Change in Suicidal Ideation After Interdisciplinary Treatment of Chronic Pain

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Objectives: To examine suicidal ideation (SI) in individuals with chronic pain, especially change in suicidal thinking after interdisciplinary treatment.

Materials and Methods: Consecutive patients (n = 250) admitted to a 4-week, group-based chronic pain management program completed measures of pain intensity, functional limitations, depressive symptoms, overall distress, pain catastrophizing, self-perceived burden, and SI at pretreatment and posttreatment.

Results: Before treatment, 30 (12.0%) participants were classified as having a high level of SI, 56 (22.4%) had a low level of SI, and 164 (65.6%) reported none. After treatment, there was a significant reduction in SI and improvements in all other outcomes, but there were still some individuals with high (n = 22, 8.8%) or low (n = 28, 11.2%) levels at discharge. Patients with high SI at baseline differed from those with no suicidal thinking on pretreatment and post-treatment measures of depression, distress, catastrophizing, and self-perceived burden, but not on pain intensity or functional limitations. Patients high in SI endorsed greater pain catastrophizing and self-perceived burden than those low in suicidal thinking. Sustained SI after treatment was associated with higher baseline levels of suicidal thinking and self-perceived burden to others, as well as a more limited overall response to treatment.

Discussion: SI was common in individuals with chronic pain, although mostly at a low level. Interdisciplinary treatment may result in reduced suicidal thinking; however, some patients continue to express thoughts of self-harm. Future studies could examine processes of change and interventions for treatment-resistant suicidal concerns.

Key Words: suicidal ideation, chronic pain, interdisciplinary treatment, treatment outcomes


It is estimated that individuals with chronic pain (CP) have a suicide rate at least 2 to 3 times higher than the general population.1,2 Several longitudinal epidemiologic investigations have demonstrated significant positive associations between pain conditions and completed suicides.3-6 Case control studies of premorbid pain among suicide victims7,8 and prospective case series studies of pain clinic or rheumatology patients9-11 have also indicated that those with CP have an increased risk of completed suicide.

Another approach to the study of suicide in CP has been to investigate the occurrence of suicidal ideation (SI) among people with pain-related problems. Although only a small percentage of those who contemplate suicide go on to complete it, there is a continuum of risk, ranging from passive thoughts of death to lethal suicide attempts, that makes SI a relevant warning sign.12-14 Indeed, several epidemiologic studies have confirmed that both SI and suicide attempts are elevated among community residents with CP.15-21

A third line of research has investigated SI among patients who are seeking treatment for pain. Studies of this type indicate that it is relatively common for people with CP to think about suicide. Depending on the study sample and method of assessment, at least passive thoughts of death or suicide have been reported by 14.1% to 41.5% of pain clinic attenders,22-30 whereas more active SI has been expressed by 1.2% to 16.6%.22,23,27,28,31

Among the more consistent individual correlates of SI (ie, variables that have been identified in more than a single study) are previous suicide attempts,24,25 longer pain duration,31,32 depressive symptoms,23,26,28–30,32 pain catastrophizing,23,25,32 pain-related interference with activities,23,25 low use of coping self-statements,23,25 and the sense that one has become a burden to others.26,32,33 In some studies,23,25,29 but not all,26,28,32 SI has also been associated with greater pain intensity. Some of these risk factors represent historical facts that cannot be changed; however, others are potentially modifiable with appropriate intervention.

Interdisciplinary rehabilitation is recognized as an effective approach for the management of chronic pain, providing beneficial outcomes in several areas related to SI, including pain intensity, functional limitations, pain catastrophizing, and depressed mood.34-40 As yet, no studies have specifically investigated the extent to which treatment for CP affects SI itself. Reductions in SI could be an important outcome for pain management programs, indicating improvement in a neglected aspect of distress and, perhaps, contributing to a reduction in suicide attempts and completed suicides. In this study, therefore, we examined: (1) the prevalence of SI among patients attending an interdisciplinary rehabilitation program for CP; (2) whether SI decreases after interdisciplinary treatment; (3) baseline and posttreatment differences among patients with varying degrees of SI; and (4) the clinically important problem of sustained SI after treatment.

