking" (Cortés-Tomás et al., 2017). Frequencies of binge drinking in Study IV are therefore reported according to the definition from the AUDIT manual (consumption

of 6 or more drinks in 1 sitting for both men and women at least once a month, corresponding to 2 and more points in item 3 of the AUDIT questionnaire), although the authors argue that the cut-off recommended in the AUDIT manual is too high for an adolescent population (Cortés-Tomás et al., 2017). In our sample, 7% of patients reported scores that indicate binge drinking. Rates of binge drinking in the Swedish general population were analysed in the 2017 CAN survey, where 8% of young people those aged 15-16 reported binge drinking, according to their definition of binge drinking as 4 or more drinks on a single occasion.

Another limitation of the study that must be acknowledged is that the design did not allow verification of the screening results through clinical interviews and/or blood sample testing (Aradottir et al., 2006). The naturalistic design did not contain a control group, which affects generalizability. The study sample, although representative of adolescents without a known SUD admitted to the emergency unit in Malmö and potentially of adolescents in other psychiatric emergency care, may not be generalizable to other groups of adolescents.

We decided to analyse risky alcohol use in relation to the main reason for the emergency admission (main diagnosis). Only a few patients in the sample were diagnosed with ADHD as main diagnosis at their inpatient stay, and ADHD is rarely the main reason for an emergency admission. However, patients in the study sample might have had comorbid ADHD as a second diagnosis, but the study design did not allow control for that. The study sample is representative of adolescents admitted to a psychiatric emergency unit.

This study is the first to use The Blue App for computerised data collection, and a possible limitation is that the computerised versions of the measures have yet to be validated. Two ongoing, larger studies are investigating the significance and feasibility of the Blue App in clinical use in both an inpatient and outpatient routine setting. However, the questionnaires themselves are well validated, well established, and have been used in computerised format previously, and there is evidence for the effectiveness of computerised screening (Brener et al., 2003; Davis et al., 2018).

Main findings of the thesis

Prevalence of risky alcohol use in the adult sample (Study I)

The main finding from study I, based on the cross-sectional sample of adult psychiatric patients, was that risky alcohol use occurred among 22% of the female and 30% of the male patients, with a higher prevalence among younger patients.

The literature on risky alcohol use in adult general psychiatry is limited. Additionally, the published papers report on diverse populations in different settings (inpatients, outpatients, and emergency ward patients), and the reported frequencies of risky alcohol use vary, from 8.6% in Ghana to around 50% in a psychiatric emergency ward in the UK. The frequencies of risky drinking found in study 1 (22% in women and 30% in men) are higher than among psychiatric inpatients screened by Hulse et al. (17%), and higher than the figures reported by Cruce et al. from screening of a Swedish psychosis sample (Hulse et al., 2000; Cruce et al., 2007).

The frequencies found in study I are slightly lower than results from screening of a comparable general psychiatric Swedish outpatient sample reported by Nehlin Gordh et al., with risky alcohol use found in 28% of the women and 31% of men, and clearly below Barnaby´s figure of 49% from screening at a psychiatric emergency (Nehlin Gordh et al., 2012; Barnaby et al., 2003). Satre et al. examined patterns of risky alcohol use in depressed patients in outpatient treatment in the US, where heavy episodic drinking was reported by 33% of the female and 48% of the male patients among those who consumed alcohol in the last year (74% of the sample) (Satre et al., 2011).

Comparisons with other publications on risky alcohol use in adult psychiatric samples are limited by the variations in the studied samples. The frequencies found in the clinical sample in study I of risky drinking (22% in women and 30% in men) were clearly above frequencies found in the Swedish general population during the study period (15% in women and 21% in men, 2004). This finding was replicated in 2009 in a comparable Swedish psychiatric sample studied by Nehlin Gordh and co-workers, and is also in line with Goulding et al, who reported that "risky drinking is common in psychiatric patients and may lead to difficulties beyond those experienced in the general population" (CAN 2004; Nehlin Gordh et al., 2012; Goulding et al., 2011). The highest frequencies of risky drinking were found in patients with personality disorders, anxiety disorders, and affective disorders.

Prevalence of risky alcohol use in the adolescent sample (Study IV)

The main finding from study IV, based on the cross-sectional sample of adolescent psychiatric emergency unit inpatients, aged 12-17, was that risky alcohol use occurred among 32.8% of the girls and 21.7% of the boys, with a significantly higher prevalence among older adolescent patients. Davies and co-workers mapped risky drinking in adolescents visiting an emergency department in the US, and found risky drinking in 24% of the patients (Davis et al., 2018). Knight et al. screened patients aged 14-18 in hospital-based adolescent primary care, and found risky drinking in 28% of the patients (Knight et al., 2003). Our results indicate at least comparable frequencies of risky alcohol use compared to other clinical samples in the same age group.

