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## **Sleep, Sense of Coherence and Suicidality in Suicide Attempters**

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Sleep, Sense of Coherence and Suicidality in Suicide Attempters  
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*To my family*



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## ABSTRACT

A suicide attempt is a strong predictor of future suicide. The management of patients who self-harm presents a challenge for psychiatric services. It is therefore important to identify factors that may be related to increased risk of suicidal behaviour in suicide attempters. The current study aimed to examine the prevalence of specific sleep disturbances in suicide attempters and possible associations between sleep disturbances (including nightmares) and suicidal behaviour. A second focus was to test associations between sense of coherence and suicidality. Further, we tested whether Suicide Assessment Scale (SUAS) predicted repeat attempt.

The study included 165 suicide attempt patients aged 18 – 69 years who were admitted to medical/psychiatric wards at Sahlgrenska University Hospital completed an initial clinical interview including self-report instruments assessing sleep complaints (Uppsala Sleep Inventory), depression/anxiety symptom intensity (CPRS Self-rating Scale for Affective Symptoms) and the individual's capacity to manage stress and stay well (Sense of Coherence Questionnaire). Ninety-eight patients took part in a 2 month follow-up interview. Data concerning repeat suicide attempts were obtained from hospital case records.

We found that 89 % of the subjects reported some kind of sleep disturbance. The most common complaint was difficulties initiating sleep (73 %) followed by difficulties maintaining sleep (69 %) and early morning awakening (58 %). Sixty-six percent reported nightmares. Persistent frequent nightmares were associated with risk for persistent suicidality and repeat attempt. SOC was associated with suicidality at follow-up, but we could not show an association with repeat attempt. The ability of the SUAS to predict repeat suicidal behaviour in the entire study group was low but the instrument performed better in the subgroup who reported ongoing psychiatric treatment at 2 month follow-up.

Questions regarding sleep disturbances and nightmares could be addressed in the clinical evaluation, care and treatment of suicidal patients. SOC may be a tool to facilitate and deepen the dialogue between the psychiatric nurse and the suicidal patient. Our data provide further support for the use of the SUAS as a complementary tool in the assessment of psychiatric patients after a suicide attempt.

*Keywords:* Suicidality, repeat suicide attempt, sleep, nightmares, sense of coherence

## LIST OF ORIGINAL PAPERS

This thesis is based on the following papers, identified in the text by their Roman numerals:

- I Sjöström N, Waern M, Hetta J. Nightmares and sleep disturbances in relation to suicidality in suicide attempters.  
*Sleep* 2007;30:91-95.
- II Sjöström N, Hetta J, Waern M. Persistent nightmares are associated with repeat suicide attempt. A prospective study.  
*Psychiatry Research* 2008, *in press*.
- III Sjöström N, Hetta J, Waern M. Sense of coherence and suicidality in suicide attempters. A prospective study.  
*Journal of Advanced Nursing*, *submitted*.
- IV Waern M, Sjöström N, Marlow T, Hetta J. Does the suicide assessment scale predict risk of repetition? A prospective study of suicide attempters at a hospital emergency department.  
*In manuscript*.

## CONTENTS

<b>ABSTRACT</b>	5
<b>LIST OF ORIGINAL PAPERS</b>	6
<b>ABBREVIATIONS</b>	9
<b>INTRODUCTION</b>	11
Suicidal behaviour	11
The suicidal process	11
Suicide risk	12
Assessment of suicide risk	14
Sleep	14
Nightmares and their associations to suicide risk	15
Nursing and Sense of coherence (SOC)	16
Prevention	17
<b>THE CURRENT STUDY</b>	19
Overall aim	19
Aims	19
<b>MATERIALS AND METHODS</b>	20
Participants	20
Study design	22
Assessments	22
Psychiatric disorders (Papers I-IV)	22
Suicidality (Paper I, III-IV)	22
Psychiatric symptoms (Papers I-IV)	23
Sleep disturbances (Papers I-II)	24
Sense of coherence (Paper III)	24
Ethics	24
Statistical analyses	25
Paper I	25
Paper II	25
Paper III	25
Paper IV	25

<b>RESULTS</b>	27
Paper I	27
Paper II	28
Paper III	30
Paper IV	31
<b>DISCUSSION</b>	33
Main findings	33
Paper I	33
Paper II	33
Paper III	33
Paper IV	33
Strengths	35
Limitations	35
<b>CONCLUSIONS</b>	37
Clinical implicatio (Messages to the clinicians)	37
Further research	37
<b>POPULÄR VETENSKAPLIG SAMMANFATTNING</b>	38
<b>ACKNOWLEDGEMENTS</b>	41
<b>REFERENCES</b>	42
<b>PAPER I-IV</b>	



## ABBREVIATIONS

AUC	Area Under Curve
CPRS	Comprehensive Psychopathological Rating Scale
CPRS-S-A	CPRS Self-rating Scale for Affective Syndromes
DSM-IV	Diagnostic and statistical manual of mental disorders, fourth edition
EEG	Electroencephalography
EOG	Electro-oculography
EMG	Electromyography
GRR	General Resistance Resources
NBHW	National Board of Health and Welfare
NASP	National Prevention of Suicide and Mental-Ill-Health at Karolinska Institutet and Stockholm County Council's Centre for Suicide Research and Prevention of Mental Ill-health
NREM	Non-Rapid Eye Movement sleep
REM	Rapid Eye Movement sleep
ROC	Receiver Operating Curve
SCID-I	Structure Clinical Interview for DSM-IV
SNIPH	The Swedish National Institute of Public Health
SOC	Sense of Coherence
SUAS	Suicide Assessment Scale
USI	Uppsala Sleep Inventory



## INTRODUCTION

About 20 – 40 % Swedes report that they have mental problems (NBHW 2005), and it is estimated that 10 - 15 % of these need psychiatric care. Suicidal behaviour is a common complication of psychiatric disorders (Kapur et al. 2006, Tidemalm et al. 2008) and suicide is the leading cause of death in Sweden in young adults (NASP 2007). About 90 % of those who die by suicide have a psychiatric disorder (Mann et al. 2005). Every day about 4 persons die by suicide in Sweden (NBHW 2006) and the suicide rate for Sweden in the year 2004 was 18.7/100.000. That suicide rate places Sweden at an intermediate level in a European perspective.

Suicide attempt and other self inflicted injuries are about 10 – 15 times more common than completed suicide in men and 15 – 20 times more common in women (NBHW 2005). The latest official figures (2005 – 2007) show that about 5 % of women made one or more suicide attempts every year compared to 3 % among men (SNIPH 2007). Follow-up studies in Sweden show that between 6 – 13 % of persons who have made a suicide attempt die by suicide within 10 years (Cullberg et al. 1988, Nordstrom et al. 1995, Johnsson Fridell et al. 1996). About 50 % of those completed the suicide within one year (Nordstrom et al. 1995, Johnsson Fridell et al. 1996). In the WHO/EURO Multicentre Study on Parasuicide it was found that more than 50 % of suicide attempters make repeats and about 20 % of the second attempts are made within 12 months after the first attempt (Schmidtke et al. 1996). Suicidal thoughts are quite usual. Every year during 2005 – 2007 about 15 % of the women and 10 % of the men had suicidal thoughts at least once (SNIPH 2007). However, there were significant differences between the genders.

### **Suicidal behaviour**

Completed suicide and suicide attempt is expressed as a manifestation of an intrapsychic conflict (Wolk-Wasserman 1986). Besides that external circumstances play a part in the suicidal process. By definition suicide is a deliberate act (Wasserman 2001). It has been defined as a conscious, deliberate life threatening action which leads to death. If a person survives it is recorded as a suicide attempt. A suicide attempt is a life-threatening or apparently life-threatening action with the intention to die, but that does not lead to death. Often, completed suicide and/or suicide attempt is preceded by suicidal thoughts. Suicidal thoughts include fantasies, thoughts, wishes and impulses to commit suicide. In order to cover suicidal thoughts, suicide attempt and completed suicide Pokorny introduced the comprehensive term suicidal behaviour (Pokorny 1974).

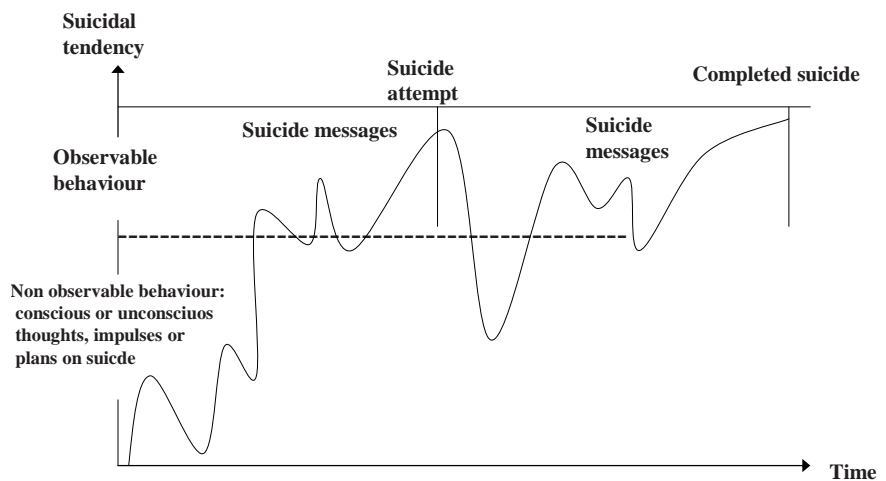
### **The suicidal process**

Completed suicide and suicide attempt have a suicidal process and involving complex causes with no simple explanation (Beskow 1979). The suicidal process is characterized by the development from the first serious suicidal thought to possible suicide attempt to possible completed suicide (Figure 1). The term emphasizes the development over time. Most patients with psychiatric disorder do not commit suicide, but

some are vulnerable to suicidal behaviour. From that starting point Mann developed the stress-diathesis model (Mann 1998). According to that model stress is linked to acute phenomena including psychiatric/somatic illness and family/social stress. The diathesis is linked to chronic phenomena including genetic, chronic illness, and early life experience.