MATERIALS AND METHODS

Participants and Procedure

The current study was embedded within a broader research program examining psychosocial aspects of CP.32,33
Participants were consecutive patients admitted to an interdisciplinary, outpatient, group-based chronic pain self-management program. Services were offered at a publicly funded rehabilitation hospital. All participants completed a battery of psychometric questionnaires at program admission and at discharge, which provided the data for the present study. Ethical approval for this research was obtained from the institution’s research ethics board. All participants provided written informed consent.

**Chronic Pain Management Program**

The overarching objective of the program was to help patients better manage chronic pain by providing education about pain and disability, teaching adaptive coping strategies, and addressing factors associated with pain and functional limitations. Patients referred to the program were initially triaged by a nurse clinician. They then attended an information session that described the program and its self-management philosophy. Patients with a continuing interest at this point were assessed medically by a physiatrist, who determined whether patients met the eligibility criteria. These included medically stable CP that was not amenable to curative treatment, fluency in English or French, the ability to tolerate a tailored physiotherapy regimen, and no acute social or psychological crisis.

Eligible patients then took part in an assessment/education week. During these 4 half-days, patients underwent individual assessments by a psychologist, social worker, occupational therapist, and physiotherapist. They also attended group sessions about pain physiology, goal setting, and the program’s cognitive-behavioral conceptual model.

After the assessment/education week, patients began the active treatment phase of the program. This typically occurred over 3 consecutive weeks. Sessions were held in a group format led by health professionals from various disciplines, including medicine, nursing, occupational therapy, pharmacy, physiotherapy, psychology, social work, and therapeutic recreation. As part of the program, patients took part in fitness sessions 4 d/wk, twice weekly group psychotherapy, occupational therapy workshops, relaxation training sessions, and interactive group discussions. Treatment groups were held 5 d/wk for about 25 hours weekly. Didactic lectures were held on 1 morning of each week and covered such topics as community and financial resources, managing headaches, sleep problems, and pain medications.

**Self-report Measures**

**Socio-demographic and Clinical Characteristics**

Socio-demographic and clinical characteristics (eg, age, sex, pain duration, and primary pain location) were collected as part of the initial screening process.

**Pain Intensity**

Participants rated their least, worst, and average pain intensity over the past 2 weeks, as well as their current pain. Responses were recorded on an 11-point numeric rating scale, with options ranging from 0 (no pain) to 10 (as intense as you can imagine). A total pain intensity score was computed by summing all items. This method of assessing pain intensity has been found to be reliable and valid.41

**Functional Limitations**

Functional limitations were evaluated using a questionnaire developed by the Task Force on Records and Data Retrieval of the International Association for the Study of Pain.42 On this measure, respondents rated their degree of difficulty in performing 16 typical daily activities, such as getting in and out of bed and making meals. Each activity is evaluated using a 5-point scale, anchored by 1 (no difficulty) and 5 (unable to do). The minimum and maximum scores on this scale are 16 and 80, respectively. Higher scores indicate greater functional limitations. Previous research with CP patients has demonstrated that this scale is internally consistent33,35 and sensitive to change.35

**Depressive Symptoms**

Participants completed the Patient Health Questionnaire (PHQ),43,44 a 9-item measure of depressive symptoms that includes a question addressing SI. The PHQ items correspond to the core diagnostic symptom criteria for major depressive disorder. Depressive symptoms, as evaluated in this study, were assessed using 8 items from the PHQ, with the SI item omitted. Participants rated the frequency of each symptom as they experienced it over the past 2 weeks. Responses ranged from 0 (not at all) to 3 (nearly every day). The 8-item version of the PHQ retains a very high correlation (ie, \( r = 0.98 \)) with the full PHQ scale.45 As used here, PHQ scores could range from 0 to 24, with higher scores representing increasingly severe depressive symptoms. Different versions of the PHQ have been widely used in medical populations.45,46

