



ORIGINAL ARTICLE

# Become your own SLEEPexpert: design, implementation, and preliminary evaluation of a pragmatic behavioral treatment program for insomnia in inpatient psychiatric care

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## Abstract

**Study Objectives:** The majority of patients with mental disorders suffer from insomnia, associated with adverse health outcomes. Cognitive behavioral therapy for insomnia (CBT-I) represents the first-line treatment, but is too complex for severely ill patients and not systematically implemented in inpatient psychiatric care. This project aimed to develop a pragmatic behavioral treatment program that empowers inpatients with severe mental disorders to take care of their own sleep health.

**Methods:** CBT-I was adapted based on implementation research involving 24 inpatients with psychiatric disorders across diagnostic entities and comorbid insomnia and 30 health care providers at the University Hospital of Psychiatry and Psychotherapy, Bern. The program was implemented and evaluated by 15 patients and 22 health care providers based on interviews and questionnaires before participation and prior to discharge.

**Results:** Implementation research resulted in the SLEEPexpert intervention, centering on bedtime restriction and circadian adaptation in three phases; therapist-guided treatment initiation, self-management with nursing support, and self-management. Evaluative pre-post assessments in 15 patients demonstrated feasibility. Time in bed decreased by 60 minutes ( $520 \pm 105.3$  vs.  $460 \pm 78.1$ ,  $p = 0.031$ ,  $d = 0.6$ ) and total sleep time increased by around 45 minutes ( $331 \pm 110.6$  vs.  $375 \pm 74.6$ ,  $p = 0.09$ ,  $d = 0.5$ ), resulting in increased sleep efficiency ( $65.3 \pm 21.8$  vs.  $81.9 \pm 11.2\%$ ,  $p = 0.011$ ,  $d = 0.8$ ). Patients improved on the Insomnia Severity Index ( $18.3 \pm 4.6$  vs.  $11.4 \pm 4.4$ ,  $p < 0.001$ ,  $d = 1.2$ ) and Pittsburgh Sleep Quality Index ( $12.9 \pm 3.8$  vs.  $10.3 \pm 3.3$ ,  $p = 0.031$ ,  $d = 0.6$ ).

**Conclusions:** We propose a new pragmatic behavioral treatment program (SLEEPexpert) customized to the needs of patients and health care providers in inpatient psychiatric care. Data demonstrate feasibility. An improvement of insomnia severity was observed, but a control comparison is needed to further test for efficacy.

## Statement of Significance

We propose a novel pragmatic behavioral treatment program for insomnia customized to the needs of patients with severe psychiatric disorders. The program translates current treatment guidelines for insomnia to inpatient psychiatric care. It aims to empower patients to take care of their own sleep health (“Become your own SLEEPexpert”) and offers an alternative to common medical practice, often comprising (over) treatment with pharmacotherapy. Given the high burden of comorbid insomnia in psychiatry, further developments might be of health relevance.

**Key words:** insomnia; psychiatric inpatients; behavioral therapy; implementation research; empowering patients

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## Introduction

Mental disorders are among the leading causes of reduced quality of life due to illness worldwide [1]. The majority of patients with mental disorders suffer from insomnia symptoms [2], and around one-third meet diagnostic criteria for insomnia disorder (ID) [3]. ID is defined by difficulties falling asleep, staying asleep, or early morning awakening associated with impaired daytime functioning over a period of at least 3 months [4]. Comorbid ID has been shown to worsen the course of mental disorders and to reduce quality of life [5]. Current guidelines identify cognitive behavioral therapy for insomnia (CBT-I) as first-line treatment, usually composed of education, relaxation, behavioral change, and cognitive components [6].

Various adaptations of CBT-I for different target groups and settings have already been developed. The Brief Behavioral Treatment for Insomnia (BBT-I), for example, centers on bedtime restriction [7]. BBT-I has proven similarly effective as the complete program for patients with primary insomnia, somatic comorbidity, or minor psychiatric comorbidity [8]. Preliminary work in patients with major psychiatric comorbidity suggested feasibility and efficacy of a CBT-I-based psychological sleep treatment in outpatient [9] and inpatient settings [10, 11]. However, other work described insurmountable obstacles for implementing bedtime restriction in inpatient psychiatric care, such as limited cooperation of patients and insufficient health