Bertolote and colleagues conducted a study on suicidal thoughts, plans and attempts in 10 different countries with diverse cultures (Bertolote et al. 2005). They found that the prevalence of suicidal thoughts, plans and attempted suicide varied among the studied countries and concluded that the suicidal process seemed to be dependent of the culture background and that further investigations were needed to reveal characteristics and risk factors in the different cultures. Runeson et al found that there is often a verbal or non-verbal suicidal communication during the suicidal process and the time from the start to completed suicide varies by sex (Runeson et al. 1996). They also found that in young people different diagnostic groups differ in time from the first suicidal communication to completed suicide. Those who were diagnosed as to have schizophrenia had a median interval of 47 months, borderline personality disorder 30 months, major depression 3 months and adjustment disorder <1 month. Paykel and colleagues have developed a questionnaire to capture the increasing severity of the suicidal process (feelings that life is not worth living, death wishes, thoughts of taken one's life, seriously considering taking one's life and suicide) (Paykel et al. 1974).

### The suicidal process



Sources: Socialstyrelsen - Vårdprogramnämnden 1983, Beskow 1979

Figure 1.

### Suicide risk

There are several risk factors that predict suicide attempt/completed suicide. No single risk factor is sufficient to predict future suicidal behaviour (Oquendo et al. 2006). It is known that suicide attempt is the strongest risk factor for future completed sui-

cide (Leon et al. 1990). There are also demographic risk factors, for example male sex (Hawton and Fagg 1988, Ekeberg et al. 1991), divorced, widow/widower (Yip and Thorburn 2004) and unemployment (Agerbo 2007). Risk factors for suicide are described by The National Board of Health and Welfare in Sweden in their proposal to national strategy for suicide prevention (NBHW 2006). Risk factors included psychiatric diseases, biological or genetic factors/traits, life events, psychological factors and social and environmental factors (including availability of the means of suicide). The program also stresses the importance of suicide risk assessment.

However, most suicide attempts and completed suicide occur in the context of a current psychiatric disorder (Lonnqvist et al. 1995, Rich and Runeson 1995). People who make non-fatal self-harm have increased risk for suicide (Owens et al. 2002). Suicide attempters differ from non-attempters with the same psychiatric disorder in so far that attempters experience more subjective depression and hopelessness (Mann et al. 1999). Interpersonal conflicts (Romanov et al. 1996) and fewer reasons for living (Mann et al. 1999, Lizardi et al. 2007) and poor problem-solving resources (Pollock and Williams 2004) are other psychological factors associated with suicidal behaviour. Negative life events have been found to precede suicide (Heikkinen et al. 1994, Heikkinen et al. 1995, Isometsa et al. 1995) and have impact on suicide intent in women (Crane et al. 2007).

Since the sixties it is known that an altered function of serotonin (5-HT) (Shaw et al. 1967) and 5-hydroxyindoleacetic acid (5-HIAA) (Bourne et al. 1968) is involved in suicide. The first report to show an association between low CSF 5-HIAA and suicide attempt was published in the mid-seventies (Asberg et al. 1976). This association has been confirmed in several later studies (Asberg 1997). In a review conducted by Träskman-Bendz and associates it was concluded that besides the association between low 5-HIAA and suicide attempt there is an association between low concentrations of the dopamine metabolite Homo Vanillic Acid (HVA) and suicidality (Traskman-Bendz et al. 1989). They also found that pathological dexamethasone-test may indicate an increased suicide risk in those patients. High Suicide Assessment Scale (SUAS) score has been found to correlate with nonsuppression of cortisol (Westrin and Nimeus 2003).

In a study of suicide attempters with major depression and adjustment disorders a negative association was observed between suicidal intent and cortisol (post dexamethasone suppression test) in patients with major depression (Lindqvist et al. 2008). It has also been found that suicide attempters who have experienced sexual abuse in childhood and adolescence have higher levels of the biological stress markers 3-Methoxy-4-hydroxyphenylglycole (MHPG) in cerebrospinal fluid (CSF) and Urine-Noradrenalin/Adrenalin (U-NA/A), while feelings of neglect were associated with low 24 h Urine-cortisol (Sunnqvist et al. 2008).

Sleep disturbances (Fawcett et al. 1990) and nightmares (Tanskanen et al. 2001) have been found to predict future suicide. Global or partial insomnia has been shown to predict suicidal behaviour (Hall and Platt 1999). Nightmares have been found to be associated with suicidal behaviour in adolescents (Liu 2004) and in an adult psychiatric outpatient population (Bernert et al. 2005).

As mentioned above there are many factors that increase the risk for future suicidal behaviour. However, most persons with the above risk factors do not make suicide attempts or die by completed suicide. That fact makes it very difficult to predict non-fatal or fatal suicidal behaviour.

### **Assessment of suicide risk**

Hunt and colleagues found that the first weeks after discharge from psychiatric units constitute a high risk period for suicide (Hunt et al. 2008). However, although suicidal behaviour is associated with increased relative suicide risk most persons with suicidal thoughts will not die by suicide (APA 2003). According to the American Psychiatric Association guidelines, the most important element in the suicide assessment is accurate psychiatric evaluation. Information about overall psychiatric and somatic history and current mental state (e.g. questioning about suicidal behaviour, self-rating symptom burden and sleep complaints) is important to obtain during the evaluation. The obtained information facilitates the identification of factors that influence the risk for suicidal behaviour, which can be utilized to determine the appropriate setting for immediate safety and the most appropriate setting for treatment. Further, it enables accurate diagnostics and planning of treatment. There are some symptom scales with single items that assess suicidality including the Hamilton Depression Rating Scale - HDRS (Hamilton 1960), the Comprehensive Psychopathological Rating Scale - CPRS (Asberg et al. 1978) and the Beck Depression Inventory – BDI (Beck 1961). Other scales have been developed specifically to assess suicidality. Examples include the Suicide Intent Scale (Beck 1974), the Scale for Suicidal Ideation (Beck et al. 1979) and the Suicide Assessment Scale (Stanley et al. 1986, Nimeus et al. 2000). The Swedish version of the SUAS scale has recently been modified (Nimeus et al. 2006). In connection with the modification a self-rating version (SUAS-S) was developed. Both the modified scale and the self-rating version were found to be reliable and valid. The scales have been developed to facilitate assessment of suicide risk. The suicide assessment scales lack the necessary clinical predictive validity, which means they can not be used to predict acute suicide risk in the clinical setting (APA 2003). That implies that it is difficult to use those scales as predictive instruments, but they can be an aid in the suicide assessment.

### **Sleep**

Sleep is a basic biological need, of importance for rest and recovery. When we fall asleep we gradually go to a relaxed state with calmer breathing, decreasing heart rate and decreasing body temperature. By the use of polysomnographic recordings (EEG, EOG and EMG) it is shown that sleep has different stages and sleep cycles. Humans have 3-5 sleep cycles during the night. Five distinct sleep stages have been indentified: four stages of non-rapid eye movement (NREM) and one stage of sleep rapid eye movement (REM) sleep. Stage 1 of NREM sleep is a transition from wakefulness to sleep and occupies about 5 % of the time spent in sleep. Stage 2 is characterized by specific EEG wave forms and occupies about 50 % of the time spent in sleep. Stages 3-4 also known as slow-wave sleep are the deepest sleep levels, comprising about 10 – 20 % of the sleeping time. REM sleep, in which the majority of story-like dreams occur, occupies about 20 - 25 % of the total sleep.

DSM-IV divides sleep disorders in four main categories: primary sleep disorders, those related to a psychiatric disorder, those due to a general medical condition, and substance-induced sleep disorders (DSM-IV 1994). Dyssomnias are primary disorders characterized by difficulties initiating or maintaining sleep or of excessive sleepiness. Examples of dysomnias are primary insomnia and primary hypersomnia. According to DSM-IV primary insomnia involves complaints of difficulties initiating or maintaining sleep or nonrestorative sleep during at least a month. The disturbance leads to clinical impairment in social or occupational functioning. In a study conducted by Broman and colleagues the prevalence of difficulties initiating sleep was 4.6 %, difficulties maintaining sleep 7.5 % and early morning awakening 8.7 % in a normal population (Broman et al. 1996).

Primary hypersomnia is prolonged sleep episodes (8 – 12 hours) or daytime sleep episodes of which last at least one month leading to clinically impairment in social or occupational functioning. The prevalence of primary hypersomnia in a normal population is approximately 5- 10 % according to DSM-IV.

### **Nightmares and their associations to suicide risk**

In a normal population about 5 % complain that they have frequent nightmares (Janson et al. 1996). Nightmares occur in REM sleep during the second half of the sleep period. They are frightening dreams usually involving threats to survival, security or self-esteem. The person wakes and remembers the dreams. When the person wakes up he is wide awake and experiences discomfort and sometimes anxiety. Nightmare disorder is characterized by the occurrence of frightening dreams that lead to awakening, and the individual is fully alert and oriented upon awakening. The frightening dreams cause distress and/or result in social or occupational stress (DSM-IV 1994). The disorder is not diagnosed if the nightmares occur only during the course of another psychiatric disorder or are due to the effect of a substance. Nightmare disorder differs from sleep terror disorder. Sleep terror occurs in non-REM sleep. It occurs most often in young children during the first hours of sleep and is characterized of confusion with no dream content. The child does not remember the episode the next morning.

Disturbed REM sleep may increase frequency of nightmares. It has been shown that disturbed REM sleep (Agargun and Cartwright 2003) and frequent nightmares is associated with suicidal behaviour in depressed patients (Agargun et al. 1998). Similarly, an association between disturbed REM sleep and suicidal behaviour has been reported in psychotic patients (Keshavan et al. 1994). A deficient serotonergic system causes disturbed REM sleep and is involved in suicidal behaviour in several psychiatric disorders (Singareddy and Balon 2001). It is possible that nightmares influence suicidality by means of altered serotonergic neurotransmission. A lowered inhibition of aggression may also constitute a common mechanism for suicidality, frequent nightmares and serotonergic hypoactivity.

Among patients with Dissociative Disorder, those with Nightmare Disorder have a higher rate of self-mutilative behaviour and a history of suicide attempt during the last year than those without Nightmare Disorder (Agargun et al. 2003). Suicidal patients have more death content and destructive violence in their dreams (Firth et al. 1986).