**Overall Distress**

The 45-item Outcome Questionnaire (OQ)47 is a global measure of symptom distress that is used primarily to assess the outcome of psychological treatments. Participants rated the frequency with which they experienced individual symptoms that often comprise presenting symptoms in counselling and behavioral health settings. The symptoms cluster around psychological and somatic distress, as well as impairments in social roles and interpersonal relationships. Ratings are made over the past week, with responses recorded on a 4-point frequency scale anchored by 0 (never) and 4 (almost always). As with the PHQ, the item inquiring about SI was not included when scoring the OQ, resulting in a 44-item measure of overall distress. Scores could range from 0 to 176, with higher totals representing greater distress. Several studies support the psychometric properties of the OQ in a variety of settings.46,50

**Pain Catastrophizing**

The Pain Catastrophizing Scale51 is a 13-item questionnaire developed to assess negative pain-related cognitions. Item responses range from 0 (not at all) to 4 (all the time), with total scores ranging from 0 to 52. Higher scores represent greater catastrophic thinking. This measure has high levels of validity and reliability.52,53

**Self-perceived Burden**

The Self-perceived Burden Scale54 is a 10-item measure of the degree to which respondents perceive that their requirements for instrumental, emotional, or financial support place undue caregiving demands on significant others. Items are evaluated on a 5-point scale, ranging from 1 (none of the time) to 5 (all of the time). Total SPBS scores range from 10 to 50, with higher scores indicating greater self-perceived burden. This measure has been shown to be valid54 and internally consistent.33
SI

SI was evaluated using a composite measure comprising 1 item each from the PHQ and OQ. In both cases, participants were asked to rate the frequency with which they experienced a desire for death or had thoughts of self-harm or suicide. On the PHQ, respondents rated, on a 4-point scale anchored by 0 (not at all) to 3 (nearly every day), how often in the past 2 weeks they had been bothered by thinking that they would be better off dead or that they wanted to hurt themselves in some way. On the OQ, respondents rated, on a 5-point scale, ranging from 0 (never) to 4 (almost always), how often in the past week they had thought of ending their lives. In this sample, the correlation between these 2 items was high at both pretreatment (r = 0.79, \( P < 0.001 \)) and posttreatment (r = 0.82, \( P < 0.001 \)). For some analyses of the change in SI, a composite score was obtained by summing the 2 ratings.\(^{31}\) This composite score could range from 0 to 7.

Identification of Subgroups Differing in SI

SI can range from passive thoughts of being better off dead to deliberate planning of an imminent suicide attempt. To maintain a focus on serious SI, we adopted a cut-off score \( > 1 \) on the OQ SI item. This corresponds to ratings of “sometimes,” “frequently,” or “almost always” to the statement: “I have thoughts of ending my life.” Respondents who endorsed these scores were considered high in SI. Participants who gave scores = 1 on this item (ie, “rarely”) were considered low in SI. Participants with scores = 0 on the OQ SI question and scores \( > 0 \) on the PHQ were also included in the low SI group. Such people may not have been currently suicidal, but did acknowledge recent thoughts of being better off dead or hurting themselves. Participants with scores = 0 on both items were classified as having no SI.

Although the OQ has not been used before to classify subgroups of suicide ideators, the PHQ SI item has been examined in several studies of medical patients.\(^{55–57}\) This single item was found to be sensitive to change in thoughts of self-harm after treatment for depression,\(^{57}\) but its validity as a sole measure of serious suicidality has been questioned.\(^{58}\) In studies that have conducted follow-up interviews with individuals who scored \( > 0 \) on the self-reported PHQ SI item, 20% to 35% were considered to be actually suicidal on interview\(^{58–60}\) and an additional 39% confirmed thoughts of being better off dead.\(^{59}\) By combining the PHQ with the OQ SI item, which has good face validity as a direct inquiry into suicide, we sought to ensure the identification of individuals for whom SI was a significant clinical concern.