It is difficult to compare the frequencies of risky alcohol use found in the present study to rates in adolescents in the general Swedish population. The annual Swedish survey of alcohol habits in school children at ages 15 and 17 years maps how many children reported alcohol use over the past year, and how many reported binge drinking (CAN 2017). This survey uses a different cut-off for binge drinking, and does not map other aspects of risky alcohol use, so no immediately comparable data is available. In the 2017 survey, 40 percent of adolescents aged 15-16 reported use of alcohol during the past year (CAN, 2017). The present study assessed a clinical sample, where 42% of the girls and 39% of the boys reported having used alcohol at some time during the past 12 months. The highest prevalence of risky alcohol drinking in the adolescent sample was found in patients with anxiety disorders and affective disorders. Anxiety and depression have previously been reported to be associated with substance use among adolescents (Schwinn et al., 2010). These groups of patients represent the majority of patients at the studied unit, and the results indicate that screening for risky alcohol is clinically relevant.

Risky alcohol use was present in one-third of the girls and one in five boys. The gender difference may reflect the fact that girls in puberty as a group are ahead of boys in their developmental history, especially in their social development, which in turn is a risk factor for early alcohol use (Ihongbe et al., 2017).

The sex distribution in the adolescent sample was uneven. Slightly more girls than boys were admitted to the emergency ward during the study period. Also, the majority of non-Swedish speaking patients (not eligible) were boys. The study sample therefore consisted of 73 girls (76%) and 23 boys (24%). Patients are normally referred to the ward from the child and adolescent psychiatric outpatient units in the catchment area. In comparison, distribution of gender at the outpatient units was quite even during 2017 (5,222 girls and 4,838 boys), but when analysing data, we see that care offered differs considerably: girls accounted for 41,774 visits, boys accounted for 26,234. This difference seems to indicate that boys at the outpatient units receive less treatment than girls. For adolescents, the latest numbers from the national statistics (2016) highlight that 57% of the patients at CAMHS units in Skåne were boys, and about 43% girls, due to an overrepresentation of boys in the neuropsychiatric diagnostic group (SKL., 2016).

Prevalence and significance of risky alcohol use in the studied samples (Study I and IV)

The present research started out in adult psychiatry, in which the highest prevalence of risky alcohol use was found in the youngest psychiatric patients, indicating earlier start of alcohol use (study I). With these results in mind the research group was looking out for corresponding screening results on adolescent psychiatric patients. As no such data

was available, that gap stimulated the interest to extend this research to include adolescents.

The results from both the adolescent and the adult study demonstrate that risky alcohol use was common and unaddressed. In adolescents, risky alcohol use was at least as common as in the general population, with highest frequencies in the oldest patients (Study IV). In adults, risky alcohol use was significantly more common than in the general population, with highest frequencies in the youngest adults (Study I). Grant and co-workers report on emerging adulthood as an increasingly vulnerable period for AUD onset: "The 12-month rate of 7.1% for severe AUD among 18- to 29-year-old respondents is especially striking. The rate is consistent with the earlier age at onset of severe relative to mild or moderate AUD (23.9 vs 25.9 or 30.1 years, respectively)" (Grant et al., 2015).

In line with this and the other comprehensive epidemiological literature on the subject of comorbidity, it is reasonable to assume that the main reason for the decline of proportion/frequencies of risky alcohol use with increasing age in the adult clinical sample (study I) is that a proportion of those with a previous risky alcohol use have developed AUD. Although treatment for alcohol problems is most effective in the early stages, people rarely seek treatment until their condition is severe, and mental health care providers frequently fail to identify warning signs regarding risky alcohol use that might be opportunities for intervention (Andreasson 2013; Satre et al., 2014; Golding et al., 2011).

Screening for risky alcohol use is a relevant concept, and the negative consequences of unaddressed risky alcohol use in both adolescent and adult populations with comorbid psychiatric conditions are well-documented (Goldning et al. 2011). The response rates of almost 100% in the adolescent and 71% in the adult sample indicate that screening for risky alcohol use is feasible, and not perceived as threatening by the patients; Nielsen and co-workers also concluded that "most patients don't mind being asked about their drinking", (Nielsen et al., 2012). Routine screening for risky alcohol use in psychiatric patients offers an opportunity for a "teaching moment" (Davies et al., 2018). To support informed decision making, all psychiatric care providers today should be prepared to educate both patients (regardless of age), and in adolescents also their guardians on risks with a concurrent risky alcohol use.

There is reason to suggest that risky alcohol use can be identified and treated in a cost-effective way in early stages. Early identification and treatment of AUD in psychiatric patients is associated with better psychiatric, psychosocial and drug-related outcome, and the importance of early detection of risky alcohol use by routine alcohol screening in both adolescents and adults has been emphasised in the literature (Chung et al., 2000; Chung et al., 2000; Kelly et al., 2009; Brown et al., 2000; De Bellis et al., 2000).

Effect of brief intervention on risky alcohol use (Study II)

The main finding of study II, based on a randomised controlled design, was that the brief intervention on risky alcohol use, based on motivational interviewing principles appeared to be effective. Approximately half of the patients who received the intervention regarding their risky alcohol consumption had reduced their consumption to non-risky levels at follow-up six months later.