Ohayon and colleagues have found that there is a high rate of psychiatric disorders in an adult insomniac population with frequent nightmares (Ohayon et al. 1997). An association between negative dream content and depressed mood in the morning in patients with depression has been observed (Besiroglu et al. 2005). Dream material in depressive patients who are suicidal have been found to include themes of revenge, punishment, and self-disintegration (Maltzberger 1993). In a twin study conducted by Hublin and colleagues a genetic disposition to nightmares both in childhood and in adulthood was reported (Hublin et al. 1999). The authors also found an association between frequent nightmares and serious psychiatric disorder.

### **Nursing and Sense of coherence (SOC)**

According to Stuart and Laraia psychiatric nursing can be seen as an interpersonal process between the nurse and the patient that promotes and/or maintains social functioning in daily life (Stuart and Laraia 2005). The authors state that the psychiatric nurse shall protect the suicidal patient from self-harm, provide safety, increase self-esteem, help the patient to regulate emotions and behaviour, mobilize social support and educate the patient. The provision of safe and compassionate care has been identified as a core component in the nursing care of suicidal patients (Sun et al. 2006). Psychiatric nurses are more or less constantly present in the ward milieu which facilitates the evaluation of changes in emotional state and the identification of factors that may be related to increased risk for suicidal behaviour (Billings 2003). One such factor may be impaired coping resources. Pollock and Williams observed that persons who attempt suicide have poorer social problem-solving ability than matched psychiatric controls (Pollock and Williams 2004). Further, they showed that problem solving did not change with improving mood. A recent WHO-EURO multicentre study demonstrated that suicide attempt patients with poor problem solving were at increased risk of repeat self harm (McAuliffe et al. 2006). The salutogenic model, which will be described below (Antonovsky 1979, Antonovsky 1987) has been found to be useful to evaluate health outcome in connection with nursing actions (Sullivan 1989).

Personal dispositions and life experiences are important to the development of health and health related behaviour (Cederblad et al. 1995) and a person's capability to cope in times of stress may be associated with increased risk of suicidal behaviour. In order to assess an individual's capacity to manage every day life, Antonovsky introduced the concept sense of coherence (SOC), which is related to an individual's capacity to manage stress (Antonovsky 1979, Antonovsky 1987). His starting point is that people are exposed to psychosocial stress. Traditional medicine and social science have a psychopathological perspective, where one asks why do persons become ill when they are exposed to psychosocial stress? Antonovsky has a contrary perspective, which he calls the salutogenetic perspective. He asks why do some persons who are exposed to psychosocial stress remain healthy while others become ill? He also means that the human moves on a health ease/dis-ease continuum. The base for the salutogenic perspective is the individual's social, historical and cultural context, childhood and genetic conditions.

Another important concept in the salutogenic model is generalized resistance resources (GRR), which is the power one has to fight against psychosocial stress (Antonovsky



1979, Antonovsky 1987). Examples of GRR are coping strategies, engagement, social support and cultural stability. GRR will build up sense of coherence (SOC) and SOC reflects the ability to cope with stressful situations. SOC consists of three core components:

- Comprehensibility, which refers to the extent to which a person perceives stimuli as ordered, consistent, structured and clear.
- Manageability, which refers to the extent to which the individual's resources are adequate to meet stressors.
- Meaningfulness, which refers to the importance to being involved in daily life processes. This is the motivational component.

An association between SOC and personal well-being or quality of life has been observed, high SOC indicates high perceived quality of life and vice versa (Suresky et al. 2008). Low SOC is associated with poor subjective health (Andren and Elmstahl 2008). Persons with low SOC have been found to experience more stress and anxiety compared to those with higher SOC (McSherry and Holm 1994). An association between low SOC and major depression has been found (Skarsater et al. 2005). Associations between low SOC and suicidal thoughts have been reported in conscripts (Mehlum 1998). The SOC subscales manageability and comprehensibility are also associated with repeat attempts among patients with depression (Petrie and Brook 1992). Further, low SOC has been found to be associated with suicidal acts in connection with military call-up (Ristkari et al. 2005). It is unclear whether sense of coherence (SOC) constitutes an independent risk factor of suicidality and repeat attempt in suicide attempters.

## **Prevention**

As suicide is a common cause of death, especially in young persons it is important to reflect in what way one can decrease the suicide rates. Mann and colleagues have conducted a review including studies reporting outcome of interest in suicide prevention strategies (Mann et al. 2005). They analysed studies on awareness and education (education of primary care physicians to diagnose and treat persons with psychiatric disorders, interventions focused on community or organizational gatekeepers, for example staff, clergies, pharmacists etc), screening programs with the aim to identify individuals at risk, means restriction (fire arm control legislation, use of new lower toxicity antidepressants etc), the influence of media education and treatment interventions. They concluded that education of physicians in depression recognition and restricting access to lethal means reduce suicide rates, while other strategies need more evidence testing.

In the clinical setting the most used strategy to prevent suicide is to treat suicidal patients. According to WHO, treating people with mental disorders (particularly those with depression, alcoholism and schizophrenia) is an important prevention strategy to reduce risk for suicidal behaviour. Regarding randomized trials with suicidal behaviour as the outcome, a literature review (Gunnell and Frankel 1994) and a meta analysis (Hawton et al. 1998) both yielded inconclusive results. However, when treating

suicidal patients it is important have focus on the underlying disorder. There is some evidence that treatment of depression decreases the risk of future suicide (Isacson 2000, Henriksson et al. 2001). However, an increased risk for suicidal behaviour has been observed during the first month after starting antidepressive treatment (Jick et al. 2004), indicating need for caution and frequent follow-up during that time. Mood stabilizers have been found to decrease suicide and decrease non-fatal suicidal behaviour (Yerevanian et al. 2007). It has been suggested that problem-solving interventions should be included in the treatment of repeaters (McAuliffe et al. 2006). In a systematic review and meta-analysis of cognitive behavioural therapy, Tarrrier and colleagues found a treatment effect in reducing suicidal behaviour in adults compared to treatment as usual (Tarrrier et al. 2008). However, they did not find any effect in adolescents and in group therapy.

## THE CURRENT STUDY

### Overall aim

This project will yield knowledge that might promote understanding and additional methods in suicide prevention. Further, it aims to increase patient safety and individualized treatment of the suicidal patient.

### Aims

#### *Study I*

- To examine the prevalence of specific sleep disturbances in suicide attempters. Further, to test for possible associations between specific sleep disturbances (difficulties initiating sleep, difficulties maintaining sleep, early morning awakening and nightmares) and suicidality.

#### *Study II*

- To determine whether those who reported sleep disturbances in general and frequent nightmares in particular were at increased risk for repeat attempt.

#### *Study III*

- To examine whether low SOC at baseline predicts persistent suicidality at 2 month follow-up and fatal/non-fatal repeat attempt.

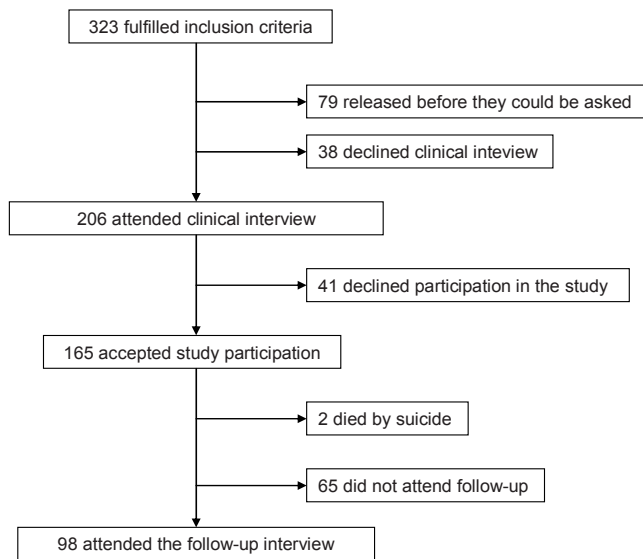
#### *Study IV*

- To test whether Suicide Assessment Scale (SUAS) can be used to predict risk for fatal/non-fatal repeat attempt.

## MATERIAL AND METHODS

### Participants

Participants were recruited among registered residents of the Sahlgrenska University Hospital catchment area (210.000 inhabitants) who took part in a clinical interview in connection with a suicide attempt. Suicide attempt was defined as “a situation in which a person has performed an actually or seemingly life-threatening behaviour with the intent of jeopardizing his life, or to give the appearance of such an intent, but which has not resulted in death” (Beck 1972). At least basic knowledge of Swedish and cognitive capacity to understand interview questions was required. Seventy-nine attempters who otherwise fulfilled inclusion criteria were released from hospital before they could be approached to take part in the clinical interview and 38 refused (Figure 2). In all, 206 patients completed the clinical interview during the study period (October 1, 2001 – June 30, 2004) and 165 (80 %) accepted participation in the research project.



**Figure 2.** Patient flow.

Table 1 shows sociodemographic characteristics of participants and non-participants. Males and persons with only mandatory school (9 yrs) were less likely to participate, whereas persons with a high school degree as highest level of education were more likely to participate.

Ninety-eight of these attended the 2 month follow-up interview. Demographic and clinical characteristics for those with and without follow-up interview are shown in Table 2. Retired persons were less likely to participate. There were no differences in proportion with high depression symptom intensity ( $\chi^2 = 0.353$ ,  $p = 0.552$ ) and high anxiety symptom intensity ( $\chi^2 = 0.578$ ,  $p = 0.447$ ) at baseline in those who participated in the follow-up compared to those who did not.

