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Adolescent self-harm with and without suicidality: cross-sectional and longitudinal analyses of a Swedish regional register

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Background: Self-harm is common and there is a need for studies that investigate the relevance of this behavior in clinical samples to inform risk assessment and treatment. The objectives in the current studies were to compare clinical and psychosocial correlates and subsequent adverse outcomes in youth who present to child and adolescent mental health services (CAMHS) with self-harm only (SH), self-harm with suicidality (SH+SU), with those without any indication of SH or SH+SU. **Methods:** We conducted a case–control study and a longitudinal cohort study using data from a regional clinical care register, and Swedish national registers. The case–control study included all patients (5–17 years) between 2011 and 2015 (N = 25,161). SH and SH+SU cases were compared with controls (patients without SH) regarding a range of correlates. The longitudinal study included former CAMHS patients (N = 6,120) who were followed for a median time of 2.8 years after termination of CAMHS contact regarding outcomes such as clinical care consumption, social welfare recipiency, and crime conviction. **Results:** In the case–control study, both the SH and SH+SU groups received more clinical care, had lower global functioning, and higher odds of having mental disorders compared to controls. In most comparisons, the SH+SU group had more problems than the SH group. In the longitudinal study, the same pattern emerged for most outcomes; for example, the adjusted hazard ratio for recurrent care due to self-harm was 23.1 (95% confidence interval [CI], 17.0–31.4) in the SH+SU group compared to 3.9 (95% CI, 2.3–6.7) in the SH group. **Conclusions:** Adolescent patients presenting with self-harm have higher risks for adverse outcomes than patients without self-harm. Suicidality in addition to self-harm is associated with more severe outcomes, importantly recurrent episodes of care for self-harm. **Keywords:** Self-harm; self-injurious behavior; suicidal ideation; epidemiology; cohort study.

Background

Nonfatal intentional self-harm (SH) is a major global health challenge that includes acts such as self-cutting and poisoning, with or without suicidal motives (Hawton et al., 2003). It has been debated whether it is meaningful, or even possible, to distinguish self-harm without suicidal intent from suicide attempts (Kapur, Cooper, O'Connor, & Hawton, 2013; Nock, Prinstein, & Sterba, 2009). However, the Diagnostic and Statistical Manual of Mental Disorders, 5th ed. (DSM-5; American Psychiatric Association, 2013) includes nonsuicidal self-injury disorder as a condition for further study.

Prior research (Hargus, Hawton, & Rodham, 2009; Mars, Heron, Crane, Hawton, Kidger et al., 2014; Mars, Heron, Crane, Hawton, Lewis et al., 2014 Wichstrom, 2009) has demonstrated that individuals who engage in SH without suicidal intent share many features with those who have attempted suicide (e.g., mental health problems, familial/nonfamilial social problems, physical abuse), but associations are generally stronger for SH with suicidal intent. For example, those with SH with suicidal intent have elevated odds of depression and anxiety, compared to those harming themselves without suicidal motives (Mars, Heron, Crane, Hawton, Kidger et al., 2014). SH with unclear intent has also been shown to be a risk factor of future suicide, affective and anxiety disorders, psychiatric inpatient care and psychotropic medication (Beckman et al., 2016), substance dependence (Beckman et al., 2016; Moran et al., 2015), violence (Sahlin et al., 2017), and labor market marginalization (Mars, Heron, Crane, Hawton, Lewis et al., 2014). To our best knowledge, there is only one longitudinal comparison between individuals with nonsuicidal and suicidal SH (Mars, Heron, Crane, Hawton, Lewis et al., 2014), showing that both groups were at increased risk of several adverse outcomes, but the suicidal SH group were generally at greater risk. If individuals with SH-only (SH) and self-harm with suicidality (SH+SU) differ in terms of clinical correlates and adverse outcomes this should inform both risk assessment and treatment. Furthermore, more knowledge in this regard would bring the field forward

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in terms of diagnostic and phenomenological clarity. However, research (e.g., Hargus et al., 2009; Mars et al., 2014; Mars et al., 2014; Wichstrom, 2009), focusing on the potential differences between non-suicidal SH and suicidal SH have been based on relatively small samples, and/or limited in scope in terms of studied correlates and outcomes. Thus, large studies addressing a range of correlates and outcomes within this field would potentially expand the knowledge base. The aim of this study was to compare the clinical and psychosocial correlates, and subsequent adverse outcomes of youths who present to the child and adolescent mental health services (CAMHS) with SH, SH+SU, and adolescents without any indication of SH or SU (i.e., neither SH or SH+SU).