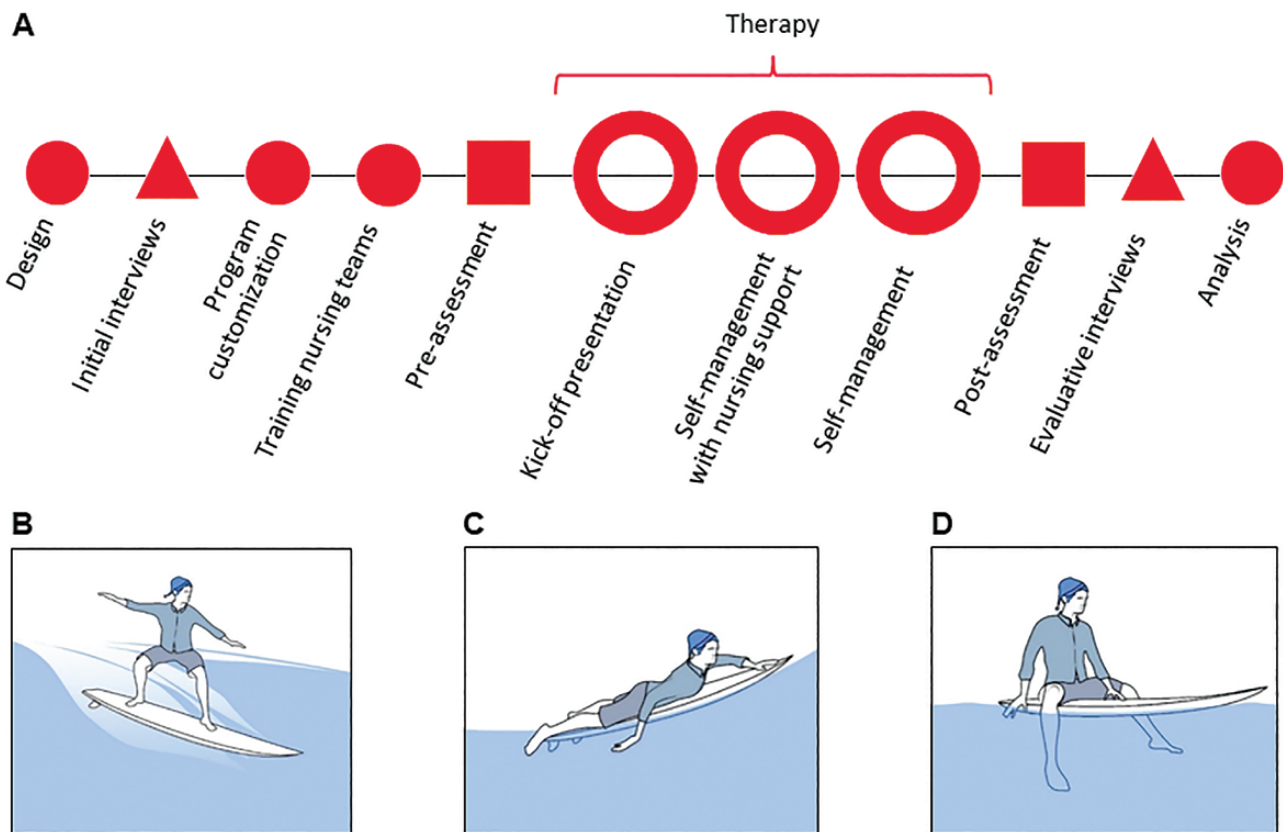
care resources on the investigated wards [12]. Together, psychological sleep treatments have not been sufficiently adapted to the particular needs of inpatients with severe psychiatric disorders, often characterized by substantive cognitive, emotional, and behavioral problems [13]. Rather, insomnia in inpatient psychiatric care often remains untreated or overtreated with hypnotics, which bears the risk of adverse effects and dependency.

The current project aimed to develop a pragmatic behavioral treatment program that empowers inpatients with severe mental disorders to take care of their own sleep health (“*Become your own SLEEPexpert*”). The specific aims were to (1) adapt CBT-I to the needs of patients and health care providers in inpatient psychiatric care, (2) implement the program on psychiatric wards, and (3) provide pilot data on the feasibility of the program and changes in sleep and mental health.

## Methods

### Participants

Twenty-four patients hospitalized due to acute psychiatric disorders and suffering from comorbid insomnia as well as 30 health care providers, including medical doctors, nurses, and psychologists across levels of experience, were involved in the development of the program (see Figure 1, A for an overview

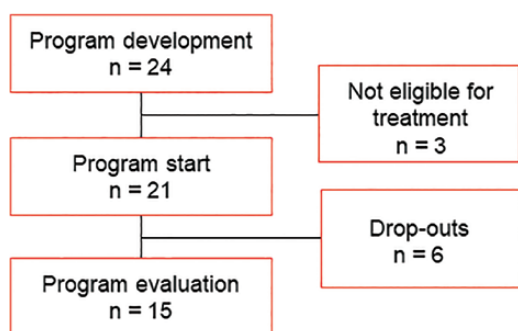


**Figure 1.** Process and SLEEPexpert treatment components. (A) The SLEEPexpert development phase included design thinking, interviews of patients and health care providers, iterative adaptations to the specialized behavior treatment program and training of the nursing teams. The program consists of three phases: (1) Kick-off presentation: a therapist-guided treatment initiation, (2) Self-management with nursing support: nurse-assisted self-management of the implementation of sleep-related behavioral change, and (3) Self-management. (B–D) Surfer imagery used for simple visualization of sleep processes. (B) Sleep pressure (wave) needs to be built up prior to sleep (surf). (C) Insufficient buildup results in an inability to sleep (surf). (D) Finally, the right point in time or circadian phase is critical for successful sleep onset (condition of wave).