**Table 1.** Demographic variables in participants and non-participants, n = 206

	Participants n = 165		Non-participants n = 41		p
	n	%	n	%	
Male	36	22	17	41	<b>0.010</b>
Married/cohabited	50	31	10	25	0.495
Divorced/widow	55	33	10	25	0.299
Single	59	36	20	50	0.103
Mandatory school	42	25	20	51	<b>0.004</b>
High school	99	60	17	41	<b>0.032</b>
University	23	14	4	10	0.477
Unemployed	33	20	10	24	0.548
Employee	82	50	16	39	0.208
Student	21	13	4	10	0.594
Retired	28	17	11	27	0.155

**Table 2.** Demographic and clinical characteristics of suicide attempters with and without follow-up interview

	Two month follow-up				$\chi^2$	df	P
	Yes, n = 98		No, n = 67				
	n	%	n	%			
Sociodemographic variables							
Male, n = 36	19	19	17	25	0.84	1	0.36
Married/cohabited, n = 50	29	30	21	31	0.04	1	0.84
Divorced/widow, n = 55	30	31	25	37	0.73	1	0.30
Single, n = 60	39	40	21	31	1.23	1	0.27
Education beyond							
mandatory, n = 122	72	74	50	75	0.003	1	0.95
Unemployed, n = 33	19	19	14	21	0.08	1	0.78
Retired/Pension, n = 28	12	12	16	24	4.01	1	<b>0.045</b>
Disorders at baseline							
Major Depression, n = 55	36	37	19	28	1.26	1	0.26
Other depression, n = 20	11	11	9	13	0.18	1	0.70
PTSD <sup>a</sup> , n = 20	11	11	9	13	0.18	1	0.67
Alcohol/substance use, n = 41	23	23	18	27	0.25	1	0.62
Psychotic disorders, n = 11	5	5	6	9	0.95 <sup>b</sup>	1	0.36
Anxiety disorders/other, n = 27	18	18	9	13	0.71	1	0.40
No axis-I disorder, n = 11	5	5	6	9	0.95 <sup>b</sup>	1	0.36
Sleep variables at baseline <sup>c</sup>							
Difficulties initiating sleep, n = 80	44	45	36	56	1.20	1	0.16
Difficulties maintaining sleep, n = 62	34	35	28	44	1.23	1	0.27
Early morning awakening, n = 61	32	33	29	45	2.64	1	0.10
Nightmares <sup>c</sup> , n = 52	32	33	20	33	0.001	1	0.98

<sup>a</sup>4 had PTSD as primary diagnosis and are also included in the anxiety disorders and other disorders. Other primary diagnoses: Major depression (6), Other depression (2), Alcohol/substance use disorder (4), and Psychosis (4). <sup>b</sup>Fisher's exact test, <sup>c</sup>Score  $\geq 4$  in accordance with the Uppsala Sleep Inventory

## **Study design**

Face-to-face standardised clinical interviews with SCID-IV and Suicide Assessment Scale (SUAS), which took place within a week after admission. Participants completed the self-rating instruments CPRS Self-rating Scale for affective syndromes (CPRS S-A), Sense of Coherence Scale (SOC) and Uppsala Sleep Inventory (USI). Patients who took part in the initial interview were asked to participate in a 2-month follow-up research interview. Those who agreed were sent a letter with information about the time and place for the second interview. The same instruments were employed at the follow-up. Those who did not show up received a phone call from the interviewer to make another appointment. Data concerning non-fatal repeat suicide attempts within 2 years (Paper II) and 3 years (Papers III - IV) were obtained from university medical records and death data from census records.

## **Assessments**

### ***Psychiatric disorders (Papers I – IV)***

Psychiatric syndromes according to Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) were assessed with the standardized interview Structured Clinical Interview for DSM-IV - SCID-I. Axis-I diagnoses were grouped according to the Swedish SCID-I interview manual, i.e., mood disorder, psychotic disorder, alcohol/substance use disorder and anxiety disorder and other disturbances. The mood disorder group was divided in major depression (including bipolar disorder and major depression with psychotic symptoms) and other depression (dysthymic disorder, depression NOS).

### ***Suicidality (Papers I, III – IV)***

Suicidality was rated with the Suicide Assessment Scale (SUAS) (Stanley et al. 1986, Niméus 2000, Niméus et al. 2000). The instrument evaluates observed and reported symptomatology associated to suicidality without being associated with any specific diagnosis (Stanley et al. 1986). The scale has been found to be correlated to the Montgomery-Asberg Depression Rating Scale - MADRS, but the concordance was not consistent and indicating that the scale measures something different from depression (Nimeus et al. 2006). This expert rating scale consists of 20 items 4 points each yielding a maximum score of 80. The items cover five areas: affect (Item 1: sadness and despondency, Item 2: hostility, Item 9: anxiety, Item 12: low self esteem and Item 13: hopelessness), bodily states (Item 3: anergia, Item 8: tension and Item 10: somatic concern), control and coping (Item 6: resourcefulness, Item 7: perceived loss of control, Item 11: impulsivity and Item 15: poor frustration), emotional reactivity (Item 4: hypersensitivity, Item 5: emotional withdrawal and Item 14: inability to feel) and suicide ideation and behaviour (Item 16: suicidal thoughts, Item 17: purpose of suicide, Item 18: wish to die, item 19: lack of reasons for living and Item 20: suicidal actions). We carried out a factor analysis in order to examine if there were some variables in SUAS, which could be grouped together. Four factors were identified within the SUAS variables (Table 3). Factor 1 mainly related to mood, factor 2 to suicidal behaviour, factor 3 to impulsivity/hostility and tension and factor 4 to somatic concern and inability to feel. Hypersensitivity was not included in any of the four factors because of low loading.

**Table 3.** Factor analysis of the Suicide Assessment Scale\*

Items	Factor 1	Factor 2	Factor 3	Factor 4
Sadness and despondency	<b>0.651</b>	0.192	0.217	-0.058
Hostility	0.171	0.051	<b>0.690</b>	0.171
Anergia	<b>0.571</b>	0.209	0.143	0.268
Hypersensitivity	0.239	0.274	0.327	0.336
Emotional withdrawal	<b>0.666</b>	0.046	0.165	0.314
Resourcefulness	<b>0.788</b>	0.072	0.180	0.018
Perceived loss of control	<b>0.666</b>	0.150	0.116	0.121
Tension	0.315	0.157	<b>0.682</b>	-0.357
Anxiety	<b>0.605</b>	0.180	0.365	-0.088
Somatic concern	0.054	-0.019	0.341	<b>0.645</b>
Impulsivity	0.213	0.084	<b>0.592</b>	0.179
Low self esteem	<b>0.650</b>	0.269	0.148	0.068
Hopelessness	<b>0.575</b>	0.493	0.079	0.102
Inability to feel	<b>0.502</b>	0.225	0.025	<b>0.558</b>
Poor frustration tolerance	0.121	0.099	<b>0.757</b>	0.229
Suicidal thoughts	0.154	<b>0.882</b>	0.096	0.056
Purpose of suicide	0.195	<b>0.819</b>	-0.015	-0.072
Wish to die	0.330	<b>0.757</b>	0.117	0.178
Lack of reasons for living	0.390	<b>0.705</b>	0.202	0.088
Suicidal actions	0.006	<b>0.815</b>	0.122	0.035

\*Items with loading greater than 0,50 were used to identify the meaning of each factor.

In Paper I two scores were calculated: SUAS total score (sum of variables 1 – 20, maximum value 80) and the suicide ideation and behaviour subscore (sum of items 16 – 20, maximum value 20). Scores were dichotomized (fourth quartile vs. all others). A person with SUAS total score  $\geq 32$  was considered to have high SUAS. A suicidal ideation and behaviour  $\geq 6$  was denoted to high suicidality.

### ***Psychiatric symptoms (Papers I – IV)***

Symptom intensity was assessed using the anxiety and depression subscales of the CPRS Self-rating Scale for Affective Syndromes – CPRS-S-A (Svanborg and Asberg 1994) which is based on the Comprehensive Psychopathological Rating Scale (Asberg et al. 1978). The anxiety subscale includes 9 items (feelings of unease, irritability and anger, sleep, concern for health, worry over trifles, phobias, physical discomfort, aches and pains and panic attacks rated from 0 – 6, yielding a maximum score of 54 points. The depression scale consists of 9 items (mood, feelings of unease, sleep, appetite, ability to concentrate, initiative, emotional involvement, pessimism and zest for life. Again, items are rated from 0 – 6 with a maximum score of 54 points. The depression subscale has been shown to be equivalent to Beck’s Depression Inventory

as a self-rating scale (Svanborg and Asberg 2001). Patients were instructed to assess symptoms present during the past three days. High depression symptom intensity was defined as a score  $\geq 35$  (fourth quartile) and high anxiety symptom intensity as a score  $\geq 29$  (fourth quartile). A person who reported high depression and high anxiety at both baseline interview and 2 month follow-up was considered to have persistent high depression and anxiety symptom intensity in Papers II – III.

### ***Sleep disturbances (Papers I – II)***

Sleep disturbances were assessed using the Uppsala Sleep Inventory (USI) (Hetta J. 1985, Edell-Gustafsson and Hetta 2001, Mallon et al. 2002). The scale consists of questions regarding sleep habits, severity of sleep difficulties and daytime symptoms. In the current study selected items were used to rate sleep disturbance. Subjects were asked about difficulties initiating sleep, difficulties maintaining sleep and early morning awakening. The questions were to be answered on a five-point severity scale (1= no problems, 2= minor problems, 3= moderate problems, 4= severe problems, 5= very severe problems). Further, subjects were asked how often they experienced nightmares. The questions were to be answered on a five-point frequency scale (1= never, 2= seldom, 3= sometimes, 4= often, 5= very often). Patients were instructed to assess sleep complaints present during the past three days. Responses for all sleep items were dichotomized (rating  $\leq 3$ / $\geq 4$ ). A person who reported a score  $\geq 4$  at both baseline interview and 2 month follow-up was considered to have persistent sleep disturbance.

### ***Sense of coherence (Paper III)***

The sense of coherence questionnaire (SOC) is a self report instrument designated to quantify an individual's capacity to manage stress and stay well (Antonovsky 1987). There is a long version with 29 items (SOC-29) and an abbreviated version with 13 items (SOC-13). We used the Swedish version of SOC-29, which has been shown to have acceptable validity and reliability (Langius et al. 1992). The questionnaire assesses three components:

- Comprehensibility (11 items): The extent to which one perceives the environment as structured and understandable
- Manageability (10 items): The extent to which one perceives that one's resources are adequate to meet life's demands.
- Meaningfulness (8 items): The extent to which life's struggles and demands are perceived as worthwhile and challenging.

Variables are rated between 1 and 7 on a Likert-type scale and 13 of the variables are reverse scored. The sum of all variables provides a score ranging from 29 to 377. Higher score indicates stronger SOC. Patients were instructed to assess how they perceive themselves in general.

### **Ethics**

The Ethics Committee of the Medical Faculty of University of Gothenburg approved the project. Participants received oral and written information about the study, and



were informed that they could leave the study at any time. Written consent was obtained from all patients who took part in the study.