Methods

Study design

We conducted two studies; a cross-sectional case–control study (Study 1) and a longitudinal clinical cohort study (Study 2) among present and former patients at the CAMHS, which combined data from clinical and national registers in Sweden. Data on all those who seek help at CAMHS, which provides specialist-level psychiatric care for inhabitants under 18 years of age in Stockholm County are documented in a regional clinical register; Pastill. Apart from the public CAMHS, there are private caregivers who are commissioned by the County Council, but approximately 90% of the care budget goes to the CAMHS. The Pastill Register was introduced in 1999, and complete data, including contact reason, treatment provided, mental disorders according to the International Statistical Classification of Diseases and Health-Related Problems, Tenth Revision (ICD-10), psychotropic medications, psychosocial problems, and global functioning, are available from 2001. Data on SH and SU as contact reasons have been available since 2011. As part of their clinical routine, the CAMHS staff (psychiatrists, psychologists, and social workers) complete a mandatory registration at patient intake and treatment termination in which they document one or several predefined reasons for contact using a checklist, including 'self-harm' (SH) or 'suicidal ideation, threats and behaviors' (SU).

The Pastill Register was linked to national registers by using the personal identification number assigned to all Swedish residents at birth or immigration. The national registers included the National Patient Register, which covers data on psychiatric inpatient care from 1973 and outpatient care from 2001, and the Prescribed Drug Register that contains information on all prescribed and dispensed drugs since 2005. We also used the National Crime Register that contains information on all criminal convictions in Swedish lower courts since 1973, and the Register of Persons Suspected of Offenses that is a registry of suspicion of a crime after completed investigation by police or other authority. Further, the Multi-Generation Register that contains data on family relations was used. Finally, we used the Longitudinal Integration Database for Health Insurance and Labor Market Studies (LISA) that contains information on education and occupation. Research ethical approval was obtained from the Stockholm Regional Ethics Committee (2013/862:31/5).

Study 1: cross-sectional case–control study

Sample. Participants were all patients between 4 and 18 years that had been in clinical contact with the CAMHS from January 1, 2011, through December 31, 2015 (N = 25,161).

Definitions of cases and controls. Cases were defined as: (a) presenting with SH without any indication of SU, or (b) having at least one SH and at least one SU as contact reason at one or more occasions during 2011–2015. These formed two separate mutually exclusive case groups: SH (N = 1,027) and SH+SU (N = 1,099). Controls were all patients who had been in contact with the CAMHS for other reasons than SH or SU during 2011–2015 (N = 21,119).

Measures. Clinical care consumption was measured as total number of outpatient visits (including counseling and psychotherapy), and number of psychiatric admissions to, including number of nights in inpatient care at any of the CAMHS units between 2011 and 2015.

Global functioning was rated with the Children's Global Assessment Scale (CGAS; Shaffer et al., 1983). CGAS is a psychometrically valid clinician-rated instrument used for assessing outcome in both research and clinical settings. The CGAS ranges from 0 to 100, with higher scores reflecting better functioning. The CGAS has shown moderate to excellent interrater reliability and stability over time (Shaffer et al., 1983). Previous studies on Pastill CGAS raters have indicated moderate interrater reliability (Lundh, Kowalski, Sundberg, Gumpert, & Landen, 2010).

The diagnoses of mental disorders were defined as a record of an ICD-10 diagnosis at any time during 2011–2015 (see Table S1 for ICD-10 codes). Prescription of antidepressants, sedatives and hypnotics was defined according to the Anatomical Therapeutic Chemical classification system, codes N06A (antidepressants) and N05C (sedatives and hypnotics).

Psychosocial problems were clinician-rated using a checklist as part of the mandatory registration at patient intake and treatment termination. After assessment, clinicians reported problems in one or several of the following predefined areas: relationships within the family, psychological problems in the family, familial violence, and problems with friends. Completing registration of global functioning, mental disorders, and psychosocial problems was a mandatory administrative part of the patient intake procedure.

Covariates. We included socioeconomic status (SES) as a categorical variable in the adjusted analyses for all outcomes except for psychosocial problems, as well as age at initial CAMHS contact. We included sex as a covariate in all adjusted analyses (with a few exceptions due to insufficient sample size). As proxy for SES, we used the mother's highest level of education.

Statistical analyses. Statistical analyses were performed with SAS version 9.4 (SAS Institute, Cary, NC) and Stata version 13.1 (StataCorp, College Station, TX). We performed two sets of analyses: SH cases compared with controls, and SH+SU cases compared with controls. Linear regression analyses were used to examine the associations regarding clinical care and global functioning, while taking the non-normal distribution of the data into account using a variance-covariance estimator. Logistic regressions were used to examine the associations between case status and mental disorders, comorbidity (>1 comorbid mental disorder), psychotropic medications, and psychosocial problems. Initially, the unadjusted odds ratios (OR) with 95% confidence intervals (CI) were calculated for each category. Analyses were then adjusted for the covariates.