Data Analyses

Data were analyzed using IBM SPSS Statistics 20. Established data screening procedures were followed.\(^{61}\) Internal consistency for each self-report scale was assessed using coefficient \( \alpha \). The proportion of patients endorsing high, low, and no SI at pretreatment and posttreatment were summarized using descriptive statistics. For the high and low SI groups, the proportions of patients who reported no longer having any SI at posttreatment were examined using a marginal homogeneity test. The demographic characteristics of participants classified as having high, low, or no SI were compared using parametric and nonparametric tests. Next, pretreatment and posttreatment differences were assessed using a repeated measures analysis of variance for the SI composite score and a repeated measures multivariate analysis of variance for all other measures. Within these models, the between-subjects factor was SI group (high, low, and no SI) and the within-subjects factor was time (pretreatment and posttreatment). Of particular interest was the interaction between group and time. Post hoc tests were performed, where appropriate.

A final set of analyses compared those individuals who either did or did not continue to report SI at the end of the interdisciplinary program. To this end, 2 groups (sustained SI vs. no SI) by 2 time periods (pretreatment and posttreatment) repeated measures multivariate analysis of variance was conducted. The goals of this analysis were to identify baseline characteristics of those individuals who continued to express suicidal thinking after treatment, and to evaluate whether sustained SI was embedded in a more limited overall response to treatment.

RESULTS

Sample Characteristics

A total of 363 patients were recruited at pretreatment. Of these individuals, 17 (4.7%) were omitted because of missing data and 5 (1.4%) were excluded because participants shared, in a feedback session, that their questionnaire results did not accurately reflect their level of functioning. Seven (1.9%) patients dropped out before the end of the assessment/education week. Another 26 (7.2%) patients did not begin the treatment phase of the program, due mainly to the demands of the program exceeding their physical tolerances. Of the 308 remaining participants who began the treatment phase of the program, 36 (11.7%) dropped out before the end. The primary reason for this was, again, low physical tolerances. Eighteen (5.8%) individuals were excluded because of missing posttreatment data and 4 (1.3%) were omitted because their programs were modified or extended.

The final sample consisted of 250 participants, the majority of whom (n = 156, 62.4%) were women. The mean age was 47.64 ± 10.24 years and, on an average, patients had CP for 6.84 ± 7.65 years. Over half of the sample (n = 146, 58.4%) graduated from college or university, or obtained a trade certificate. Nearly half of the participants (n = 119, 47.6%) were on disability or sick leave and 48 (19.2%) were employed full-time or part-time. The main pain locations were back (n = 84, 33.6%) and generalized body pain (n = 74, 29.6%).

Preliminary Analyses

All scales demonstrated satisfactory internal consistency, with coefficient \( \alpha \)’s ranging from 0.81 to 0.95.

Pretreatment Prevalence of SI

Table 1 shows the cross-tabulation of pretreatment scores on the 2 SI questions. On these baseline measures, 86 (34.4%) patients endorsed at least some SI or thoughts of being better off dead. Of these individuals, 56 (65.1%) were classified as having low SI and 30 (34.9%) were considered high. Although the OQ response of “sometimes” having thoughts of ending one’s life was used as the main criterion for identifying participants with high SI, 29 of 30 (96.7%) also had scores \( > 0 \) on the PHQ. The demographic characteristics of participants with no, low, and high SI are presented in Table 2. No significant differences were obtained among the 3 SI groups on any of the demographic variables, although there was a tendency for patients with high SI to be younger (\( P = 0.085 \)).
Posttreatment Prevalence of SI

Of the 86 individuals who acknowledged at least some SI at pretreatment, 45 (52.3%) no longer endorsed any suicidal thinking at the end of the program. Of the 41 patients with sustained SI, 19 were in the low group and 22 were in the high group. Of note, 9 individuals who endorsed no pretreatment SI reported some at posttreatment, with all scores falling in the low SI range. Thus, a total of 50 patients endorsed SI at posttreatment. There was a significant difference in the proportion of patients in the 3 SI groups at pretreatment and posttreatment, based on a marginal homogeneity test ($P < 0.001$). This indicated an overall decrease in suicidal thinking over time.