## **Statistical analyses (shown in Table 4)**

### ***Paper I***

The T-test was used to compare means in continuous variables. Pearson's  $\chi^2$  was used to compare differences in proportions. Dichotomized variables were used: Severe sleep complaints and high SUAS score (fourth quartile), high suicidality subscore (fourth quartile), symptom intensity of depression and anxiety (fourth quartile). Univariate logistic regression was used to analyze associations between specific sleep disturbances and suicidality at baseline. Significant variables from univariate analyses were used in multivariate analyses in three separate models: with axis-I diagnosis (model 1), with posttraumatic stress disorder diagnosis (PTSD) only (model 2) and with symptom intensity (model 3).

### ***Paper II***

The T-test was used to compare means in continuous variables. Pearson's  $\chi^2$  and Fisher's exact test were used to compare differences in proportions. Dichotomized variables were used: Severe sleep complaints (fourth quartile) and symptom intensity of depression and anxiety (fourth quartile). Univariate logistic regression was used to analyze associations between specific sleep disturbances and repeat suicide attempt in the total group (n = 165). The significant variable in the univariate analysis was then adjusted for sex (model 1), axis-I disorders (model 2), PTSD (model 3), high depression intensity (model 4), high anxiety symptom intensity (model 5) and antidepressant medication (model 6). In the sub group with follow-up interview (n = 98), associations between persistent sleep variables and repeat attempt were tested in univariate analyses. Significant variables were included in a multivariate model and significant variables in this analysis were then adjusted for sex (model 1), axis-I disorders (model 2), PTSD (model 3), high depression intensity (model 4), high anxiety symptom intensity (model 5) and antidepressant medication (model 6).

### ***Paper III***

The T-test was used to compare means in continuous variables. Univariate logistic regression was used to analyse associations between baseline SOC score and suicidality variables (high suicidality at baseline and fatal/non-fatal repeat attempt within 3 years) in the entire group (n = 165). For the subgroup that took part in the follow-up interview (n = 98) 2 months after the index attempt, additional models were constructed using high suicidality and persistent suicidality at follow-up as outcome variables. All significant associations were analysed in separate models adjusted for major depression (model 1), high depression symptom intensity (model 2) and high anxiety symptom intensity (model 3).

### ***Paper IV***

Correlation analyses were performed with Spearman's rank-order correlation test. The Mann-Whitney U test was used to compare SUAS scores at baseline and follow-up.

Logistic regression models were constructed to examine associations between SUAS scores (baseline score, follow-up score, maximum score) and fatal/non-fatal repeat suicide attempt within 3 years. All SUAS scores were dichotomized ( $>30/ \leq 30$ ). Both symptoms subscores (depression and anxiety) showed normal distribution at baseline; symptom subscores were introduced as continuous variables in the regression models. Models were also adjusted for sex, age and for a diagnosis of major depression. Receiver operating characteristics (ROC) curves were constructed for the entire group and the subgroup in psychiatric treatment to test the instrument's specificity and sensitivity for repeat attempt over the range of test scores.

**Table 4.** Measures and statistical analyses

	Axis-I disorders	Suicidal behaviour	Symptom intensity	Sleep disturbances	Sense of coherence	Statistical methods
Paper I	SCID <sup>1</sup> DSM-IV <sup>2</sup>	SUAS <sup>3</sup>	CPRS-S-A <sup>4</sup>	USI		T-test, $\chi^2$ , logistic regression
Paper II	SCID DSM-IV		CPRS-S-A	USI		T-test, $\chi^2$ , logistic regression
Paper III	SCID DSM-IV	SUAS	CPRS-S-A		SOC <sup>5</sup>	T-test, logistic regression
Paper IV	SCID DSM-IV	SUAS	CPRS-S-A			Spearman's rank-order test, Mann-Whitney U test, logistic regression, ROC curve

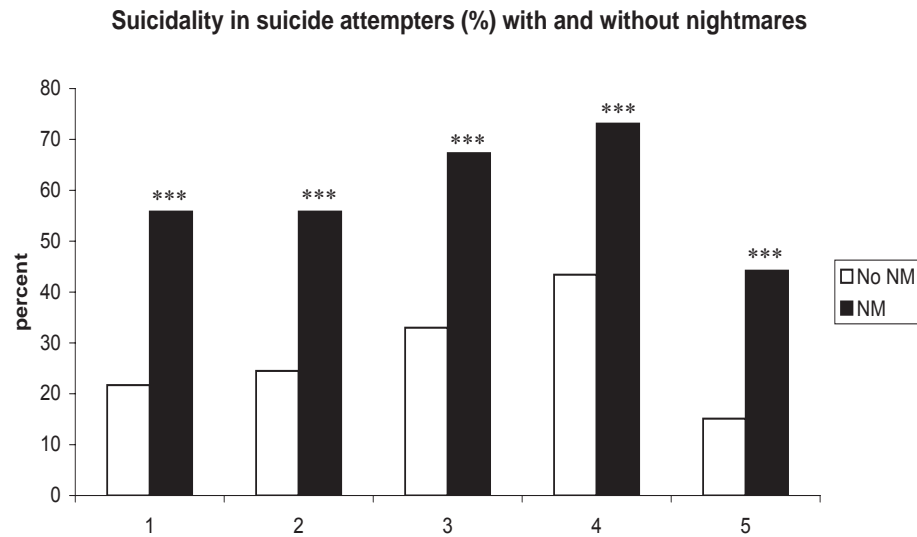
<sup>1</sup> Structured Clinical Interview for DSM-IV, <sup>2</sup> Diagnostic System Manual, 4th edition, <sup>3</sup> Suicide Assessment Scale, <sup>4</sup> CPRS Self-rating Scale for Affective Syndromes, <sup>5</sup> Sense of Coherence scale

## RESULTS

### Paper I

Eighty-nine percent of the study participants reported some kind of sleep disturbance. The most common complaint was difficulties initiating sleep (73 %). Other complaints included difficulties maintaining sleep (69 %), nightmares (66 %) and early morning awakening (58 %). One hundred fifty-four patients (93 %) met the criteria for at least one axis-I disorder. The most common diagnosis was major depression (36 %) followed by alcohol/substance use disorder (27 %).

Figure 3 shows the five core suicidality items in relation to frequent nightmares. For all items there was a significant difference between subjects with frequent nightmares, compared with patients without.



**Figure 3.** Percentages with scores  $\geq 1$  on Suicide Assessment Scale (SUAS) suicidality items in patients without (white bars) and with (black bars) frequent nightmares. 1=suicidal thoughts, 2=purpose of suicide, 3=wish to die, 4=lack of reasons for living and 5=suicidal actions. \*\*\* $p < .001$  ( $\chi^2$  test).

Nightmares were associated with a fivefold increase in risk for high suicidality (Table 5). This relationship was independent of all psychiatric diagnoses and psychiatric symptom intensity.

**Table 5.** Univariate and multivariate analyses of high and low total score on the Suicide Assessment Scale and suicidality in relation to severe sleep disturbances and nightmares in 165 patients who were hospitalized after a suicide attempt

	High SUAS			High suicidality		
	OR	95 % CI for OR	p	OR	95 % CI for OR	p
<b>Sex</b>						
Univariate	1.03	.44 – 2.42	.950	.63	.25 – 1.58	.325
<b>Hypersomnia</b>						
Univariate	1.56	.50 – 4.91	.445	1.04	.26 – 4.12	.955
<b>Difficulties initiating sleep</b>						
Univariate	<b>2.61</b>	<b>1.23 – 5.58</b>	<b>.013</b>	1.45	.72 – 2.93	.301
Model 1 (adjusted OR)	<b>3.62</b>	<b>1.38 – 9.54</b>	<b>.009</b>	-	-	-
Model 2 (adjusted OR)	2.35	.98 – 5.59	.058	-	-	-
Model 3 (adjusted OR)	2.39	.96 – 6.00	.062	-	-	-
<b>Difficulties maintaining sleep</b>						
Univariate	1.74	.84 – 3.62	.137	1.38	.67 – 2.80	.379
<b>Early morning awakening</b>						
Univariate	<b>2.52</b>	<b>1.20 – 5.27</b>	<b>.014</b>	1.72	.84 – 3.50	.137
Model 1 (adjusted OR)	2.43	.97 – 6.07	.058	-	-	-
Model 2 (adjusted OR)	1.82	.78 – 4.25	.169	-	-	-
Model 3 (adjusted OR)	1.47	.59 – 3.62	.408	-	-	-
<b>Nightmares</b>						
Univariate	<b>4.87</b>	<b>2.24 – 10.60</b>	<b>.000</b>	<b>4.92</b>	<b>2.31 – 10.48</b>	<b>.000</b>
Model 1 (adjusted OR)	<b>5.01</b>	<b>1.99 – 12.61</b>	<b>.001</b>	<b>5.08</b>	<b>2.21 – 11.71</b>	<b>.000</b>
Model 2 (adjusted OR)	<b>3.06</b>	<b>1.30 – 7.21</b>	<b>.011</b>	<b>4.17</b>	<b>1.90 – 9.14</b>	<b>.000</b>
Model 3 (adjusted OR)	<b>2.55</b>	<b>1.04 – 6.27</b>	<b>.042</b>	<b>3.50</b>	<b>1.57 – 7.81</b>	<b>.002</b>

Significant variables from the univariate analyses were used in multivariate analyses in three models – model 1: Adjusted for major depression, other depression, psychotic disorders, alcohol/substance use disorder and anxiety disorders and other syndromes, Model 2: Adjusted for PTSD; Model 3: Adjusted for depressive and anxiety symptom intensity according to the Comprehensive Psychopathological Rating Scale. SUAS refers Suicide Assessment Scale; CI, confidence interval; OR, odds ratio

## Paper II

In total 42 (26 %) of the subjects who completed the baseline interview made at least one additional repeat within 2 years. Most (26 out of 42) occurred within a year of the index attempt. Proportions with difficulties initiating/maintaining sleep at baseline were similar in those with and without repeat attempt (Table 6). Half of the repeaters and one third of non-repeaters had reported early morning awakening at the index interview, but the difference in proportions was not significant. Repeaters were more likely to have reported frequent nightmares at baseline. While neither difficulties initiating/maintaining sleep nor early morning awakening at baseline predicted repeat attempt, having nightmares did (OR = 3.15). These associations remained after adjusting for sex, axis-I DSM-IV diagnoses and self-reported depression and anxiety symptom intensity.