Supplementary analyses. For completeness, we directly compared the SH+SU group with the SH group. These analyses were performed on all measures and additionally adjusted for the covariates. We also compared individuals who had presented to CAMHS with SU-only (i.e., had never presented with SH) with controls on all measures, adjusting

for the covariates. To elucidate the degree to which SH, SU, and SH+SU were associated with our outcome measures above and beyond psychiatric severity, we reran all analyses including the lowest available CGAS score as an additional covariate.

Study 2: Longitudinal cohort study

The sampling strategy and comparison groups were identical for the cross-sectional and longitudinal analyses, with the exceptions; in the longitudinal analyses the patients had terminated their contact with CAMHS between January 1, 2011 and December 31, 2015, and individuals born after December 31, 1997 (i.e., <18 years of age at the end of study follow-up) were excluded.

The longitudinal analyses included the following outcome variables: (a) any record of alcohol/substance use disorder (ICD-10 codes F10-F19); (b) any intentional self-harm (ICD-10 codes X60-84) or one or more event of undetermined intent (ICD-10 codes Y10-34); (c) completed suicide; (d) psychiatric inpatient care (related to ICD-10 code F20-90); (e) dispensed psychotropic medication N05C (hypnotics and sedatives) and N05B (anxiolytics) according to the Anatomical Therapeutic Chemical classification system; (f) being a recipient of social welfare at any time during follow-up (only applicable for individuals aged 18 years or older); (g) conviction/suspicion of a violent crime; and (h) conviction/suspicion of a nonviolent crime.

Data sources. Participants were followed from baseline (terminated contact with CAMHS) until December 31, 2015. Need for psychiatric care and events of SH (intended and undetermined) were ascertained from the National Patient Register. Information on psychotropic medications was collected from the Prescribed Drug Register. Data on criminality were collected from the National Crime Register and the Register of Persons Suspected of Offenses. We used the Multi-Generation Register and the LISA register for information on use of social welfare and parents' highest attained level of education.

Statistical analysis. After collecting information on the prevalence of each outcome in each group (SH, SH+SU, clinical controls), we estimated differences in outcome rate. Analogous with Study 1, we performed two sets of analyses: SH cases were compared with clinical controls, and SH+SU cases were compared with clinical controls. By using the Cox proportional hazards model, hazard ratios (HR) with 95% CI were estimated for each outcome. The data were first analyzed without adjustment (crude) and then once more, adjusting for SES. Since it is in the nature of being a patient at the CAMHS to have mental health issues, cases with events of the outcome measures before baseline were not excluded. The proportional hazards assumption was not violated in any analyses (tested with Stata's estat phtest). Because we had insufficient power to estimate risks of completed suicide, only descriptive information is provided.

Supplementary analyses. As in Study 1, we additionally compared the SH+SU group with the SH group, and the SU-only group with controls on all correlates and outcomes adjusting for covariates. Also, all analyses were analyzed separately including the lowest available CGAS as an additional covariate.

Results

Study 1: cross-sectional case–control study

Our final sample consisted of 25,161 individuals (see Table 1 for demographic data) that included: 1,027 SH patients, 1,099 SH+SU patients, and 21,119 clinical controls (no SH or SU).

SH versus Controls. Clinical care: Adjusted analyses showed that SH patients had on average 7.3 (95% CI, 5.3–9.6) more CAMHS visits than controls, but the groups were similar in adjusted rates of psychiatric hospital admissions and nights in psychiatric care (Table 2).

Global functioning: Results indicated a lower rated global functioning at clinical intake (β, −1.9; 95% CI, −3.1 to 0.8) in the adjusted analysis but not at treatment termination for patients with SH compared to controls (Table 2).

Mental disorders and psychotropic medications: The adjusted odds for presenting with depressive, anxiety, and eating disorders for patients with SH were 2.3 (95% CI, 1.7–3.1), 1.8 (95% CI, 1.4–2.4), and 1.8 (95% CI, 1.1–3.2) times that in the controls. There were no statistically significant differences for presenting with attention-deficit hyperactivity disorder (ADHD) or autism spectrum disorder (ASD) in the adjusted analyses. The OR for presenting with greater comorbidity (OR, 2.4, 95% CI, 1.8–3.4) was elevated in the adjusted analysis for the SH group. Further, the adjusted odds of being prescribed with psychotropic medications in the SH group were 1.8 (95% CI, 1.4–2.4) times that in the controls (Table 3).

Table 1 Demographic and descriptive statistics

		Study 1, case–control study (N = 25,161)			Study 2, longitudinal study (N = 6,120)		
		SH *n* (%)	SH+SU *n* (%)	Controls *n* (%)	SH *n* (%)	SH+SU *n* (%)	Controls *n* (%)
Total		1,027 (4.1)	1,099 (4.4)	21,119 (83.9)	261 (4.3)	363 (5.9)	4,746 (77.6)
Female		835 (81.3)	935 (85.1)	9,833 (46.6)	210 (80.5)	298 (82.1)	2,555 (53.8)
Age at first contact	Mean (*SD*)	13.3 (2.7)	14.0 (2.0)	10.9 (3.8)	–	–	–
Length of contact	Mean (*SD*)	1.0 (1.1)	1.2 (1.2)	1.0 (1.1)	–	–	–
Follow-up (years)	Median (Q1;Q3)	–	–	–	2.8 (1.9;3.7)	2.8 (1.9;3.7)	2.8 (1.9;3.7)

SH, Self-harm; SU, Suicidality.