Of the 56 individuals with low pretreatment SI (Table 1), 39 (69.6%) reported no SI at posttreatment. Twelve of the remaining 17 individuals (70.6%) continued to endorse low SI, whereas 5 (29.4%) endorsed high SI. Of the 30 participants with high SI at pretreatment, 6 (20%) reported no SI, 7 (23.3%) reported low SI, and 17 (56.7%) continued to endorse high SI at posttreatment.

Change in SI Scores

Although most individuals with SI at pretreatment experienced a reduction, some endorsed an increase. Accordingly, as a further check of the overall effect of treatment on SI, a 3 (SI group) × 2 (time) repeated measures ANOVA was conducted with the composite SI total score, which is a summation of the 2 SI screening items. The mean SI composite scores by time and SI group are shown in Table 3 and Figure 1.

Because the groups were defined on the basis of pretreatment SI scores, the significant and substantial main effect for SI group, $F_{2,247} = 350.25, P < 0.001, \eta_p^2 = 0.74$, was unremarkable except for the post hoc finding that the group differences were retained at posttreatment. Specifically, patients in the high SI group at pretreatment continued to have higher scores than both other groups at posttreatment ($P < 0.001$), whereas patients in the low SI group still had higher scores than patients with no pretreatment SI ($P = 0.006$).

Of particular importance was the significant main effect of time, showing that there was a reliable decrease in SI scores from pretreatment to posttreatment, $F_{1,247} = 110.09, P < 0.001, \eta_p^2 = 0.31$. This indicated that the intervention was associated with a robust overall decline in SI. The SI group by time interaction was also significant, $F_{2,247} = 350.25, P < 0.001$, indicating that the effect of time was only apparent in the high SI group.

### Table 1. Cross-tabulation of Pretreatment Responses to Suicidal Ideation Items on the Outcome Questionnaire and the Patient Health Questionnaire (n = 250)

<table>
<thead>
<tr>
<th>Outcome Questionnaire</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Health Questionnaire</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>164 (65.6)</td>
<td>26 (10.4)</td>
<td>1 (0.4)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Several days</td>
<td>7 (2.8)</td>
<td>21 (8.4)</td>
<td>18 (7.2)</td>
<td>0 (0.0)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>More than half the days</td>
<td>1 (0.4)</td>
<td>0 (0.0)</td>
<td>5 (2.0)</td>
<td>0 (0.0)</td>
<td>2 (0.8)</td>
</tr>
</tbody>
</table>

Values are the number (percentage) of participants endorsing each combination of responses. On the Outcome Questionnaire, participants were asked to rate how frequently “I have thoughts of ending my life.” On the Patient Health Questionnaire, participants were asked “Over the last 2 weeks, how often have you been bothered by thoughts that you would be better off dead or hurting yourself in some way?” Different typefaces indicate the classification of respondents into groups with no (values in italics), low, or high (values in bold) suicidal ideation.