**Table 1.** Demographic and clinical characteristics of patients

	Program start (n = 21)	Program evaluation (n = 15)
Sex	13 F, 8 M	9 F, 6 M
Age (years)	36.2 ± 13.8 (19;59)	41.7 ± 12.6 (19;59)
Primary diagnosis (ICD-10)	10F1; 3F2; 11F3; 3F4; 3F5; 4F6; 1F9	9F1; 2F2 10F3; 2F4; 3F5; 1F6; 1F9
Patients with psychiatric comorbidities (n)	13	9
Duration of mental disorder (years)	13.9 ± 13.4 (1;49)	15.1 ± 15.6 (1;49)
Duration of current hospitalization (days)	49.1 ± 37.6 (7;151)	58.2 ± 38.7 (7;151)
Number of prior hospitalizations (n)	3.6 ± 4.5 (0;20)	3.3 ± 2.6 (0;8)
History of substance use disorder (%)	62%	60%
History of suicide attempts (%)	43%	40%
History of self-harm (%)	38%	27%
Duration of insomnia (years)	13.6 ± 15.3 (0.1;50)	16.2 ± 16.9 (0.5;50)

Data represent means ± SD or frequencies. F, female. M, male. F1, substance use disorder. F2, schizophrenia, schizotypal, and delusion disorders. F3, mood (affective) disorders. F4, neurotic, stress-related, and somatoform disorders. F5, behavioral syndromes associated with physiological disturbances and physical factors. F6, disorders of adult personality and behavior. F9, Attention deficit hyperactivity disorder according to ICD-10: international statistical classification of diseases and related health problems: tenth revision. World Health Organization, 2004. Data is based on clinical records and interviews.

**Figure 2.** Flow of patients from program development to evaluation.

of the program development). Twenty-four patients fulfilling diagnostic criteria according to DSM-5 for comorbid ID or acute ID were recruited and provided written informed consent. Clinical interviews revealed no symptoms of other sleep disorders than insomnia. Of particular note, minimal exclusion criteria, such as severe cognitive deficits or acute drug intoxication, were determined to ensure a typical sample of inpatients with acute psychiatric disorders. Demographic and clinical characteristics are listed in [Table 1](#). As indices of severity, most patients had more than one psychiatric diagnosis and a high burden of disease, such as acute hallucinations or a history of suicide attempts. Three patients were excluded based on clinical judgment by the responsible senior physician (difficulties participating in the group session due to severe restlessness, catatonia with motor inhibition, and severe acoustic hallucinations). Patients received treatment as usual, including pharmacotherapy informed by current guidelines, adapted to individual needs ([Supplementary Table 1](#)). Six patients were not available to report on their clinical experience due to discharge according to standard clinical procedures, pointing to challenges of implementation in an acute psychiatric setting. Fifteen patients took part in program evaluation (see [Figure 2](#) for flow of patients).

The clinical treatment development was reviewed by the Bernese Ethics Committee (BASEC-Nr. Req-2020-00340). Clarification of responsibility concluded that the present work is a clinical development project and did not require ethical approval.

## Implementation research

Implementation research strategies [14] aiming at decreasing the know-do gap were used to promote the translation of CBT-I components into inpatient psychiatric care. Patients and health care providers were involved to ensure a shared concept and feasibility. As [Figure 1](#) illustrates, this included design thinking, qualitative-quantitative analyses of semi-structured interviews, training of the nursing teams [15] and iterative adaptations of the treatment program based on consultations with participants, information from social media mining, clinical expertise of the authors, and recommendations from international experts [16].

## Assessments

### Semi-structured interviews

Initial interviews were conducted with 24 patients and 30 health care providers. Guidelines for this interview were informed by clinical experience from authors with different levels of clinical experience (CLS, master student; EH, clinical psychologist; CN, chief physician). Interviews with patients and health care providers comprised common and group-specific questions exploring underlying beliefs and attitudes towards insomnia (e.g. relevance of insomnia and preferences for treatment). For a detailed description of the interview guidelines, please refer to [Supplementary Document 1](#). Evaluative interviews with patients (n = 15) and health care providers (n = 22) after participation in the program intended to give insight to the treatment's feasibility. Evaluative guidelines were compiled from a treatment satisfaction questionnaire and a qualitative research paper investigating patients' treatment experiences [17].

Interviews were audiotaped, transcribed, and analyzed according to qualitative content analysis as described by Mayring [18]. A mixed procedure was selected, combining basic procedures of inductive and deductive analysis. A coding guideline was developed, including typical anchor examples defining the categories. Interview recordings were transcribed by the first author following a combination of the selective and comprehensive protocol system in order to limit transcription only to material relevant for the current investigation. Category scoring was checked and discussed with the second and last author. Finally, the text was coded by material fulfilling pre-defined

categories. Inductive category formation allowed for additional categories to be formed when new themes emerged during the coding process.

#### Sleep diary

Patients were asked to keep a standard sleep diary throughout participation [19].