Table 2 Study 1: Case–control study: means and standard deviations for clinical care consumption and CGAS in patients with SH as well as in patients with SH+SU and controls, respectively

	SH versus controls				SH+SU versus controls			
	Mean (*SD*)		*β* (95% CI)		Mean (*SD*)		*β* (95% CI)	
	SH (*n* = 1,027)	Controls (*n* = 21,119)	Crude	Adjusted[a]	SH+SU (*n* = 1,099)	Controls (*n* = 21,119)	Crude	Adjusted[a]
Clinical care consumption								
Number of visits	17.8 (24.7)	11.9 (16.2)	5.9*** (4.8–6.9)	7.3*** (5.3–9.6)	39.3 (52.5)	11.9 (16.2)	27.4*** (26.2–28.6)	30.7*** (28.3–33.1)
Admissions	0.1 (0.2)	0.1 (0.2)	0.0* (0.0–0.0)[b]	0.0 (−0.1 to 0.1)	1.0 (2.7)	0.1 (0.2)	0.9*** (0.9–1.0)	1.0*** (0.9–1.1)
Number of nights	0.1 (1.8)	0.1 (3.2)	0.0 (−0.1 to 0.2)	−0.4 (−1.2 to 0.4)	6.5 (42.3)	0.1 (3.2)	6.2*** (5.7–6.8)	7.8* (6.8–9.8)
CGAS								
At intake	53.3 (8.7)	55.6 (9.1)	−2.3*** (−2.8 to 1.7)	−1.9** (−3.1 to 0.8)	49.7 (8.9)	55.6 (9.1)	−5.9*** (−6.9 to −5.3)	−6.1*** (−7.0 to −5.1)
After treatment	61.9 (12.9)	62.6 (11.4)	−0.7 (−1.5 to 0.2)	−0.3 (−1.9 to 1.2)	54.1 (12.6)	62.6 (11.4)	−8.4*** (−9.2 to −7.7)	−9.5*** (−10.8 to −8.3)

Associations are expressed as regression coefficients with 95% confidence intervals (CI).
CGAS, Children's Global Assessment Scale; SH, Self-harm; SU, Suicidality.
[a]Adjusted for socioeconomic status, age at first CAMHS contact, and sex (where possible).
[b]β, 0.02; 95% CI, 0.01–0.03.
*$p \le .05$; **$p \le .01$; ***$p \le .001$.

Psychosocial problems: Statistically significant more patients with SH had relational and psychological problems in the family, and problems with friends (all ORs, 1.3–1.4) in the adjusted analyses (Table 3).

SH+SU versus Controls. Clinical care: In the adjusted analyses, patients with SH+SU had more admissions (β, 1.0; 95% CI, 0.9–1.1), and on average 7.8 (95% CI, 6.8–9.8) more nights in psychiatric inpatient care compared to controls. Also, they had on average 30.7 (95% CI, 28.3–33.1) more visits at the CAMHS in the adjusted analysis (see Table 2).

Global functioning: The SH+SU group had lower global functioning at clinical intake (β, −6.1; 95% CI, −7.0 to 5.1), and at treatment termination (β, −9.5; 95% CI, −10.8 to 8.3), compared to controls in the adjusted analyses (Table 2).

Mental disorders and psychotropic medications: For the SH+SU group, the adjusted odds of having depressive (OR, 5.4; 95% CI, 4.3–6.8), anxiety (OR, 8.7; 95% CI, 6.8–11.1), and eating disorders (3.9, 95% CI, 2.6–5.7) were highly elevated compared to controls. The adjusted OR for presenting with ADHD or ASD were 2.0 (95% CI, 1.4–2.7) and 2.7 (95% CI, 1.8–4.6), respectively. The SH+SU group were characterized by even greater OR of comorbidity than in the controls (OR, 7.8, 95% CI, 6.2–9.9), in the adjusted analysis. Also, for patients with SH+SU, the adjusted OR of receiving psychotropic medications were 5.3 (95% CI, 4.8–6.8) times that in controls (Table 3).

Psychosocial problems: Statistically significant more patients with SH+SU had relational and psychological problems in the family, and more experience of familial violence and problems with friends (all ORs, 1.3–1.9) compared to controls in the adjusted analyses.

Supplementary analyses. The effect sizes remained largely unchanged for most outcomes after including CGAS as a covariate in the adjusted comparisons (Tables S2–S7).