Persistent sleep disturbances were more common in repeaters, with the exception of difficulties initiating sleep (Table 7). In the univariate analyses persistent difficulties maintaining sleep, early morning awakening and frequent nightmares were all as-

**Table 6.** Associations between baseline sleep variables<sup>a</sup> and repeat suicide attempt within two years *N*=165

	Repeat suicide attempt				<i>X</i> <sup>2</sup>	<i>df</i>	<i>P</i>	OR	95 % CI	<i>P</i>
	No		Yes							
	<i>n</i>	%	<i>n</i>	%						
Difficulties initiating sleep	58	48	22	52	0.20	1	0.65	1.18	0.58 – 2.38	0.65
Difficulties maintaining sleep	43	36	19	45	1.09	1	0.30	1.46	0.71 – 2.98	0.30
Early morning awakening	40	33	21	50	3.68	1	0.06	2.00	0.98 – 4.09	0.06
Frequent nightmares	26	30	22	52	9.82	1	0.002	3.15	1.51 – 6.57	<b>0.002</b>
Adjusted models <sup>b</sup>										
Model 1								3.05	1.46 – 6.38	<b>0.003</b>
Model 2								3.04	1.41 – 6.62	<b>0.004</b>
Model 3								3.09	1.44 – 6.62	<b>0.004</b>
Model 4								2.28	1.04 – 4.99	<b>0.04</b>
Model 5								2.39	1.10 – 5.18	<b>0.03</b>
Model 6								2.65	1.22-5.58	<b>0.013</b>

<sup>a</sup> Uppsala Sleep Inventory rating  $\geq 4$  at index suicide attempt

<sup>b</sup> Models adjusted for 1) sex 2) major depression, other depression, substance use disorders, psychotic disorders, and anxiety disorders/other axis-I diagnoses 3) PTSD 4) depression symptom intensity 5) anxiety symptom intensity. 6) antidepressant drugs.

**Table 7.** Associations between persistent<sup>a</sup> sleep variables and repeat suicide attempt within two years *N* = 98

	Repeat suicide attempt				<i>X</i> <sup>2</sup>	<i>df</i>	<i>P</i>	OR	95 % CI	<i>P</i>
	No		Yes							
	<i>n</i>	%	<i>n</i>	%						
Difficulties initiating sleep	16	23	10	37	1.774	1	0.18	1.92	0.73 – 5.00	0.19
Difficulties maintaining sleep	6	9	9	32	8.18 <sup>b</sup>	1	<b>0.010</b>	4.90	1.54 – 15.52	<b>0.007</b>
Multivariate <sup>c</sup>								2.60	0.06 – 10.86	0.190
Early morning awakening	4	6	7	25	7.31	1	<b>0.01<sup>b</sup></b>	5.42	1.44 – 20.34	<b>0.01</b>
Multivariate <sup>c</sup>								1.85	0.35 – 9.70	0.49
Frequent nightmares	10	14	13	46	11.50	1	<b>0.001</b>	5.20	1.91 – 14.13	<b>0.001</b>
Multivariate <sup>c</sup>								3.66	1.26 – 10.66	<b>0.02</b>
Adjusted models <sup>d</sup>										
Model 1								5.30	1.92 – 14.64	<b>0.001</b>
Model 2								4.78	1.67 – 13.69	<b>0.004</b>
Model 3								4.18	1.47 – 11.89	<b>0.007</b>
Model 4								3.37	1.13 – 10.10	<b>0.03</b>
Model 5								3.09	1.01 – 9.46	0.05
Model 6								2.96	1.14-7.67	<b>0.025</b>

<sup>a</sup> Uppsala Sleep Inventory rating  $\geq 4$  at both index suicide attempt and 2 month follow-up. <sup>b</sup> Fisher's exact test.

<sup>c</sup> Includes all significant sleep variables from the univariate analyses. <sup>d</sup> Models adjusted for 1) sex 2) major depression, other depression, substance use disorders, psychotic disorders, and anxiety disorders/other axis-I diagnoses 3) PTSD 4) depression symptom intensity 5) anxiety symptom intensity 6) antidepressant drugs.

sociated with repeat attempt. However, in the multivariate analysis only persistent nightmares were associated with repeat attempt. The association remained in models adjusted for sex, axis-I DSM-IV diagnoses and self-reported depression and anxiety symptom intensity

We examined whether those who fulfilled criteria for a specific diagnostic category at both index and 2 month follow-up interview were more likely to repeat attempt than those who did not. Only those with persistent major depression ( $n = 21$ ) were more likely to make a repeat attempt ( $\chi^2 = 4.752$ ,  $df = 1$ ,  $p = 0.003$ ). Focusing on the subgroup with persistent major depression, seven of eight (87 %) who had persistent nightmares made a repeat attempt. This can be compared to 3 out of 13 (23 %) of those without persistent nightmares (Fisher's exact test,  $p = 0.008$ ).

### **Paper III**

According to hospital records, 56 of the study participants made one or more repeat attempt during the 3 years that followed the index attempt (Papers III and IV). Seven deaths were recorded during the observation period. Two of these (both women) made no further non-fatal attempts but died by suicide prior to the 2 month follow-up. Two further persons (one man and one woman) made non-lethal repeats after the index attempt; both committed suicide at a later point during the 3 year observation period. Deaths were registered for three further participants (all women) within 3 years of the index attempt. Cause of death data is missing for these cases, but due to the relatively low age of these individuals, we made the assumption that these were also suicides. In all, 61 cases repeated suicidal behaviour during the observation period.

The mean SOC score was lower in the group with major depression compared to all others (mean score 105 vs. 116, 95 % CI 1.98 – 20.62,  $p = 0.018$ ). Lower mean scores were also observed in those with high depression symptom burden (mean score 90 vs. 119, 95 % CI 19.75 – 38.96,  $p = 0.000$ ) and in those with high anxiety symptom burden (92 vs. 120, 95 % CI 18.43 – 36.74,  $p = 0.000$ ). Persons with high suicidality at baseline (mean score 91 vs. 120, 95 % CI 19.88 – 37.66,  $p = 0.000$ ) and those who made non-fatal/fatal repeats (mean score 105 vs. 117, 95 % CI 2.40 – 20.62,  $p = 0.014$ ) had lower mean SOC scores at baseline.

Low SOC score was associated with high suicidality in the cross-sectional analysis at baseline (Table 8). The association remained also after adjustment for major depression and depressive and anxiety-related psychopathology. Low baseline SOC score was associated with repeat attempt in the univariate analysis and the association remained after adjustment for major depression. However, low SOC was no longer an independent predictor in models adjusted for depression and anxiety symptom burden.

Ninety-three persons completed SOC at the 2-month follow-up interview. Mean SOC score increased from baseline to follow-up (113.4 vs. 117.9, CI 95 % for the difference -4.17 - -0.53,  $p = 0.027$ ). Fewer patients fulfilled criteria for major depression

**Table 8.** Associations between low SOC (first quartile) and suicidality variables at baseline,  $N = 155$

	High suicidality			Repeat attempt within 3 yrs		
	OR	95 % CI	p	OR	95 % CI	p
Univariate	<b>6.77</b>	<b>3.04 – 15.04</b>	<b>0.000</b>	<b>2.59</b>	<b>1.23 – 5.45</b>	<b>0.012</b>
Model 1 (adjusted OR)	<b>6.86</b>	<b>3.07 – 15.33</b>	<b>0.000</b>	<b>2.60</b>	<b>1.24 – 5.48</b>	<b>0.012</b>
Model 2 (adjusted OR)	<b>6.01</b>	<b>2.64 – 13.67</b>	<b>0.000</b>	<b>2.28</b>	<b>1.08 – 4.81</b>	<b>0.030</b>
Model 3 (adjusted OR)	<b>4.82</b>	<b>1.92 – 12.18</b>	<b>0.001</b>	1.66	0.69 – 3.98	0.256
Model 4 (adjusted OR)	<b>5.90</b>	<b>2.43 – 14.36</b>	<b>0.000</b>	1.72	0.75 – 3.97	0.202

Model 1: Adjusted for sex, Model 2: Adjusted for major depression, Model 3: Adjusted for high depression, Model 4: Adjusted for high anxiety.

( $\chi^2 = 22.561$ ,  $p = 0.000$ ) and fewer had high suicidality ( $\chi^2 = 7.136$ ,  $p = 0.008$ ). Low baseline SOC was associated with an increase in risk of high suicidality (OR = 8.13, 95 % CI 2.73 – 24.26,  $p = 0.000$ ) two months after the initial suicide attempt. The association remained after adjustment for sex, major depression and high depression and anxiety symptom intensity.

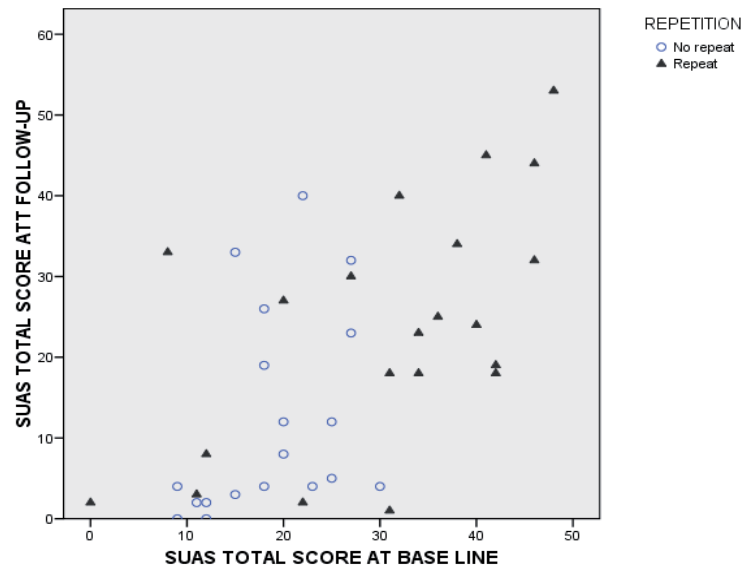
Persistent low SOC was associated with increased risk for high suicidality (OR = 6.80, 95 % CI 1.88 – 24.55,  $p = 0.003$ ), and the association remained after adjustment for sex, major depression and high depression and anxiety symptom intensity. We could not show an association between persistent low SOC and repeat attempt within 3 years (OR 2.75, 95 % CI 0.80 – 9.45,  $p = 0.108$ ).