#### Questionnaires

Patients were given standard questionnaires before the intervention and prior to discharge (days  $17.9 \pm 6.7$ ). This included the *Insomnia Severity Index* (ISI [20]), the *Pittsburgh Sleep Quality Index* (PSQI [21]), and the *Brief Symptom Inventory* (BSI-18 [22]). Treatment adherence was measured through monitoring of patients' estimated time in bed (TIB) and total sleep time (TST).

#### Data analysis

Means and standard deviations are reported as descriptive values. Paired-samples t-tests compared pre-post values and effect size estimates are reported. Data was analyzed using SPSS (version 26).

## Results

### Initial interviews

Qualitative content analyses of initial interviews in 24 patients resulted in four categories best representing the data (Figure 3). The interviews highlighted insomnia to be a highly relevant topic (Panel A) and a preference for non-pharmacological insomnia treatment (Panel B). Most patients believe their mental disorder to be a possible source of their insomnia, followed by

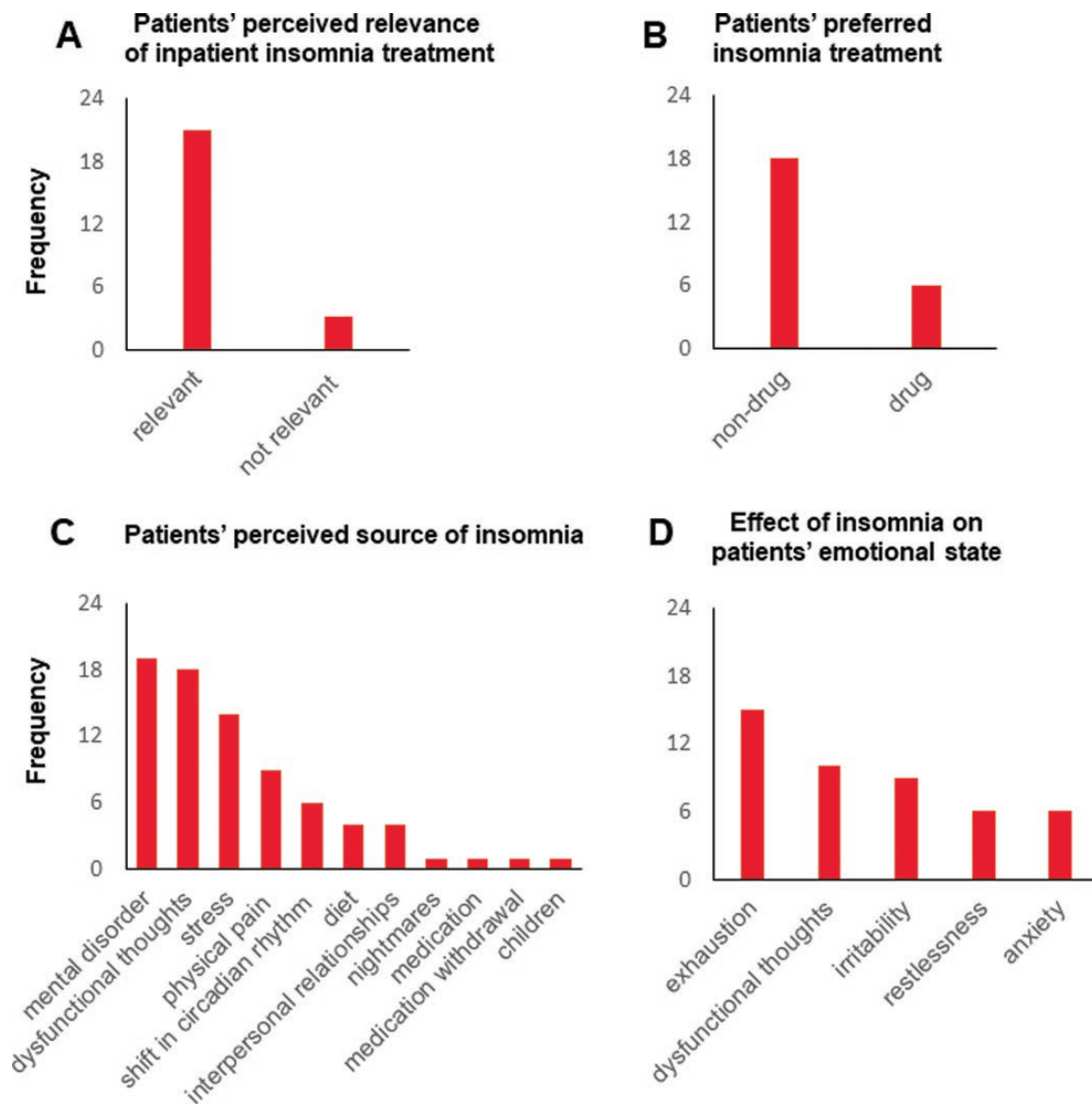
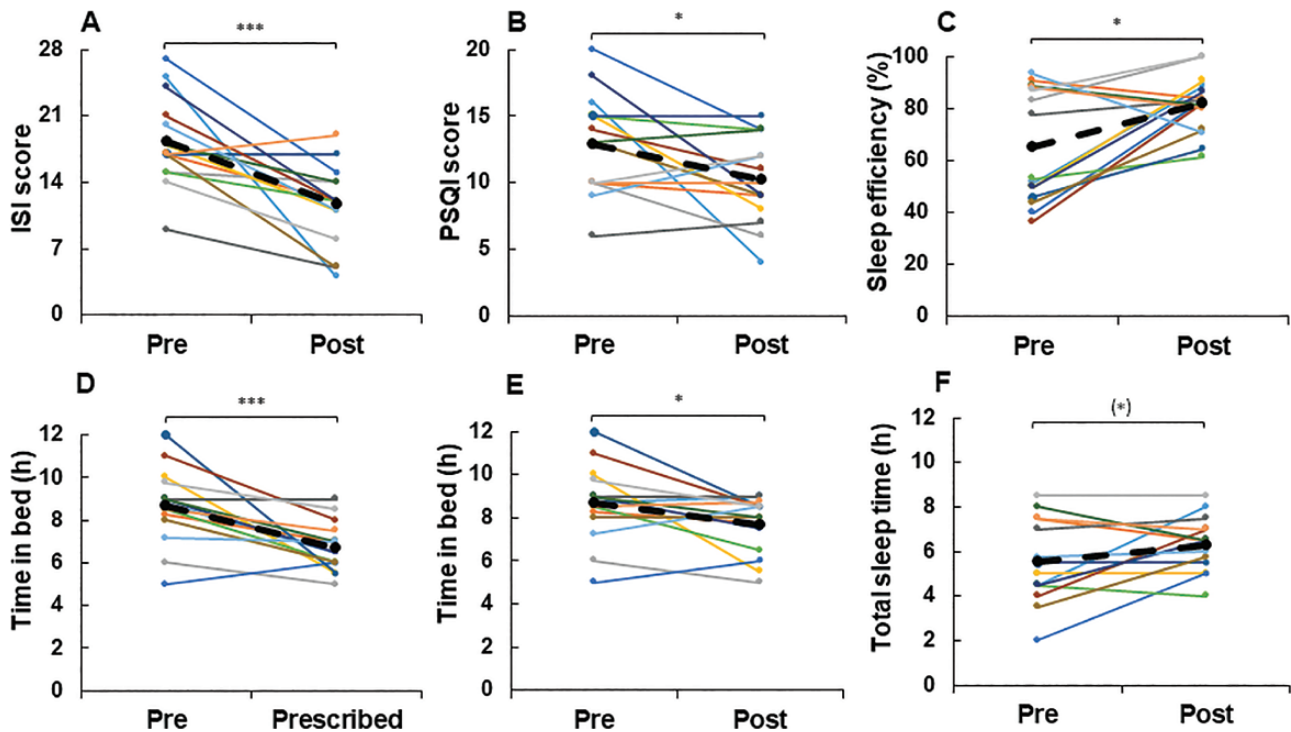