### Table 2. Sociodemographic Characteristics by Suicidal Ideation (SI) Group (n = 250)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>No SI (n = 164)</th>
<th>Low SI (n = 56)</th>
<th>High SI (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (M ± SD) (y)</td>
<td>48.2 ± 10.3</td>
<td>48.0 ± 9.5</td>
<td>43.8 ± 10.9</td>
</tr>
<tr>
<td>Sex (N [%])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>108 (65.9)</td>
<td>34 (60.7)</td>
<td>14 (46.7)</td>
</tr>
<tr>
<td>Male</td>
<td>56 (34.1)</td>
<td>22 (39.3)</td>
<td>16 (53.3)</td>
</tr>
<tr>
<td>Duration of pain (M ± SD) (y)*</td>
<td>6.3 ± 6.6</td>
<td>7.9 ± 9.5</td>
<td>7.8 ± 9.1</td>
</tr>
<tr>
<td>Primary pain site (N [%])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head, face, mouth</td>
<td>5 (3.0)</td>
<td>0 (0.0)</td>
<td>2 (6.7)</td>
</tr>
<tr>
<td>Neck (cervical)</td>
<td>16 (9.8)</td>
<td>6 (10.7)</td>
<td>2 (6.7)</td>
</tr>
<tr>
<td>Shoulders, arms, hands</td>
<td>11 (6.7)</td>
<td>7 (12.5)</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>Back</td>
<td>57 (34.8)</td>
<td>18 (32.1)</td>
<td>9 (30.0)</td>
</tr>
<tr>
<td>Legs, feet</td>
<td>14 (8.5)</td>
<td>3 (5.4)</td>
<td>2 (6.7)</td>
</tr>
<tr>
<td>Pelvic region</td>
<td>3 (1.8)</td>
<td>2 (3.6)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Generalized</td>
<td>45 (27.4)</td>
<td>16 (28.6)</td>
<td>13 (43.3)</td>
</tr>
<tr>
<td>Others</td>
<td>13 (7.9)</td>
<td>4 (7.1)</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>Education level (N [%])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary or secondary</td>
<td>33 (20.1)</td>
<td>11 (19.6)</td>
<td>5 (16.7)</td>
</tr>
<tr>
<td>Some college or university</td>
<td>33 (20.1)</td>
<td>15 (26.8)</td>
<td>7 (23.3)</td>
</tr>
<tr>
<td>College or university graduate</td>
<td>83 (50.6)</td>
<td>25 (44.6)</td>
<td>13 (43.3)</td>
</tr>
<tr>
<td>Trade certificate</td>
<td>15 (9.1)</td>
<td>5 (8.9)</td>
<td>5 (16.7)</td>
</tr>
<tr>
<td>Employment status (N [%])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time or part-time</td>
<td>37 (22.6)</td>
<td>9 (16.1)</td>
<td>2 (6.7)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>26 (15.9)</td>
<td>8 (14.3)</td>
<td>9 (30.0)</td>
</tr>
<tr>
<td>Student</td>
<td>1 (0.6)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Disability</td>
<td>61 (37.2)</td>
<td>24 (42.9)</td>
<td>13 (43.3)</td>
</tr>
<tr>
<td>Sick leave</td>
<td>13 (7.9)</td>
<td>6 (10.7)</td>
<td>2 (6.7)</td>
</tr>
<tr>
<td>Retired</td>
<td>11 (6.7)</td>
<td>3 (5.4)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Homemaker</td>
<td>5 (3.0)</td>
<td>1 (1.8)</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>Others</td>
<td>10 (6.1)</td>
<td>5 (8.9)</td>
<td>3 (10.0)</td>
</tr>
<tr>
<td>Marital status (N [%])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>21 (12.8)</td>
<td>9 (16.1)</td>
<td>8 (26.7)</td>
</tr>
<tr>
<td>Married/common-law</td>
<td>119 (72.6)</td>
<td>36 (64.3)</td>
<td>16 (53.3)</td>
</tr>
<tr>
<td>Divorced/separated</td>
<td>22 (13.4)</td>
<td>11 (19.6)</td>
<td>5 (16.7)</td>
</tr>
<tr>
<td>Widowed</td>
<td>2 (1.2)</td>
<td>0 (0.0)</td>
<td>1 (3.3)</td>
</tr>
</tbody>
</table>

Numbers in parentheses are the percentages of participants within each group who have that characteristic.

*Data are missing for 2 participants.