To our knowledge Paper II was the first to demonstrate that brief alcohol interventions might be effective in general psychiatric populations, and has repeatedly been cited. Since its publication in 2009, several other studies have been published in the field, recently summed up in the review by Boniface and co-workers that included Paper II (Boniface et al., 2018). The authors conclude that the evidence regarding the effects of brief interventions (BI) for alcohol in participants with comorbid mental health conditions overall is mixed: "Where BI was compared with a minimally active control, BI was associated with a significant reduction in alcohol consumption in four out of nine RCTs in common mental disorders and two out of five RCTs in severe mental illness. Where BI was compared with active comparator groups (such as motivational interviewing or cognitive behavioural therapy), findings were also mixed. Differences in the findings may be partly due to differences in study design, such as the intensity of BI and possibly the risk of bias".

Boniface and co-workers point to the need for further well-designed research before this question can be answered more definitively. Their results may appear disappointing at first glance, and might reflect the fact that patients with such co-morbid issues can present with very different clinical features, where several variables regarding the dimensions of the alcohol problem, the psychiatric diagnosis, and other complicating circumstances have to be taken into account.

The Blue App (Study III)

Paper III is a research protocol on the development of the smartphone application The Blue App, including results from the pilot assessing the feasibility of the app. The contents of paper III are mainly discussed under *'Methodological considerations, new technology, Study II, III and IV'*.

The main finding from study III was that substantial resources on different organisational levels were needed for successful development of the new smartphone application. This has been previously discussed regarding the development of new technology for health care, often summarised as the 'fuzzy front end: "The front end begins when the organization recognizes that an idea presents an opportunity, and concludes with an approval or disapproval of the proposed project," (Hüsig et al., 2003; Florén et al., 2012 and 2018). New product development projects frequently

fail, either in the final stage of the development process or in the later commercial stage (Florén et al., 2018). Front end success seems to depend on two conditions: the quality and status of the product definition when it 'leaves' the front end; and the usefulness of the product definition relative to enlightened decision-making about product development (Florén & Frishammar, 2012).

One important factor behind the development process of The Blue App identified in study III was the support given to the project group from all levels in the organisation, from stakeholders to staff, a factor previously reported by Ducker and co-workers (Ducker et al., 2007). Other crucial factors were related to the project group's acceptance in the organisation and to committed team members whose determination continued over several years. The results from study III underline that these factors need to be taken into account when considering development of new technology for health care.

Paper III reports on translational research, often defined as research based on questions raised in the clinic, which form the basis for pre-clinical research and development, with the goal to apply the results in new methods for diagnostics and treatment (Marincola, 2003). According to Marincola, "Translational research should be regarded as a two-way road: Bench to Bedside and Bedside to Bench" (Marincola, 2003).

Conclusions

The overall conclusion was that risky drinking seems to be common in both the adolescent and adult general psychiatric sample; in the adolescent sample at least as common as in the Swedish general population, in the adult sample clearly above frequencies found in the Swedish general population. A brief intervention on risky alcohol use, based on motivational interviewing principles, seems to be effective in adults.

The specific conclusions were:

- Risky alcohol use was prevalent in 22% of the women and 30% of the men in the adult psychiatric outpatient sample, with the highest frequencies of risky and binge drinking in the youngest quartile. The diagnostic groups found to have the highest prevalence of risky alcohol use in the adult sample were affective disorders and personality disorders (**Study I**).
- In the randomised controlled trial, about half of the adult patients who received the brief intervention by telephone regarding their risky alcohol consumption reduced their consumption to non-risky levels at follow-up six months later; and the brief intervention on risky alcohol use, based on motivational interviewing principles appeared to be effective (**Study II**).
- Factors of importance when developing new technology for health care, such as the smartphone application The Blue App, seem to be the support of the project from all levels in the organisation, the quality of the product definition when it 'leaves' the front end, and the usefulness as well as the user-friendliness of the product (**Study III**).
- Risky alcohol use was prevalent in 33% of the girls and 22% of the boys in the adolescent psychiatric inpatient sample, with rates at least as common as in adolescents in the general population. The diagnostic groups found to have the highest prevalence of risky alcohol use in the adolescent sample were anxiety and affective disorder (**Study IV**).

Directions for future research

There is a need for further research on risky alcohol use in psychiatric patients, especially in adolescents, to assess whether the findings from this thesis are replicable.

The adolescent results in this thesis are representative for an emergency unit, and further research on risky alcohol use in adolescent outpatients would be of importance, including mapping of comorbidity and relevant psychosocial factors, and further studies on the effects of brief intervention for risky alcohol use in adolescent psychiatric patients.

Results on the effect of brief interventions for risky alcohol use in adult psychiatric patients are mixed, and further research on this topic is called for. Additional research is needed to further illuminate the effectiveness of psychiatric e-tools, especially when implemented on a broad scale.

Clinical implications

Based on the main findings from this thesis and current knowledge, all psychiatric care providers should be prepared to educate patients on risks relating to a concurrent risky alcohol use, to support informed decision making regardless of their patients' diagnoses. As risky alcohol use often starts in adolescence, this area is relevant for both child and adolescent psychiatry, as well as for adult psychiatry. In adolescents, guardians also need to be informed.