Figure 3. Initial interviews. Histogram panels represent relevant themes mentioned by inpatients during the interview prior to treatment. Interview material was coded into pre-defined categories. Bars represent frequencies of mentioned subcategories within a category (Panels A-D).



**Figure 4.** Quantitative results. Colored lines represent the same individual patient ( $n = 15$ ) across panels. Bold black dotted line represents the change in mean score of each respective measure. (A) Insomnia Severity Index (ISI). ISI score  $\geq 8$  suggests clinically relevant insomnia. \*\*\* $<0.001$  ( $d = 1.2$ ). (B) Pittsburgh Sleep Quality Index (PSQI). PSQI score  $\geq 5$  indicates limited sleep quality. \* $0.031$  ( $d = 0.6$ ). (C) Sleep efficiency, \* $0.01$  ( $d = 0.8$ ). (D) Time in bed (TIB) as reported prior to the intervention and prescribed in the kick-off session. \*\*\* $<0.001$  ( $d = 1.3$ ). (E) TIB as reported prior to and after the intervention. Please note that the similarity to panel D indicates adherence to the prescribed sleep window. \* $0.031$  ( $d = 0.6$ ). (F) Total sleep time (TST) reported prior to and after the intervention derived from the PSQI. \* $<0.1$  ( $d = 0.5$ ). T-tests for paired samples are reported.

dysfunctional thoughts (“I can’t stop ruminating during bedtime”) and stress (“I feel a constant pressure is the biggest burden on me”) (Panel C). Furthermore, the majority of patients reported exhaustion as a result of insomnia affecting their emotional state, followed by dysfunctional thoughts and irritability (Panel D). When asked what they expected from a specialized insomnia treatment, almost all patients expressed a need for help “beyond tips and tricks in form of sleep hygiene.”

Initial interviews in 30 health care providers emphasize the need for a specialized insomnia treatment due to the high prevalence, negative impact, and additional work-load insomnia poses on daily ward routines. Furthermore, the overall success of standard treatment is perceived to be limited due to patients’ extended bedtimes. A broad consensus amongst health care providers was the wish to reduce overtreatment with sleep medication; however, they felt a lack of alternative due to limited resources (available non-medicinal treatment, knowledge, and training). The nursing team reported confidence in the feasibility of integrating pragmatic treatment components into a daily ward routine (two brief interactions with each patient each week), as well as pointing to challenges such as patient adherence.