#### Paper IV

SUAS scores were grouped into five bands and the odds associated with each band were calculated and log transformed. The two highest bands (corresponding to a score >30) were merged into one category which was denoted “high baseline SUAS score”. Forty-five participants had high SUAS score at baseline according to this definition. High baseline score was associated with an increased risk for repeat suicidal behaviour after adjustment for sex and age (OR = 4.5, 95 % CI 1.83 – 10.82,  $p = 0.001$ ), age, sex and depression score (OR = 3.36, 95 % CI 1.22 – 9.24,  $p = 0.024$ ), age, sex and anxiety score (OR = 3.69, 95 % CI 1.42 – 9.31,  $p = 0.007$ ) and age, sex and major depression (OR = 4.01, 95 % CI 1.62 – 9.94,  $p = 0.003$ ).

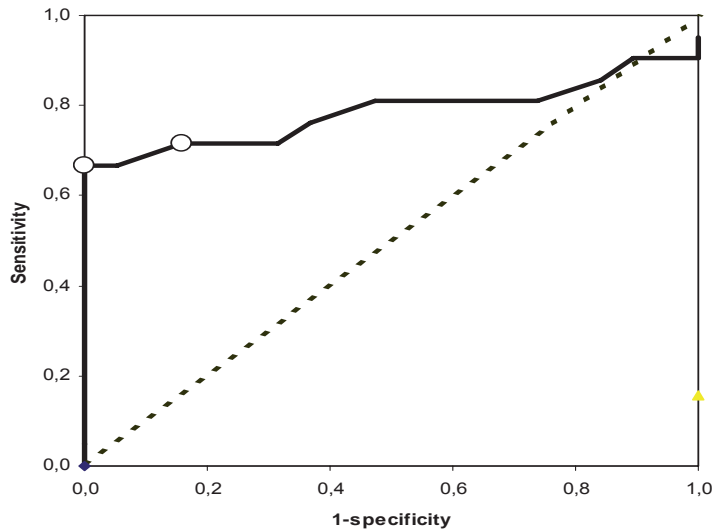
Those with high SUAS score at *either* interview were at increased risk for repeat attempt after adjustment for age and sex (OR = 5.77, 95 % CI 2.20 – 15.12,  $p = 0.000$ ) age, sex and depression score (OR = 4.69, 95 % CI 1.54 – 14.27,  $p = 0.006$ ), age, sex and anxiety score (OR = 3.48, 95 % CI 1.16 – 10.45,  $p = 0.026$ ) and age, sex and major depression (OR = 7.08, 95 % CI 2.41 – 20.82,  $p = 0.000$ ).

Ongoing psychiatric treatment was reported by 42 patients. In this subgroup, all with an initial score exceeding 30 made repeat attempts, (Figure 5).



**Figure 5.** Distribution of baseline and follow-up SUAS scores in participants with psychiatric treatment at follow-up (n=42).

ROC analysis showed that the ability of the SUAS to predict repeat suicidal behaviour in the entire study group was low (AUC= 0.65, 95% CI=0.56-0.74). The instrument performed better for the subgroup (n=42) who reported ongoing psychiatric treatment at 2 month follow-up (AUC = 0.78, 95% CI 0.63- 0.94). Two points at 26 and 31 maximized the number of true positives and minimized the number of false positives with sensitivities of 0.70 and 0.67, and specificities of 0.84 and 1.0, respectively. (Figure 6).



**Figure 6.** Receiver operating characteristics curve for the relationship between baseline SUAS scores and repetition in the subgroup (n=42) with in/outpatient psychiatric treatment at 2-month follow-up.



## DISCUSSION

### Main findings

#### *Paper I*

- Sleep disturbances were common (89 %) among suicide attempters.
- Nightmares were independently associated with suicidality at baseline.

#### *Paper II*

- Frequent nightmares were associated with a 3-fold risk for repeat suicide attempt and the risk was 5-fold when nightmares were reported at both baseline and follow-up.

#### *Paper III*

- Low SOC score was associated with suicidality independently of major depression and of symptom intensity.
- Low SOC could not be shown to predict repeat attempt.

#### *Paper IV*

- High SUAS at index attempt was associated with 4-fold risk for repeat attempt
- SUAS performed well as a screening instrument for risk of repeat suicidal behaviour in persons with psychiatric treatment.

The main findings will be discussed in the same order as they are reported above.

About 90 % reported some kind of sleep disturbance. Hall and Platt have reported a similar figure (92 %) in suicide attempters (Hall and Platt 1999). Suicidal patients with major depression experience more subjective sleep disturbances than non-suicidal (Agargun et al. 1997b) and suicidal substance abusers have irregular sleep pattern (McCloud et al. 2004). Wallander and colleagues found that noticeably more patients with sleep disorders (4.2 %) died by suicide compared to the control group (0.6 %) (Wallander et al. 2007). Goldstein and colleagues have found that adolescent suicide completers have higher rates of overall sleep disturbance the week preceding completed suicide compared to controls (Goldstein et al. 2008). Somewhat unexpectedly insomnia and hypersomnia were not associated with suicidality. This is in contrast to Agargun and colleagues who concluded in a study of associations between sleep disturbances and suicidality in major depressive patients that hypersomnia and insomnia were associated with suicidal behaviour (Agargun et al. 1997a). Their study focused on depressive patients, while the current study consisted of a diagnostically heterogeneous group. The different study populations may partly explain the difference.

In the cross-sectional study we found an independent association between nightmares and suicidality in connection with the index suicide attempt. To the best of our know-

ledge, this is the first report on an association between nightmares and suicidality in suicide attempters. That finding is parallel with Bernert and colleagues, who found that nightmares were independently related to suicidality in outpatients (Bernert et al. 2005). Nightmares have also been found to be associated with suicidality in major depressive patients (Agargun et al. 1998). In a population-based study with a 20-year follow-up Tanskanen and colleagues found that nightmares were related to suicide risk (Tanskanen et al. 2001).

We found that nightmares were associated with a 3-fold risk for repeat attempt within 2 years. That risk increased if the nightmares were persistent at 2-month follow-up. This provides further support for our finding (Paper I) that nightmares are associated with suicidality in suicide attempters. It is also in line with the findings reported by Liu who reported a 3-fold increase in suicide attempts in adolescents with frequent nightmares (Liu 2004). Liu and Buysse noted in a review that insomnia and nightmares are more common in suicidal adolescent psychiatric patients than in non-suicidal (Liu and Buysse 2006).

Low SOC score was associated with suicidality. The relationship was independent of both a diagnosis of major depression and of symptom intensity, suggesting that the SOC scale is more than a mirror of psychopathology. It has been reported that SOC is related to psychological and physiological stress responses and that inappropriate responses might make persons vulnerable to suicidality (McSherry and Holm 1994). SOC is correlated with measures of quality of life (Eriksson and Lindstrom 2007) and quality of life may influence the association between SOC and suicidality. In a prospective study of schizophrenic patients with depression, low quality of life predicted suicidality (Kasckow et al. 2007).

We did not find an independent association between low SOC and repeat attempt. Petrie and Brook have reported that the SOC subscales manageability and comprehensibility predict repeat attempt within 6 months (Petrie and Brook 1992). We could not confirm the association between SOC and repeat attempt, which might be due to methodological differences. Petrie and Brook used the subscales, while we used total SOC score. Further, they did not include diagnostic data but rather controlled for depression with the Zung depression scale. Also, the follow-up period in that study was shorter.

Persons with high SUAS at index attempt were found to have a 4-fold risk for repeat attempt. Even higher odds were observed for the maximum suicidality at the two interviews, suggesting that suicide assessments should include questions about the patient's most intensive level of suicidality. Beck and colleagues have found that suicide ideation at its worst point identifies a subgroup of outpatients at risk for eventual future completed suicide (Beck et al. 1999).

In the ROC analysis we found that SUAS was limited in correctly identifying persons at suicide risk for the entire study population. However, all patients who were 1) referred to psychiatric treatment and 2) had score exceeding 30 at baseline made repeat attempts. There is evidence that serious psychiatric disorders (Tidemalm et

al. 2008), high levels of psychiatric comorbidity (Beautrais 2003) and high depression rating (Holmstrand et al. 2006) are all associated with increased risk for future suicide. Patients referred to psychiatric treatment are more homogenous compared to those without referral to psychiatric treatment; their psychiatric disorder is judged to be more severe and the function level is often impaired. It might be one explanation for the finding that the SUAS performed better for the subgroup referred to psychiatric treatment. Further, SUAS is developed specifically for use in psychiatric patients populations, indicating that the items may be less appropriate in the risk assessment in persons with milder levels of psychopathology.

### **Strengths**

The prospective design can be seen as a strength of the study. We have detailed ratings of symptoms related to depression, anxiety, sleep disturbance, sense of coherence and suicidality at index attempt and 2 month follow-up. The latter time point has clinical relevance, as it corresponds to the period following discharge which has been identified as a critical time in terms of suicide risk (Hunt et al. 2008). Further the use of the SCID interview allowed us to adjust for axis-I diagnoses.

### **Limitations**

The proportion of patients who did not complete the clinical interview was large and these persons were not eligible for the study (see Figure 2). Low participation is a well-known problem in this in this type of study (Agargun et al. 1997b, Niméus 2000, Haw et al. 2001). The selection bias in terms of sex and educational level limits generalization of results to the entire population of suicide attempters.

The proportion of non-participants at the follow-up interview was large, but participants and non-participants at the second interview did not differ concerning a number of baseline variables, indicating that participants were fairly representative of the original study cohort. While we did not formally ask about reasons for non-participation in the follow-up, many spontaneously volunteered information that they chose not to participate because they wanted to forget the incident.

There was no control group of non-suicidal mentally ill patients. SOC scores in the current study were clearly lower than those reported by Langius and colleagues for a healthy Swedish reference population (mean score 151) (Langius et al. 1992) and similar to those observed in inpatients with first episode major depression (Skarsater et al. 2005).