The results warrant extra attention when treating patients within the diagnostic groups with the highest frequencies of risky alcohol use, i.e. mood and anxiety disorders in adolescents, and personality and affective disorders in adults.

The findings in this thesis can be applied in clinical settings to highlight the relevance of the subject, and could help decision makers prioritise. Training for care providers in the field of co-occurrence of alcohol problems in psychiatric patients might increase the probability that the topic is addressed. The findings of this thesis underline the importance of early detection of risky alcohol use by routine screening in both adolescent and adult psychiatric patients. Implemented routine screening for risky alcohol use can be useful for both patients and care providers in addressing the problem.

E-mental health initiatives are ubiquitous, and more are in the pipeline. Although numerous projects are initiated, few make it to a product ready to use. The Blue App has made it to an 'up and running' product. The findings also highlight that public health care organisations would benefit from providing resources to support and coordinate the development of new e-Health initiatives.

Populärvetenskaplig sammanfattning

Introduktion

Psykiatriska sjukdomar är mycket vanliga globalt, och kan drabba oss alla, oavsett socioekonomisk status, etnicitet eller kön. Nya studier visar att psykisk sjukdom och missbruk idag tillsammans utgör den sjukdomsgrupp med tyngst sjukdomsbörda i termer av förlorade levnadsår.

Denna avhandling handlar om riskbruk av alkohol hos psykiatriska patienter. Riskbruk betecknar ett mönster av alkoholanvändande som ännu ej givit skador, men visat sig öka risken att drabbas av negativa konsekvenser i framtiden. Riskbruk av alkohol definieras som konsumtion över en viss mängd/vecka eller som ett skadligt mönster av återkommande berusningsdrickande (binge). För vuxna har gränsen för riskbruk i Sverige satts vid över 9 glas/vecka för kvinnor och över 14 glas/vecka för män, gränsen för riskfylld intensivkonsumtion (binge) ligger på mer än 3 glas för kvinnor, och mer än 4 glas för män vid ett tillfälle. För barn och ungdomar saknas motsvarande värden; först vid 18 års ålder får ungdomar dricka på krogen, och handla själv vid 20 års ålder.

Ett pågående riskbruk av alkohol har i stora befolkningsstudier visat sig vara förknippat med ökad risk för att utveckla ett alkoholberoende, försämrad psykisk hälsa och ökad suicidrisk samt med kroppslig sjukdom som hjärt-kärl- och leversjukdom.

Vid vanlig psykisk sjukdom som exempelvis depression eller ångest verkar ett pågående riskbruk av alkohol även påverka den psykiska sjukdomen och dess behandling på ett negativt sätt. Riskbruk av alkohol har i flera studier kunnat kopplas till försämrad återhämtning och till ökad risk för beroendeutveckling.

Betydelsen av tidig upptäckt av riskabla alkoholvanor och intervention är välbeskrivet i litteraturen i relation till kroppslig sjukdom. Mindre har publicerats om psykiatriska populationer, och då mest avseende patienter med psykossjukdom.

Syftet med denna avhandling ha varit ökad kunskap om riskbruk av alkohol bland allmänpsykiatriska patienter i olika åldrar (ungdomar och vuxna), med fokus på upptäckt, förekomst, och intervention, och även i relation till ny teknik i psykiatrin (e-hälsa). Psykiatrin som medicinsk specialitet lyfts ofta fram som extra lämpad för ny teknik, då psykiatriska diagnoser fortfarande i första hand ställs utifrån information av patient och anhöriga om symtom och beteende som kan inhämtas på distans. Det gäller

även till stor del psykiatrisk behandling, där även det terapeutiska samtalet kan ges på distans.

Det som idag bromsar införandet av ny teknik är till stor del avsaknad av regelverk och prejudikat för patientsäkerhet och finansiering (sammanfattas ofta som ”fuzzy front end”), och att vårdens organisation för införandet av nya metoder ännu bara är under uppbyggnad. En ytterligare aspekt är att det saknas övergripande systematiska valideringar av nya metoder inom psykiatrisk e-hälsa (eMental health).

Studie I

Det första delarbetet är en kartläggning av alkoholvanor och förekomst (prevalens) av riskbruk bland 1,670 vuxna patienter inom allmänpsykiatrisk öppenvård i Lund och Uppsala, som i samband med rutinbesök på mottagningen svarade på två skattningsskalor avseende alkohol (AUDIT) och drogvanor (DUDIT). Patienternas vanligaste diagnoser var (i fallande ordning): depression, ångestsyndrom, anpassningsstörning och personlighetsstörningar. Vi fann att ca 22 % av kvinnorna och ca 30 % av männen uppvisade ett riskbruk, att förekomsten av riskbruk var signifikant vanligare än i normalbefolkningen och att riskbruk var vanligast i den yngsta patientgruppen. Bland kvinnor med riskbruk var andelen med personlighetsstörningar större än bland kvinnor utan riskbruk, för män fanns ingen skillnad i diagnosfördelning mellan män med och utan riskbruk.