#### “Become your own SLEEPexpert”: the intervention

Implementation research resulted in a pragmatic treatment program (“Become your own SLEEPexpert”) customized to the needs of inpatients and health care providers in inpatient psychiatry. To secure integration of the program, SLEEPexpert was designed

to function with existing resources on psychiatric wards. We aimed to make SLEEPexpert as compact and simple as possible, comprising the most promising components based on current literature. SLEEPexpert therefore centers on two evidence-based and feasible treatment components, bedtime restriction, and circadian adaptation. The human sleep-wake cycle is governed by two principle regulatory processes. Bedtime restriction addresses the homeostatic process and represents the single most effective treatment component of CBT-I [23]. Circadian adaptation, that is, the adaptation of bedtime to the individual chronotype, addresses the circadian process. Other components of CBT-I were not selected. Specifically, sleep hygiene has been widely implemented in inpatient settings without sufficient therapeutic effects. Moreover, relaxation training and cognitive restructuring are challenging, resource intense, and not suited for all patients due to, for instance, high levels of anxiety or prior trauma exposure.

SLEEPexpert was designed to include three phases; (1) A therapist-guided treatment initiation (Kick-off presentation) consisting of a 45-minute group therapy session, including a simplified introduction of homeostatic and circadian sleep-wake regulation, the derived interventions (bedtime restriction and circadian adaptation), the self-management concept and general sleep advice. Bedtime restriction was operationalized as an individualized sleep window (i.e. set bedtime) determined in two steps: (1) adapting the time in bed to the duration the patient usually spends asleep at night (e.g. 6 h; never  $< 5$  h) and (2) positioning the sleep window respectful of the individual’s chronotype (e.g. 11 pm–5 am for early types, 1–7 am for late