When directly comparing individuals with SH+SU and SH, the former group consumed statistically significant more clinical care, had lower CGAS-ratings, and had higher ORs of having of any mental disorders, except for ASD, in the adjusted analyses. Furthermore, individuals with SH+SU had higher adjusted ORs for psychotropic medications and all psychosocial problems except for psychological family problems (Tables S4 and S5).

Compared with controls, youths with SU-only (n = 1,916) had significantly more clinical care consumption, lower CGAS-ratings, significantly

Table 3 Study 1: Case–control study: mental disorders, psychotropic medication, and psychosocial problems in patients with SH as well as in patients with SH+SU and controls, respectively

	SH versus controls				SH+SU versus controls			
	n (%)		OR (95% CI)		*n* (%)		OR (95% CI)	
	SH (*n* = 1,027)	Controls (*n* = 21,119)	Crude	Adjusted[a]	SH + SU (*n* = 1,099)	Controls (*n* = 21,119)	Crude	Adjusted[a]
Mental disorders								
Depressive disorders	260 (25.3)	1,555 (7.4)	4.3*** (3.7–5.0)	2.3*** (1.7–3.1)	551 (50.1)	1,555 (7.4)	12.6*** (11.1–14.4)	5.4*** (4.3–6.8)
Anxiety disorders	422 (41.1)	4,540 (21.5)	2.5*** (2.2–2.9)	1.8*** (1.4–2.4)	762 (69.3)	4,540 (21.5)	8.3*** (7.2–9.4)	8.7*** (6.8–11.1)
Eating disorders	54 (5.3)	330 (1.6)	3.5*** (2.6–4.7)	1.8* (1.1–3.2)	119 (10.8)	330 (1.6)	7.7*** (6.1–9.5)	3.9*** (2.6–5.7)
ADHD	100 (9.7)	3,164 (15.0)	0.6** (0.5–0.8)	0.7 (0.4–1.2)	155 (14.1)	3,164 (15.0)	0.9 (0.8–1.1)	2.0*** (1.4–2.7)
Autism spectrum disorder	59 (5.7)	1,648 (7.8)	0.7* (0.5–0.9)	1.4 (0.8–2.7)	99 (9.0)	1,648 (7.8)	1.2 (0.9–1.4)	2.7*** (1.8–4.6)
>1 comorbid mental disorder	218 (21.2)	2,099 (9.9)	2.4*** (2.1–2.9)	2.4*** (1.8–3.4)	526 (47.9)	2,099 (9.9)	8.3*** (7.3–9.4)	7.8*** (6.2–9.9)
Psychotropic medications[b]	244 (24.9)	2,818 (14.0)	2.0*** (1.8–2.4)	1.8*** (1.4–2.4)	524 (51.3)	2,818 (14.0)	5.7*** (5.0–6.5)	5.3*** (4.8–6.8)
Psychosocial problems								
Relational family problems	423 (41.2)	6,336 (30.0)	1.6*** (1.4–1.9)	1.4*** (1.2–1.6)	555 (50.5)	6,336 (30.0)	2.2*** (1.9–2.5)	1.8*** (1.6–2.1)
Psychological family problems	191 (18.6)	2,885 (13.7)	1.4*** (1.2–1.7)	1.3** (1.1–1.5)	227 (20.7)	2,885 (13.7)	1.5*** (1.3–1.8)	1.3 ** (1.1–1.6)
Familial violence	93 (9.1)	1,476 (7.0)	1.3* (1.1–1.6)	1.2 (1.0–1.5)	128 (11.7)	1,476 (7.0)	2.0*** (1.6–2.4)	1.9*** (1.5–2.3)
Problems with friends	205 (20.0)	2,722 (12.9)	1.7*** (1.4–2.0)	1.4** (1.2–1.7)	289 (26.3)	2,722 (12.9)	2.2*** (2.0–2.6)	1.9*** (1.2–2.2)

Associations are expressed as odds ratios (OR) with 95% confidence intervals (CI).
SH, Self-harm; SU, Suicidality.
[a]Adjusted for socioeconomic status, age at first CAMHS contact, and sex.
[b]Antidepressants, sedatives, hypnotics.
*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

higher ORs of presenting with any mental disorder, except for ADHD and ASD, comorbid disorders, psychotropic medications, and for all psychosocial problems except for psychosocial family problems in the adjusted analyses (Tables S6 and S7).

Study 2: Longitudinal cohort study

The 6,120 young adults who had terminated CAMHS contact included: 261 SH patients, 363 SH+SU patients, and 4,746 clinical controls (no SH/SU). The median follow-up time was 2.8 years (range: 0–5 years; Table 1). Over 90% of the patients had terminated their contact with CAMHS when they were between 15 and 18 years old. Six percent were 14 years old, 1% were 13 years when ending their contact with the CAMHS.