Studie II

I det andra delarbetet undersöktes effekten av en kort intervention mot riskfylld alkoholkonsumtion. De 344 patienter som i studie I uppvisade riskbruk av alkohol eller droger erbjöds att delta i en randomiserad kontrollerad studie och slumpades till antingen intervention eller kontroll. Interventionsgruppen erbjöds ett ca 15 min. långt rådgivande och motiverande telefonsamtal och en förnyad skattning av alkoholvanorna ett halvår senare. Kontrollgruppen fick skatta sina alkoholvanor utan rådgivande samtal vid studiestart samt efter ett halvår, och erhöll sin rådgivning därefter. Resultaten visade att båda grupperna reducerade sin alkoholkonsumtion, men reduktionen var signifikant större i interventionsgruppen som fick rådgivning och motiverande samtal tidigt. I den gruppen uppvisade nästan hälften av deltagarna ett icke-riskfyllt alkoholbruk, i kontrollgruppen var motsvarande andel drygt en fjärdedel.

Studie III

Det tredje delarbetet är en metodartikel, som beskriver utvecklingen av en smartphoneapplikation, Blå Appen för barn- och ungdomspsykiatrisk vård. Avsikten med Appen var att förbättra det diagnostiska arbetet genom att datorisera vanliga psykiatriska frågeformulär för att kunna öka användningen av dessa, och därigenom förbättra systematisk psykiatrisk diagnostik. Blå Appen utvecklades i sex steg under en

treårsperiod, där även en mindre pilotstudie genomfördes som visade god acceptans för den systematiska skattningen hos inlagda ungdomar. Resultatet blev Region Skånes första egenutvecklade applikation, Blå Appen, en tekniskt avancerad, användarvänlig smartphone applikation, som uppfyller de krav på säkerhet som ställs på medicinsk-tekniska produkter i offentlig vård idag.

Studie IV

Det fjärde delarbetet är en kartläggning av alkoholvanor inklusive riskbruk bland 96 ungdomar mellan 12-17 år som vårdats inlagda på BUP Skånes regionala barn - och ungdomspsykiatriska akutavdelning i Malmö, och som under inläggningen besvarade två datoriserade frågeformulär avseende alkohol (AUDIT-C) och drogvanor DUDIT) i Blå Appen. De vanligaste diagnoserna var depressioner och ångesttillstånd. Vi fann att ca 33 % av flickorna och ca 22 % av pojkarna uppvisade ett riskbruk av alkohol, en förekomst minst lika vanlig som bland ungdomar i normalbefolkningen. Riskbruk var vanligast bland dem med ångest- och depressionsdiagnoser.

Slutsatser

Riskbruk av alkohol är vanligt både bland ungdomar och vuxna med psykiatrisk sjukdom. En kort intervention mot riskbruk baserad på motiverande samtalsmetoden var effektiv för vuxna med psykiatrisk sjukdom.

I arbete II (telefonintervention), III (utveckling av smartphone applikation) och IV (screening med datoriserade skattningsskalor) används ny teknik, som accepterades väl av patienter och vårdgivare, och var tidsbesparande. Framgångsfaktorer för utveckling av nya e-hälsolösningar som identifierades i studie III var stöd till projektet på alla nivåer i sjukvårdsorganisationen, och applikationens kvalitet och användbarhet.

Tillämpning av resultaten i kliniken

Baserat på att riskbruk av alkohol är vanligt bland psykiatriska patienter, och att det utgör en riskfaktor för komplicerande samsjuklighet behöver psykiatriska patienter oavsett ålder eller diagnos av vårdgivare få kännedom om riskerna med ett samtidigt riskbruk av alkohol. Först då ges patienterna möjlighet till delaktighet och ett grundat ställningstagande i denna fråga. Även föräldrar till ungdomar behöver informeras. Riskbruk av alkohol börjar ofta i ungdomen, varför ämnet är relevant för både barn- och ungdomspsykiatrin och för vuxenpsykiatrin.

Populärwissenschaftliche Zusammenfassung

Einführung

Psychiatrische Erkrankungen sind weltweit verbreitet und können uns alle betreffen, unabhängig von sozioökonomischem Status, ethnischer Zugehörigkeit oder Geschlecht. Neuere Studien zeigen, dass Geisteskrankheit und Sucht heute zusammen die Krankheitsgruppe mit der größten Krankheitslast in Bezug auf verlorene Lebensjahre darstellen.

Diese Doktorarbeit befasst sich mit problematischem Alkoholkonsum von psychiatrischen Patienten. Ein problematischer Alkoholkonsum beschreibt ein Muster des Alkoholkonsums, das noch keine Schäden verursacht hat, aber das Risiko negativer Konsequenzen in der Zukunft erhöht.