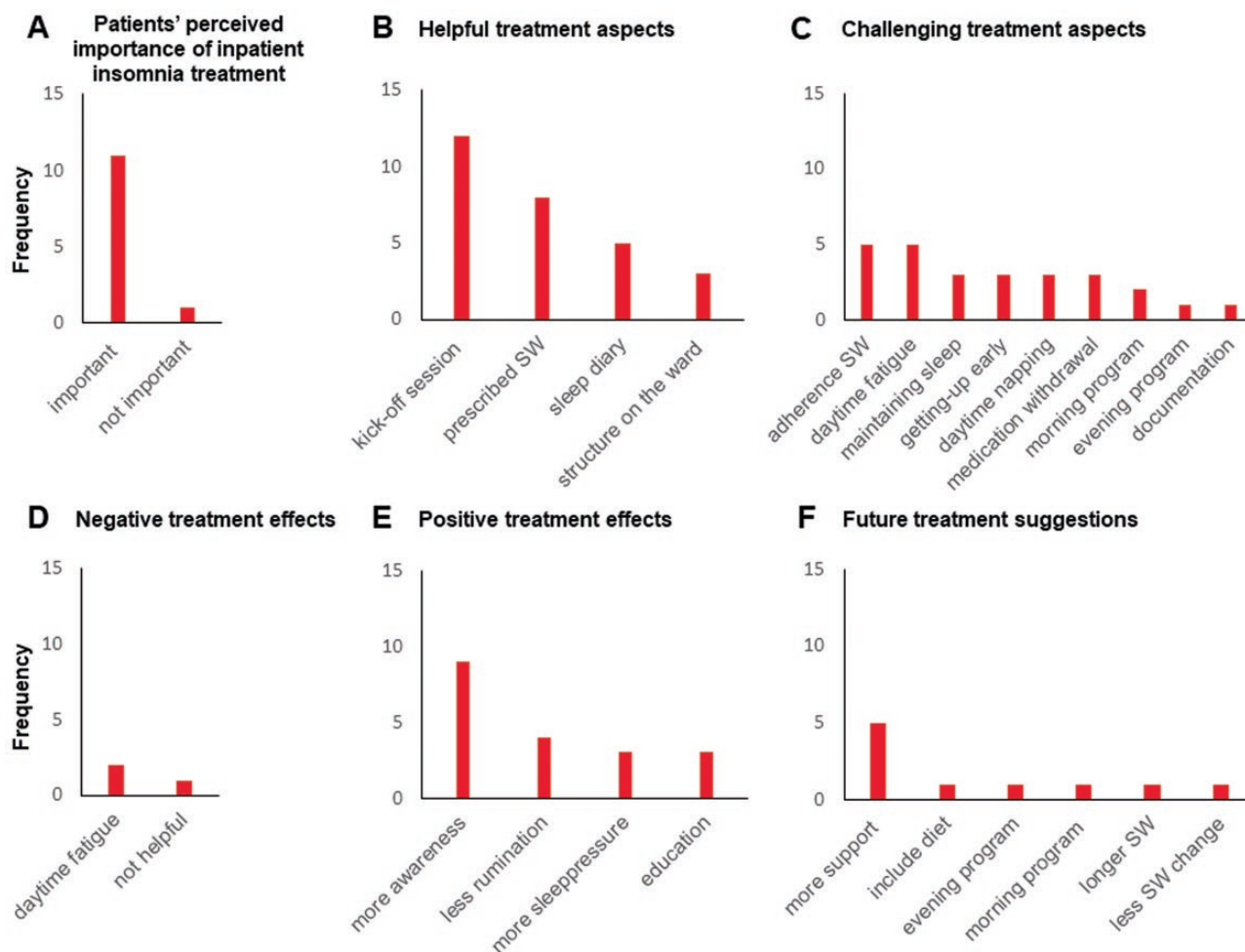


Figure 5. Evaluative interviews. Histogram panels represent themes relevant to the investigation mentioned by inpatients during the evaluative interview following treatment. Interview material was coded into pre-defined categories. Bars represent frequencies of mentioned subcategories within a category (Panels A–F).

types). In contrast to standard procedures (sleep window based on sleep diary entries over a 2-week period), the sleep window here was determined during the kick-off session based on patient reports and therapist feedback (TIB, TST, chronotype, etc.) to circumvent substantial delays in the acute care setting. The individual sleep window was then prescribed by a physician and documented in the electronic patient record. Of note, the therapeutic content is presented in simple language and metaphors, such as the sleep surfer. This metaphor allows for uniform explanation of both homeostatic and circadian aspects of sleep regulation to patients (Figure 1, B–D).

(2) *Patient self-management with nursing support* constitutes the second phase. Broad clinical experience in inpatient psychiatric care point to the importance of patient empowerment by health care providers, making coaching by nursing teams an essential treatment component. Nurse-assisted self-management therefore included two brief (1–10 min) individual interactions with each patient per week (and additional advice according to clinical routines). These interactions centered on explanation, motivation, and adaptation of the sleep window, as well as preparing the patient for independent self-management. The contact used existing resources, ensuring implementation into routine care. *SLEEPexpert* serves to guide the contact between health care providers and patients with insomnia, thereby

reducing the need of turning to hypnotics when patients report difficulties falling asleep. The individually prescribed sleep window can be adjusted through evaluation of the sleep diary and in accordance with the patient. The sleep window can be prolonged or shortened by 30 minutes, if sleep efficiency (total sleep time/time in bed  $\times$  100) is  $\geq 90\%$  or  $< 90\%$ , respectively [6]. (3) *Patient self-management* of sleep-related behavior constitutes the final phase and may also commence at discharge from the psychiatric hospital.

### Feasibility and observation of sleep-related improvement

As depicted in Figure 4, both ISI (Panel A,  $18.3 \pm 4.6$  vs.  $11.4 \pm 4.4$ ,  $t(14) = 4.5$ ,  $p < 0.001$ ,  $d = 1.2$ ) and PSQI scores (Panel B,  $12.9 \pm 3.8$  vs.  $10.3 \pm 3.3$ ,  $t(14) = 2.4$ ,  $p = 0.031$ ,  $d = 0.6$ ) significantly decreased from pre- to post-assessments ( $n = 15$ ). ISI cutoff scores (Panel A) indicate that all patients suffered from insomnia (score  $\geq 8$ ) at pre-assessment, with most categorized as moderately severe to severe insomnia (score  $\geq 15$ ). At post-assessment, most patients scored below clinically relevant insomnia, with three scoring below the insomnia subthreshold (score  $\leq 8$ ). Panel C shows an increase of sleep efficiency from pre- to post-assessment (SE,  $65.3\% \pm 21.8$  vs.  $81.9\% \pm 11.2$ ,  $t(14) = -2.9$ ,  $p = 0.011$ ,  $d = 0.8$ ).

**Table 2.** Evaluative quotes from patients and health care providers

Patients
<i>"I think it is very encouraging to see that there are people who take my problem (insomnia) seriously and support you throughout (therapy)."</i>
<i>"I did not expect that something as simple as a sleep window could alleviate the stress from having to sleep."</i>
<i>"Through the bedtime restriction, I don't ruminate in bed as much as I used to."</i>
<i>"It is difficult to stay awake and keep myself occupied in the evenings, especially in the hospital."</i>
<i>"I have been suffering from insomnia all my life, probably already in my mother's womb. My anxiety towards sleep has since haunted me like an evil spirit. SLEEPexpert shed light on the spirit - and as spirits do, it dissolved in the light."</i>
Health care providers
<i>"I especially liked the sleep window, I think this is a great treatment component."</i>
<i>"We appreciated the knowledge and experience that the program brought to the ward and the nursing team."</i>
<i>"SLEEPexpert was easy to understand and viable."</i>
<i>"We would recommend SLEEPexpert to other wards."</i>
<i>"Motivated patients are more likely to profit from the program."</i>
<i>"The biggest challenge was making the program compatible with the daily structure on the ward."</i>

Quotes have been translated from German to English.