In our studies nightmares were self-reported. In a recent study Robert and Zadra found that prospective dream logs are to prefer when assessing dreams, because retrospective self-reports may underestimate nightmare frequency (Robert and Zadra 2008). In a meta-analysis of 175 studies it was found that females are more likely to recall dreams than males. Females are more prone to non-fatal suicidal behaviour than males. That suggests that sex can be a confounder. Therefore, we adjusted for sex, but the association between nightmares and repeat attempt remained significant.

Another limitation is that the main outcome variable (repeat suicide attempt) is based solely on data from hospital records. While this is the only hospital serving the catchment area, some persons may have made repeat suicide attempts without seeking hospital care. Cause of death data is lacking for three deaths that we assumed to be suicides. When we redid the analyses in Papers III and IV using only non-fatal attempt as the outcome variable, this procedure yielded similar findings (results not shown).

The theoretical underpinnings of the findings may be diverse as patients with varied diagnoses were included. Previous studies show that about half of those who self-harm have more than one diagnosis (Haw et al. 2001). There is evidence that suicide attempters have biological commonalities that are independent of psychiatric diagnosis.

There was no formal testing of inter-rater reliability regarding the SCID and the SUAS. Even though the interviewers had long clinical experience and were trained together in rating sessions, there might be some lack of inter-rater reliability. The same interviewer made ratings at both time points. It may have influenced SCID and SUAS rating at follow-up, so that the interviewer at follow-up interview was influenced by the symptoms and signs from the initial interview.

Individual symptoms were self-rated, and there is some evidence that depression symptoms that are self-rated during acute depressive episodes are not reliable (Prusoff et al. 1972). The sleep disturbances identified by the USI do not fulfil formal sleep disorder criteria. In clinical practice it is important to take it seriously when patients perceive different types of symptoms regardless of whether they fulfil diagnostic criteria for a sleep disorder.

The health care system is more or less uniform in Sweden, as is the care and management of suicidal persons. It implies that the results probably can be generalized to other settings in Sweden. However, the results can not be generalized to completed suicide, as this was beyond the scope of this study.

## CONCLUSIONS

In summary the findings of the current study show that sleep disturbances are common among suicide attempters and that frequent nightmares are associated with risk for persistent suicidality and repeat attempt. SOC might be seen as a complement to suicide assessment scales, providing a basis for individualized interventions. The SUAS scale performed well as a screening instrument for future suicidal behaviour in patients who were referred to psychiatric treatment after the index attempt.

### **Clinical implications (Messages to the clinicians)**

- Questions regarding sleep disturbances and nightmares could be addressed in the clinical evaluation, care and treatment of suicidal patients.
- SOC may facilitate and deepen the dialogue between the psychiatric nurse and the suicidal patient.
- SUAS is a useful complementary tool in the risk assessment of psychiatric patients after a suicide attempt.

### **Further research**

- Prospective studies with dream logs in order to follow the association between nightmares and suicidality over time.
- Qualitative studies to analyse whether dream content differs between suicide attempters and psychiatric patients who not make suicide attempts.
- Perform intervention studies to determine whether pharmacological/psychological treatment of nightmares is followed by a reduction of suicidality in suicidal patients.
- Perform studies of psychological/psychosocial nursing interventions for suicidal patients, for example problem-solving and mindfulness therapy to examine whether these lead to increased SOC and decreased suicidality.
- Test if the SUAS scale is a useful scale to predict suicide attempt and completed suicide in larger populations and in other cultural settings.

## POPULÄRVETENSKAPLIG SAMMANFATTNING

### Bakgrund

Suicidalt beteende leder till stora konsekvenser för patienter och deras närstående. För vårdpersonal är det en tung börda att vårda suicidala patienter. Suicidalt beteende är en vanlig komplikation vid psykiatrisk störning. I Sverige tar ca 1.500 personer/år livet av sig och ca 15.000 gör suicidförsök. Död i suicid är den vanligaste dödsorsaken i åldrarna 18 – 44 år i Sverige. Det finns ingen enskild riskfaktor som är tillräcklig stark för att förutse om någon kommer att ta sitt liv. Ett antal riskfaktorer har identifierats, t.ex. tidigare suicidförsök (starkaste riskfaktorn), psykiatrisk störning och hopplöshet. Dessutom har man funnit demografiska faktorer t.ex. kön (vanligast bland män), skilsmässa, änka/änkling och arbetslöshet. Man har funnit att olika typer av sömnstörningar och mardrömmar är riskfaktorer för såväl suicid som suicidförsök. Oförmåga att lösa problem som uppstår i vardagen kan utlösa suicidalt beteende. Suicidriskbedömningar är ofta ostrukturerade, vilket kan leda till att de blir ofullständiga. Den psykiatriska sjuksköterskan kan vara en viktig person vid suicidriskbedömning och vid behandling/omvårdnad av suicidala patienter, då han/hon är mer eller mindre ständigt närvarande på psykiatriska vårdavdelningar. Det är inte helt klarlagt hur sömnstörningar påverkar suicidalt beteende och hur problemlösningsförmågan hos personer som gjort suicidförsök påverkas av upplevda depressions- och ångestbesvär.

### Syfte

Syftet med studien var att generera kunskap som kan främja förståelse och metodutveckling i suicidprevention, samt att främja ökad patientsäkerhet och individualiserad behandling/omvårdnad av suicidala patienter

Syftet i de fyra delstudierna var att:

1. Undersöka förekomst av specifika sömnstörningar hos personer som gjort suicidförsök. Vi testade om det finns ett samband mellan specifika sömnstörningar (svårt att somna, svårt att sova, tidigt morgonuppvaknande och mardrömmar) och suicidalt beteende.
2. Undersöka om de personer som rapporterar sömnstörningar och frekventa mardrömmar har en ökad risk för att göra ytterligare suicidförsök inom 2 år.
3. Undersöka sambandet mellan låg känsla av sammanhang (KASAM) och suicidalt beteende. Hypotesen var att låg KASAM i samband med suicidförsök predicerar ihållande suicidalt beteende vid 2 månaders uppföljning samt ytterligare suicidförsök inom 3 år.
4. Testa om skattningsskalan Suicide Assessment Scale (SUAS) predicerar risk för ytterligare suicidförsök inom 3 år.

## **Genomförande av studien**

Studien omfattade 165 personer (53 män, 112 kvinnor) i åldrarna 18 – 69 år som vårdades på somatiska och psykiatriska avdelningar. Vid uppföljningsintervjun efter 2 månader kom 98 personer (36 män, 62 kvinnor).

Deltagarna i studien genomgick strukturerade intervjuer med vedertaget diagnostiskt instrument och suicidskattningsinstrument inom 1 vecka efter man blivit inlagd för suicidförsök och igen efter 2 månader. Intervjuerna genomfördes av psykiatriska sjuksköterskor och en specialistläkare i psykiatri, alla med lång erfarenhet. I samband med intervjutillfällena fyllde deltagarna i självskattningsinstrument om sömnstörningar, upplevd symtomintensitet av depression och ångest och känsla av sammanhang.

Delstudie I var en så kallad tvärsnittsstudie, innebärande att vi undersökte förekomsten av och samband mellan sömnstörningar och suicidalt beteende i anslutning till att en person gjort ett suicidförsök (baseline). Delstudie III var även prospektiv, vilket innebar att personerna följdes upp efter 2 månader. Vid den studien undersökte vi om det fanns ett samband mellan låg KASAM och suicidalitet i anslutning till suicidförsöket och om det fanns ett samband mellan låg KASAM vid baseline och suicidalt beteende vid uppföljning och ytterligare suicidförsök inom 2 år. Delstudie II och IV var enbart prospektiva. I delstudie II undersökte vi om det fanns samband mellan sömnstörningar med ytterligare suicidförsök inom 2 år och i Delstudie IV testade vi om SUAS predicerade nytt suicidförsök inom 3 år.

## **Resultat**

### ***Delstudie I***

Vi fann att 89 % av deltagarna rapporterade någon form av sömnstörning. Den vanligaste rapporterade sömnstörningen var svårt att somna (73 %), följt av svårt att sova (69 %), mardrömmar (66 %) och tidigt morgonuppvaknande (58 %). Mardrömmar var relaterade till en 5-faldig risk för kvarstående suicidalt beteende. Sambandet kvarstod efter kontroll av psykiska sjukdomar, t.ex. depressions- och ångestsjukdomar samt upplevda depressions- och ångestbesvär.

### ***Delstudie II***

Det var 42 personer (26 %) som gjorde ytterligare ett suicidförsök inom 2 år. Frekventa mardrömmar var associerade med en 3-faldig ökad risk för ytterligare suicidförsök inom 2 år. Var mardrömmarna ihållande (fanns vid såväl baseline som vid uppföljning) var risken 5-faldig. Riskökningen kvarstod efter kontroll av kön, psykisk sjukdom och upplevda depressions- och ångestbesvär. Vi fann ingen riskökning om man rapporterade att man hade svårt att somna, svårt att sova eller tidigt morgonuppvaknande.

### ***Delstudie III***

Den studerade populationen hade låg känsla av sammanhang. Personer med egentlig depression hade lägre KASAM jämfört med de övriga. Låg KASAM vid baseline var relaterat till en nästan 7-faldig risk för kvarstående suicidalt beteende. Angav patien-

terna att de hade låg KASAM vid både baseline och uppföljning var sambandet mer än 8-faldig. Sambanden kvarstod efter kontroll av kön, depression och upplevda depressions- och ångestbesvär. Det kunde inte påvisas något samband mellan låg KASAM och ytterligare suicidförsök inom 3 år.

#### ***Delstudie IV***

Hög SUAS i samband med suicidförsöket var relaterat till 4-faldig ökad risk för ytterligare suicidförsök. SUAS förmåga att predicera ytterligare suicidförsök fungerade bättre på de personer som hade pågående psykiatrisk behandling jämfört med de som inte hade det.

#### **Resultatens betydelse i arbetet med suicidala patienter.**

Vid den kliniska bedömningen och behandlingen av suicidala patienter är det viktigt att uppmärksamma sömnstörningar. KASAM kan vara ett verktyg för den psykiatriska sjuksköterskan för att underlätta och fördjupa dialogen med suicidala patienter. SUAS är ett användbart kompletterande instrument vid bedömning av personer som gjort suicidförsök.



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