Problematischer Alkoholkonsum wird definiert als Konsum über eine bestimmte Menge pro Woche, oder/und als ein Muster von wiederkehrendem Rauschtrinken. Für Erwachsene liegt die Grenze heute in Schweden bei mehr als neun Standardgetränken pro Woche für Frauen und mehr als 14 Standardgetränken pro Woche für Männer; die Grenze für Rauschtrinken (Binge) liegt bei mehr als drei Standardgetränken für Frauen und mehr als vier Standard-Drinks für Männer je Gelegenheit. Für Kinder und Jugendliche gibt es keine entsprechenden Grenzwerte; erst ab dem Alter von 18 Jahren dürfen junge Leute in Schweden in der Kneipe trinken und erst ab 20 Jahren selber Alkohol kaufen.

In großen Bevölkerungsstudien hat man zeigen können, dass problematischer Alkoholkonsum mit einem erhöhten Risiko für die Entwicklung einer Alkoholabhängigkeit, mit einer Beeinträchtigung der psychischen Gesundheit und mit einem erhöhten Selbstmordrisiko sowie körperlichen Erkrankungen wie Herz-Kreislauf- und Lebererkrankungen einhergeht.

Bei häufig vorkommenden psychischen Erkrankungen wie z.B. Depressionen wirkt sich ein anhaltender problematischer Alkoholkonsum besonders negativ auf die psychische Erkrankung und deren Behandlung aus. Wiederholt wurde in wissenschaftlichen Studien gezeigt, dass bei psychiatrischen Patienten mit Depressionen oder Angstzuständen ein problematischer Alkoholkonsum zu verlangsamter Genesung führt

und außerdem mit einem erhöhten Risiko, eine Alkoholabhängigkeit zu entwickeln, in Verbindung gebracht wird.

Die Bedeutung der Früherkennung von und Intervention bei problematischem Alkoholkonsum ist in der Literatur, was körperliche Krankheiten betrifft, ausführlich beschrieben worden. Über Bevölkerungsgruppen mit psychiatrischen Krankheiten wurde in diesem Zusammenhang weniger veröffentlicht, davon hauptsächlich Psychosen betreffend.

Ziel dieser Dissertation ist es, den Kenntnisstand über Risiken mit problematischem Alkoholkonsum für psychiatrische Patienten unterschiedlichen Alters (Jugendliche und Erwachsene) zu erhöhen, wobei der Schwerpunkt der Arbeit auf der Früherkennung, Prävalenz, und Intervention liegt. Ein Teil der Arbeit fokussiert darauf, wie neue Technologie in der Psychiatrie (E-Health) verwendet werden kann. Psychiatrie als medizinische Spezialität wird oft als besonders geeignet für neue Technologien hervorgehoben, da psychiatrische Diagnosen immer noch hauptsächlich auf Patienten- und Familieninformationen über Symptome und Verhaltensweisen basieren, die teilweise auch über eine Distanz untersucht/besprochen werden können. Dies trifft auch weitgehend auf die psychiatrische Behandlung zu, bei der das therapeutische Gespräch auch über eine räumliche Entfernung erfolgen kann.

Was derzeit die Einführung neuer Technologien im öffentlichen Gesundheitswesen hemmt, ist weitgehend das Fehlen von Vorschriften und Präzedenzfällen für Patientensicherheit und -finanzierung (oft als "Fuzzy Front End“ bezeichnet). Die Organisation der Einführung neuer Methoden im öffentlichen Gesundheitswesen befindet sich weitgehend im Aufbau. Ein weiterer Aspekt ist, dass es bisher kaum umfassende systematische Auswertungen neuer technischer Methoden in der Psychiatrie gibt.

Studie I

Der erste Teil meiner Doktorarbeit ist eine Untersuchung der Alkoholgewohnheiten inklusive des problematischen Alkoholkonsums bei 1.670 erwachsenen Patienten der allgemeinpsychiatrischen ambulanten Kliniken in Lund und Uppsala. Während des Termins in der Klinik haben die Studienteilnehmer zwei Fragebögen über Alkohol- (AUDIT) und Drogengewohnheiten (DUDIT) ausgefüllt. Die häufigsten Diagnosen der Patienten waren (in fallender Reihenfolge): Depression, Angststörung, Anpassungsstörung und Persönlichkeitsstörungen. Wir fanden heraus, dass etwa 22% der Frauen und etwa 30% der Männer einen problematischen Alkoholkonsum aufwiesen, dass problematischer Alkoholkonsum signifikant häufiger vorkam als in der Normalbevölkerung und in der jüngsten Patientengruppe am häufigsten auftrat.