Importantly, data deduced from the PSQI indicates adherence to the prescribed sleep window (Panel D and E). The reported TIB decreased by about 60 minutes (Panel E,  $520 \pm 105.3$  vs.  $460 \pm 78.1$ ,  $t(14) = 2.4$ ,  $p = 0.031$ ,  $d = 0.6$ ), while TST (Panel F) increased by around 45 minutes ( $331 \pm 110.6$  vs.  $375 \pm 74.6$ ,  $t(14) = -1.8$ ,  $p = 0.09$ ,  $d = 0.5$ ). The BSI-18 (data not visualized) showed non-significant difference ( $29.1 \pm 13.7$  vs.  $24.0 \pm 14.4$ ,  $t(14) = 2.1$ ,  $p = 0.055$ ,  $d = 0.5$ ).

Analyses of pharmacotherapy concluded no systematic increase in sedative medication based on physician judgment (Supplementary Table 1). Seven patients had no change in medication; four patients had an increase in dosage; four patients received a decreased dosage with two successfully undergoing benzodiazepine withdrawal during the time of observation.

### Evaluative interviews

Qualitative content analyses of the evaluative interviews prior to discharge ( $n = 15$  patients) resulted in six categories best representing the data (Figure 5). The data acquired after the intervention shows that most patients perceived sleep therapy as important (Panel A). The therapist-guided treatment initiation, including the individually prescribed sleep window, was judged as the most helpful component (Panel B). Few patients reported challenging treatment effects (Panel C and D). The majority reported an increase in their awareness towards their sleep-wake rhythm, followed by a decrease in bedtime rumination (Panel E). Our observations confirmed that severely ill patients require substantive support, especially in dealing with adherence to the prescribed sleep window and daytime fatigue (Panel C and F). The health care providers reported that the overall additional effort surrounding SLEEPexpert was feasible, however, more extensive with severely affected patients. Table 2 provides quotes illustrating the evaluation of patients and health care providers.

### Discussion

The main outcome of our project is the design and implementation of a novel pragmatic treatment program for insomnia in inpatient psychiatric care ("Become your own SLEEPexpert"). This extends prior work that mostly centered on insomnia in

the absence of severe mental disorders. The development appears to be relevant since most patients with severe mental disorders suffer from comorbid insomnia. Our own clinical experience and data, in line with other work, shows that insomnia is often treated with hypnotics, comprising benzodiazepines or benzodiazepine receptor agonists, associated with the risk of tolerance and dependency. Our work shows that patients, some of them suffering from acute hallucinations or suicidality, as well as health care providers on psychiatric wards show a strong interest in non-pharmacological treatment options. Of note, we show feasibility of implementation with existing resources in inpatient psychiatric care. The heterogeneity of the sample could indicate treatment feasibility across a broad spectrum of psychiatric disorders, yet further differentiation in terms of diagnosis was not feasible due to a small sample size.

The reported reduction of time in bed, increase of total sleep time and increase of sleep efficiency suggest an overall trend towards an improvement in insomnia severity and sleep continuity, although the PSQI as our measure for adherence offers a low resolution. Activity tracking was deemed less suitable due to the limited distinction of sleep from inactivity, common for patients with severe mental disorders [12]. Since the majority of patients reported chronic insomnia that withstood many years of treatment (insomnia duration > 10 years, intermittent/persistent insomnia not defined), the observed improvement might at least partly be attributed to the SLEEPexpert intervention. The adjustments made to the medication regimen suggest that the effects cannot be fully attributed to pharmacotherapy (Supplementary Table 1). Evaluative interviews provided information about challenges in the hospital environment, rarely addressed in research. This included routines such as early dinner times (6 pm) and reduced activity opportunities in the evening, complicating adherence to delayed and restricted bedtimes. A supportive nursing team appears pivotal in supporting behavioral change.

The current treatment development represents an early step in the research-translation pathway. Future studies are required to investigate the mechanisms of sleep restriction therapy [24]. Importantly, future randomized, controlled, and powered trials are needed to test for safety and efficacy on insomnia and, potentially other health-related outcomes. Follow-up assessments

are required to shine light onto the effectiveness of the treatment program after discharge of the clinic.

Together, the described line of research aims to result in a novel sleep-centered intervention that has the potential to be further implemented and disseminated in inpatient psychiatric care. An idea here is for clinicians to have the possibility to prescribe a pragmatic non-pharmacological treatment package, as they would prescribe medication. We believe that the hospital stay represents a window of opportunity to reach out to patients who are otherwise difficult to support. *SLEEPexpert* could be considered as a starting point of a treatment chain, equipping severely ill patients with tools for self-management of their sleep-wake behavior. This self-management of sleep-wake behavior could be supported by a smart-phone application in the future. Given the substantive burden of mental disorders and comorbid insomnia, further developments may fill the know-do gap and advance the management of insomnia in inpatient psychiatric care.

## Supplementary material

Supplementary material is available at *SLEEP Advances* online.

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## Disclosure Statement

None declared.

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