SH versus Controls. Substance misuse: At follow-up, the adjusted HR of having a diagnosis of alcohol misuse was 2.2 (95% CI, 1.4–3.3) in the SH group, compared to controls. No difference was found for drug misuse (Table 4).

Self-harm, clinical care, and psychotropic medication: The adjusted HR for renewed care contact due to acts of intentional self-harm or self-harm with undetermined intent (ICD-10 codes X60-84, Y10-34) was 3.9 (95% CI, 2.3–6.7). At follow-up, no one in the SH group had committed suicide. The adjusted risk for inpatient care during follow-up was 1.7 (95% CI, 1.0–2.7) in the SH group. Likewise, the adjusted risk of having been prescribed psychotropic medication was elevated (HR, 1.4; 95% CI, 1.2–1.7) for the SH group (Table 4).

Social welfare and crime: There were no statistically significant differences in risk for social welfare recipiency, nonviolent or violent crime between SH and controls.

SH+SU versus Controls. Substance misuse: The adjusted risks for the SH+SU group of having a diagnosis of alcohol misuse (HR, 3.3; 95% CI, 2.3–4.9), and drug misuse were highly elevated (HR, 4.0; 95% CI, 2.7–5.8), compared to controls (Table 4).

Self-harm, clinical care, and psychotropic medication: The adjusted HR of additional acts of intentional self-harm or self-harm with undetermined intent for the SH+SU group was 23.1 (95% CI, 17.0–31.4). At follow-up, one patient in the SH+SU group had completed suicide. The risk for inpatient care during follow-up was more than ten times (HR, 11.3; 95% CI, 8.9–14.4) higher among SH+SU than among controls. Also, the adjusted risk for psychotropic medication was elevated (HR, 3.2; 95% CI, 2.8–3.7; Table 4).

Table 4 Study 2: Longitudinal study: alcohol and drug misuse, self-harming acts, inpatient care, medication, recipient of social welfare, nonviolent, and violent crime in patients with SH and SH+SU compared with clinical controls

	SH versus Controls				SH+SU versus Controls			
	n (%)		HR (95% CI)		*n* (%)		HR (95% CI)	
	SH (n = 261)	Controls (n = 4,746)	Crude	Adjusted[a]	SH+SU (n = 363)	Controls (n = 4,746)	Crude	Adjusted[a]
Alcohol misuse	26 (10.0)	201 (4.2)	2.3*** (1.6–3.5)	2.2*** (1.4–3.3)	38 (10.5)	201 (4.2)	3.6*** (2.6–5.1)	3.3*** (2.3–4.9)
Drug misuse	10 (3.4)	172 (3.6)	1.1 (0.6–2.0)	1.1 (0.6–2.0)	43 (11.9)	172 (3.6)	4.7*** (3.4–6.6)	4.0*** (2.7–5.8)
Recurrent care due to self-harming acts	22 (8.4)	86 (1.8)	4.6*** (2.9–7.4)	3.9*** (2.3–6.7)	107 (29.5)	86 (1.8)	23.2*** (17.4–30.9)	23.1*** (17.0–31.4)
Completed suicide	0 (0.0)	2 (0.0)	–	–	1 (0.0)	2 (0.0)	–	–
Inpatient care	22 (8.4)	215 (4.5)	1.9** (1.2–2.9)	1.7* (1.0–2.7)	126 (34.7)	215 (4.5)	10.9*** (8.8–13.6)	11.3 (8.9–14.4)
Psychotropics[b]	115 (44.1)	1,487 (31.3)	1.4*** (1.2–1.7)	1.4*** (1.2–1.7)	264 (72.7)	1,487 (31.3)	3.3*** (2.9–3.7)	3.2*** (2.8–3.7)
Social welfare recipiency	12 (4.7)	142 (3.2)	1.5 (0.8–2.7)	1.5 (0.8–2.7)	21 (6.2)	142 (3.2)	2.2*** (1.4–3.5)	2.6*** (1.6–4.3)
Non-violent crime	26 (10.0)	533 (11.2)	0.9 (0.6–1.3)	0.7 (0.4–1.1)	67 (18.5)	533 (11.2)	2.4*** (1.9–3.1)	2.1*** (1.6–2.8)
Violent crime	9 (3.5)	244 (5.1)	0.7 (0.3–1.3)	0.6 (0.3–1.2)	30 (8.3)	244 (5.1)	2.4*** (1.9–3.1)	2.0** (1.3–3.1)

Risks are expressed as Hazard ratios (HR) with 95% confidence intervals (CI).
SH, Self-harm; SU, Suicidality.
[a]Adjusted for socioeconomic status.
[b]Sedatives, hypnotics, anxiolytics.
*$p < .05$; **$p < .01$; ***$p < .001$.

Social welfare and crime: There adjusted HRs for use of social welfare recipiency, nonviolent and violent crime was elevated in the SH+SU group (HRs, 2.0–2.6; Table 4).