Studie II

In der zweiten Studie wurde der Effekt einer kurzen Intervention gegen problematischen Alkoholkonsum untersucht. Den 344 Patienten, die in Studie I einen problematischen Alkoholkonsum hatten, wurde angeboten, an einer randomisierten kontrollierten Studie teilzunehmen. Die Interventionsgruppe erhielt ein ca. 15 Minuten langes, beratendes und motivierendes Telefongespräch und nach sechs Monaten eine erneute Untersuchung der Alkoholgewohnheiten. Die Kontrollgruppe gab ihre Trinkgewohnheiten zu Beginn der Studie und nach sechs Monaten ohne Beratungsgespräche an und erhielt erst anschließend ihre Beratung. Die Ergebnisse zeigten, dass beide Gruppen ihren Alkoholkonsum reduzierten, die Reduktion war jedoch signifikant grösser in der Interventionsgruppe, die frühzeitig einen Beratungs- und Motivationsanruf erhielt. In dieser Gruppe zeigte am Ende nahezu die Hälfte der Teilnehmer einen unproblematischen Alkoholkonsum, in der Kontrollgruppe lag der entsprechende Anteil bei etwas über einem Viertel.

Studie III

Die dritte wissenschaftliche Arbeit beschreibt die Entwicklung einer Smartphone-Applikation, „The Blue App", für verbesserte Diagnostik in der psychiatrischen Betreuung von Kindern und Jugendlichen. Der Zweck der App bestand darin, die Diagnosearbeit zu verbessern, indem häufig verwendete psychiatrische Fragebögen computerisiert wurden, um dadurch eine systematischere psychiatrische Diagnostik zu fördern. Die Blue App wurde über einen Zeitraum von drei Jahren in sechs Phasen entwickelt, wobei auch eine kleinere Pilotstudie durchgeführt wurde, die eine gute Akzeptanz für computerisierten Fragebögen bei den teilnehmenden Jugendlichen zeigte. Das Ergebnis der dritten Studie war die erste eigenentwickelte, technologisch fortschrittliche, benutzerfreundliche Smartphone-Applikation des öffentlichen Gesundheitswesens in Südschweden (Region Skåne), die die gegenwärtigen Anforderungen an die Sicherheit von medizintechnischen Produkten im öffentlichen Gesundheitswesen erfüllt.

Studie IV

Die vierte wissenschaftliche Arbeit ist eine Untersuchung der Alkoholgewohnheiten inklusive des problematischen Alkoholkonsums bei 96 jungen Menschen zwischen 12 und 17 Jahren, die während ihres stationären Aufenthaltes auf der kinder- und jugendpsychiatrischen Notaufnahmestation in Malmö zwei computerisierte Fragebögen bezüglich Alkohol- (AUDIT-C) und Drogengewohnheiten (DUDIT) mit der Blue App beantworteten. Die häufigsten Diagnosen waren Depressionen und Angststörungen. Wir kamen zu dem Ergebnis, dass etwa 33% der jungen Frauen und etwa 22% der jungen Männer einen problematischen Alkoholkonsum beschrieben, damit kam problematischer Alkoholkonsum mindestens so häufig vor wie bei den Jugendlichen in der Normalbevölkerung.

Schlussfolgerungen

Problematischer Alkoholkonsum erwies sich sowohl bei Jugendlichen als auch bei Erwachsenen mit psychiatrischen Erkrankungen als häufig vorkommend. Ein kurzes beratendes und motivierendes Telefongespräch war für Erwachsene mit psychiatrischen Erkrankungen wirksam.

In drei der Studien wurden neue Technologien verwendet (Studie II-Telefonintervention, Studie III-Smartphone-Entwicklung, Studie IV-computergestützte Frageformulare), die von Patienten und Pflegepersonal gut angenommen und als zeitsparend empfunden wurden. Erfolgsfaktoren für die Entwicklung neuer E-Health-Lösungen, die in Studie III identifiziert wurden, waren die Unterstützung des Projekts auf allen Ebenen der Gesundheitsorganisation sowie die Qualität und Benutzerfreundlichkeit der Lösung.

Anwendung der Ergebnisse in der Klinik

Da problematischer Alkoholkonsum bei psychiatrischen Patienten unabhängig von Alter oder Diagnose häufig vorkommt und einen Risikofaktor für Komplikationen ausmacht, müssen psychiatrische Patienten über diese Risiken, die für sie mit dem Alkoholkonsum verbunden sind von ihrem Arzt oder Therapeuten informiert werden. Nur dann bekommen Patienten die Möglichkeit einer fundierten Stellungnahme. Auch die Eltern junger Patienten müssen informiert werden.

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Appendix – Questionnaires

Alcohol screening questionnaire (AUDIT)

Drinking alcohol can affect your health and some medications you may take. Please help us provide you with the best medical care by answering the questions below.

One drink equals:  12 oz. beer  5 oz. wine  1.5 oz. liquor (one shot)

1. How often do you have a drink containing alcohol?	Never	Monthly or less	Two to four times a month	Two to three times a week	Four or more times a week
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	Zero to two	Three or four	Five or six	Seven to nine	Ten or more
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
4. How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
5. How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
7. How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
8. How often during the last year have you been unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
9. Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, in the last year
10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, in the last year
	0	1	2	3	4

Id. nr. ☐☐☐☐☐☐

DUDIT Drug Use Disorders Identification Test

Here are a few questions about drugs. Please answer as correctly and honestly as possible by indicating which answer is right for you.