Supplementary analyses. The effect sizes for most outcomes were only marginally altered after including CGAS as a covariate in the adjusted analyses (Tables S8–S10). In direct comparison with SH, individuals with SH+SU had statistically significant higher risks of all outcomes, except alcohol misuse and social welfare recipiency in the adjusted analyses (Table S9). Individuals with SU-only (n = 750) had statistically significant higher HRs of all outcomes in the adjusted analyses and one individual had completed suicide at follow-up (Table S10).

Discussion

The aim of this study was to compare the clinical and psychosocial correlates, and subsequent adverse outcomes in subgroups of adolescents with self-harm seeking mental health care in the Stockholm metropolitan area. Those who presented to the CAMHS with SH were more burdened in terms of clinical care, global functioning, mental disorders, and psychosocial problems than the clinical controls, and were at greater risk for several important adverse outcomes in emerging adulthood. In most cases, having SU-only, appeared to be associated with at least the same level of burden and as much subsequent problems as SH-only. Although both groups were more burdened than controls, they were not as burdened as the SH+SU group. In the cross-sectional study (Study 1), the SH+SU group received more clinical care, had higher odds of being prescribed with psychotropic medications, and had the highest odds of most mental disorders. This pattern was also confirmed in direct comparisons between SH+SU and SH for most correlates. Similar findings emerged from the longitudinal study in which the SH+SU had greater risk for adverse outcomes compared to both controls and the SH and SU groups. For example, the risk for having recurrent care contact due to intentional SH was almost four times higher among SH and more than 23 times higher for SH+SU. While the study was underpowered to evaluate suicide deaths, and our follow-up period was brief, our data indicated that suicide deaths occurred in all groups (except for the SH-only group) underscores the need to monitor for suicide risk among all CAMHS patients. In summary, despite the relatively short follow-up time, the results point toward a worse prognosis among those who present with SH or SU and substantially worse among those with SH+SU, which suggest that both SH and SU need to inform risk-assessment for several adverse outcomes.

Previous studies show consistent and strong associations between self-harm, recurrent care due to self-harm (Beckman et al., 2016; Mars, Heron, Crane, Hawton, Kidger et al., 2014), and suicide attempts and/or completed suicide (Andover, Morris, Wren, & Bruzzese, 2012; Carr et al., 2017). Although we could not differentiate SH from suicide attempts in terms of outcome, the observed patterns in this study are similar in that SH of any kind was associated with an elevated risk of later recurrent care contact due to intentional self-injury (suicide attempts included). It has been proposed that the act of self-injury may increase an individual's capability for suicide, because the individual may overcome the pain and fear of harming oneself (Joiner, 2005). Hamza, Stewart, and Willoughby (2012) have proposed an integrated model to explain the link between SH and SU, where in addition to Joiner's theory, they also suggest that there is a direct link between SH and SU, which is expected to be stronger in individuals experiencing high levels of psychological distress (which seem to be in line with our findings). They also propose that there are shared risk factors between SH and SU that explain their high co-occurrence. Our supplementary findings indicate that although individuals with SU-only (no record of SH) had more problems and were at greater risks than clinical controls, they had less problems and lower risks compared to the SH+SU group in most comparisons. This indicates, that the higher degree of adverse outcomes seen in the SH+SU group was associated with the combination of SH+SU rather than SU alone. Furthermore, our results confirm previous studies of population-based samples, as well as clinical cohorts, that have repeatedly identified a link between SH and mental illness, psychiatric inpatient care, psychotropic medication, alcohol misuse, and childhood maltreatment (Beckman et al., 2016; Liu, Scopelliti, Pittman, & Zamora, 2018; Mars, Heron, Crane, Hawton, Lewis et al., 2014; Moran et al., 2015; Nakar et al., 2016). Also, consistent with previous research (Beckman et al., 2016; Mars, Heron, Crane, Hawton, Lewis et al., 2014; Moran et al., 2015), only SH+SU was associated with a weaker connection with the labor market. Moreover, the link between SH and violence has previously been identified in another Swedish dataset (Sahlin et al., 2017). However, this study differentiates between SH and SH+SU in relation to violence, and our findings suggest that the previously reported increased risk for violence among self-harming individuals may primarily be driven by co-occurring SU, at least among adolescents. Finally, our findings that those who engage in both SH and SU display more mental disorders and have a worse prognosis are in line with prior research (Andover et al., 2012). However, many studies using data from clinical populations have sampled participants from emergency or inpatient care settings that may not be representative of the entire spectrum of self-harming patients and have been limited in terms of the range of studied correlates and outcomes

(Groschwitz et al., 2015; Stewart et al., 2017). In contrast, this study utilized information from both out- and inpatient settings from over 30,000 individuals. Thus, an important merit of this study is its sample size, large scope in terms of studied correlates and outcomes, and the more detailed information on type of SH, allowing for subgroup identification.