☐ Man ☐ Woman Age ☐☐

1. How often do you use drugs other than alcohol? (See list of drugs on back side.)	Never ☐	Once a month or less often ☐	2-4 times a month ☐	2-3 times a week ☐	4 times a week or more often ☐
2. Do you use more than one type of drug on the same occasion?	Never ☐	Once a month or less often ☐	2-4 times a month ☐	2-3 times a week ☐	4 times a week or more often ☐
3. How many times do you take drugs on a typical day when you use drugs?	0 ☐	1-2 ☐	3-4 ☐	5-6 ☐	7 or more ☐
4. How often are you influenced heavily by drugs?	Never ☐	Less often than once a month ☐	Every month ☐	Every week ☐	Daily or almost every day ☐
5. Over the past year, have you felt that your longing for drugs was so strong that you could not resist it?	Never ☐	Less often than once a month ☐	Every month ☐	Every week ☐	Daily or almost every day ☐
6. Has it happened, over the past year, that you have not been able to stop taking drugs once you started?	Never ☐	Less often than once a month ☐	Every month ☐	Every week ☐	Daily or almost every day ☐
7. How often over the past year have you taken drugs and then neglected to do something you should have done?	Never ☐	Less often than once a month ☐	Every month ☐	Every week ☐	Daily or almost every day ☐
8. How often over the past year have you needed to take a drug the morning after heavy drug use the day before?	Never ☐	Less often than once a month ☐	Every month ☐	Every week ☐	Daily or almost every day ☐
9. How often over the past year have you had guilt feelings or a bad conscience because you used drugs?	Never ☐	Less often than once a month ☐	Every month ☐	Every week ☐	Daily or almost every day ☐
10. Have you or anyone else been hurt (mentally or physically) because you used drugs?		No ☐	Yes, but not over the past year ☐		Yes, over the past year ☐
11. Has a relative or a friend, a doctor or a nurse, or anyone else, been worried about your drug use or said to you that you should stop using drugs?		No ☐	Yes, but not over the past year ☐		Yes, over the past year ☐

Turn the page to see the list of drugs

LIST OF DRUGS

(Note! Not alcohol!)

Cannabis	Amphetamines	Cocaine	Opiates	Hallucinogens	Solvents/inhalants	GHB and others
Marijuana Hash Hash oil	Methamphetamine Phenmetraline Khat Betel nut Ritaline (Methylphenidate)	Crack Freebase Coca leaves	Smoked heroin Heroin Opium	Ecstasy LSD (Lisergic acid) Mescaline Peyote PCP, angel dust (Phencyclidine) Psilocybin DMT (Dimethyltryptamine)	Thinner Trichlorethylene Gasoline/petrol Gas Solution Glue	GHB Anabolic steroids Laughing gas (Halothane) Amyl nitrate (Poppers) Anticholinergic compounds

PILLS – MEDICINES

Pills count as drugs when you take

- more of them or take them more often than the doctor has prescribed for you
- pills because you want to have fun, feel good, get "high", or wonder what sort of effect they have on you
- pills that you have received from a relative or a friend
- pills that you have bought on the "black market" or stolen

SLEEPING PILLS/SEDATIVES

Alprazolam	Glutethimide	Rohypnol
Amobarbital	Halcion	Secobarbital
Apodorm	Heminevrin	Sobril
Apozepam	Iktorivil	Sonata
Aprobarbital	Imovane	Stesolid
Butabarbital	Mephobarbital	Stilnoct
Butalbital	Meprobamate	Talbutal
Chloral hydrate	Methaqualone	Temesta
Diazepam	Methohexital	Thiamyal
Dormicum	Mogadon	Thiopental
Ethcholorvynol	Nitrazepam	Triazolam
Fenemal	Oxascand	Xanor
Flunitrazepam	Pentobarbital	Zopiklon
Fluscand	Phenobarbital	

PAINKILLERS

Actiq	Durogesic	OxyNorm
Coccilana-Etyfin	Fentanyl	Panocod
Citodon	Ketodur	Panocod forte
Citodon forte	Ketogan	Paraflex comp
Dexodon	Kodein	Somadril
Depolan	Maxidon	Spasmofen
Dexofen	Metadon	Subutex
Dilaudid	Morfin	Temgesic
Distalgesic	Nobligan	Tiparol
Dolcontin	Norflex	Tradolan
Doleron	Norgesic	Tramadul
Dolotard	Opidol	Treo comp
Doloxene	OxyContin	

Pills do NOT count as drugs if they have been prescribed by a doctor and you take them in the prescribed dosage.

AUDIT-C ASSESSMENT TOOL

The AUDIT-C assessment tool[i] can be used to provide a quick assessment of how much and often a woman is drinking alcohol. AUDIT-C is the first three questions of the longer AUDIT tool, which is a more comprehensive assessment of problem drinking. Both tools are internationally recognised and widely used.

Questions	0	1	2	3	4	Score
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week	
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
					Total	

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Risky Alcohol Use in Adolescent and Adult Psychiatric Patients

This is a thesis on risky alcohol use in psychiatric patients of different age groups, with focus on detection, prevalence and intervention, and on the use of new technologies.

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