The present findings indicate that there may be a qualitative difference between clinical subgroups of self-harming youth, and that not only the absence or presence of SH needs to be taken into account but also the degree to which behaviors and thoughts are suicidal. Whether or not it is meaningful to distinguish nonsuicidal SH from suicidal behaviors is, however, an ongoing discussion (e.g., Kapur et al., 2013). One could argue that from a clinical point of view, it is less important if a hazard of an unwanted outcome is doubled or tripled for the individual patient; SH is still a marker of an increased risk of potentially hazardous outcomes and needs to be assessed carefully and repeatedly (Stewart et al., 2017). However, identifying subgroups may still have relevance for treatment planning (Brent et al., 2013; Hawton et al., 2015; Nock, 2010). Our results demonstrate that presenting at CAMHS with SH+SU is associated with high risk for several adverse outcomes and should thus be a priority for CAMHS. Nevertheless, in comparison with clinical controls, it is also evident that adolescents with SH or SU should be a prioritized group that needs regular assessment and effective treatments. However, despite the clinical relevance of SH, the evidence for interventions targeting this behavior is low (Hawton et al., 2015). Hence, effective evidence-based treatments for these two patient groups are needed.

This study has limitations, some of which are inherent to registry studies using administrative data. Notably, study subgroups were defined using clinician ratings of SH and SU, both of which are often underestimated and under-reported in clinical care (Thomas et al., 2013), and estimates of reliability for clinician ratings are not available. Study analyses do not explore potential cross-over between comparison groups over time (e.g., we do not know whether SH predicts later SH+SU), and groups may not be mutually exclusive over longer follow-up. Since some outcomes were rare (e.g., drug misuse, social welfare, death), the statistical power was limited for some outcomes. Furthermore, the follow-up time was relatively short and varied among participants. Finally, the sample consists of youths seeking help at CAMHS; results may not generalize to nonhelp-seeking populations and self-harming adolescents are often reluctant to seek professional help (e.g., Brunner et al., 2007).

To our knowledge, this study is the largest study comparing SH, SH+SU, and SU to clinical controls. Other strengths include the focus on adolescence and emerging adulthood, which are vulnerable periods that can affect later outcomes (Arnett, 2007), the use of both cross-sectional and longitudinal analyses, and the combined examination of clinician-rated and register-based outcomes.

Conclusions

Our results provide evidence that adolescent SH and SH+SU are associated with a higher problem load and adverse outcomes compared with CAMHS patients in general, and that SU could be a distinguishing feature among adolescents with self-harm that can inform risk-assessment and treatment.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Table S1. ICD-10 codes for the included mental disorders.

Table S2. Study 1: Case–control study: regression coefficients of clinical care consumption after additional adjustment for CGAS in patients with SH as well as in patients with SH+SU and controls, respectively.

Table S3. Study 1: Case–control study: regression coefficients of mental disorders, psychotropic medication, and psychosocial problems after additionally adjusting for CGAS in patients with SH as well as in patients with SH+SU and controls, respectively.

Table S4. Study 1: Case–control study: means and standard deviations for clinical care consumption and CGAS in patients with SH+SU compared to SH.

Table S5. Study 1: Case–control study: mental disorders, medication, and psychosocial problems in patients with SH+SU compared to SH.

Table S6. Study 1: Case–control study: means and standard deviations for clinical care consumption and CGAS in patients with SU versus controls.

Table S7. Study 1: Case–control study: mental disorders, psychotropic medication, and psychosocial problems in patients with SU versus controls.

Table S8. Study 2: Longitudinal study: risks of alcohol and drug misuse, self-harming acts, inpatient care, medication, recipient of social welfare, nonviolent and violent crime in patients with SH and SH+SU compared to clinical controls after additional adjustment for CGAS.

Table S9. Study 2: Longitudinal study: alcohol and drug misuse, self-harming acts, inpatient care, medication, recipient of social welfare, nonviolent and violent crime in patients with SH+SU compared to SH.

Table S10. Study 2: Longitudinal study: alcohol and drug misuse, self-harming acts, inpatient care, medication, recipient of social welfare, nonviolent and violent crime in patients with SU compared with patients presenting without SH or SU.

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Key points

- Adolescent self-harm with and without suicidality is common within health care, associated with clinical and psychosocial burden and increased risk for adverse outcomes.
- However, there remains a continued need to examine the respective relevance of self-harm with and without suicidality in large scale clinical samples.
- This study shows that self-harm among care-seeking adolescents is associated with a higher problem load and adverse outcomes when compared with care-seeking adolescents without documented self-harm.
- Associations and risks were generally even stronger in those with self-harm with suicidality, compared to those with self-harm only.
- Suicidality could be a distinguishing feature among clinical populations of adolescents with self-harm that should inform risk assessment and treatment.

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