SI indicates suicidal ideation.
TABLE 3. Means and SD of Suicidal Ideation Composite Scores and Outcome Variables by Time and Suicidal Ideation Group (n=250)

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>No SI (n = 164)</th>
<th>Low SI (n = 56)</th>
<th>High SI (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Tx</td>
<td>Post-Tx</td>
<td>Pre-Tx</td>
</tr>
<tr>
<td>SI composite score</td>
<td>0.0 ± 0.0</td>
<td>0.1 ± 0.3</td>
<td>1.4 ± 0.5</td>
</tr>
<tr>
<td>Pain intensity ratings</td>
<td>25.6 ± 5.9</td>
<td>24.8 ± 6.1</td>
<td>26.3 ± 5.0</td>
</tr>
<tr>
<td>Functional limitations</td>
<td>40.5 ± 10.0</td>
<td>34.9 ± 8.9</td>
<td>42.4 ± 10.4</td>
</tr>
<tr>
<td>Depressive symptoms</td>
<td>11.8 ± 4.6</td>
<td>8.6 ± 4.6</td>
<td>15.0 ± 5.4</td>
</tr>
<tr>
<td>Overall distress</td>
<td>68.5 ± 19.6</td>
<td>58.2 ± 19.5</td>
<td>86.8 ± 19.9</td>
</tr>
<tr>
<td>Pain catastrophizing</td>
<td>23.2 ± 12.1</td>
<td>15.5 ± 10.8</td>
<td>28.1 ± 10.7</td>
</tr>
<tr>
<td>Self-perceived burden</td>
<td>24.6 ± 8.5</td>
<td>22.7 ± 7.4</td>
<td>27.8 ± 9.8</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD. SI composite scores at pretreatment and posttreatment were calculated by summing the suicidal ideation items from the Patient Health Questionnaire and the Outcome Questionnaire. SI indicates suicidal ideation; Tx, treatment.

\[ F_{2,247} = 51.98, \quad P < 0.001, \quad \eta^2_p = 0.30, \] demonstrating that the decline was necessarily limited to the groups with either low or high SI at pretreatment.

Change in Pretreatment and Posttreatment Measures

The mean scores on all other outcome variables at pretreatment and posttreatment are shown in Table 3 and Figure 2. In the multivariate analysis, there were significant main effects for time (Wilks’ Lambda = 0.55, \( F_{6,242} = 32.89, \quad P < 0.001, \quad \eta^2_p = 0.45 \)), SI group (Wilks’ Lambda = 0.76, \( F_{12,484} = 5.88, \quad P < 0.001, \quad \eta^2_p = 0.13 \)), and the group by time interaction (Wilks’ Lambda = 0.90, \( F_{12,484} = 2.21, \quad P = 0.010, \quad \eta^2_p = 0.05 \)).

The main effect of time indicated that, with treatment, there was a significant pre-post improvement in pain intensity (\( P = 0.008 \)), and more substantial improvements in functional limitations, depression, overall distress, catastrophizing, and self-perceived burden (\( Ps < 0.001 \)). The significant group by time interaction combined with the main effect for SI group, suggested that post hoc analyses could be conducted by comparing the 3 groups separately at pre- and posttreatment. These results are shown in Figure 2. At pretreatment, the 3 groups were comparable with respect to pain intensity and functional limitations (\( Ps > 0.421 \)). Patients in the high SI group endorsed greater depressive symptoms, overall symptoms and distress, pain catastrophizing, and self-perceived burden than patients in the no SI group (\( Ps < 0.001 \)). They also endorsed greater levels of pain catastrophizing and self-perceived burden in comparison with those in the low SI group (\( Ps < 0.024 \)). Individuals low in SI, compared with those with no SI, endorsed greater depressive symptoms, overall distress, and pain catastrophizing (\( Ps < 0.018 \)). There was a trend for self-perceived burden, with the low SI group scoring higher than the no SI group (\( P = 0.058 \)).

At posttreatment, patients high in SI endorsed greater levels of depressive symptoms, overall symptoms and distress, pain catastrophizing, and self-perceived burden than patients in both the no and low SI groups (\( Ps < 0.047 \)). Thus, the high and low SI groups showed differentiation on a broader range of measures at posttreatment than at baseline. The low SI group, at posttreatment, reported greater overall distress compared with the no SI group (\( P = 0.034 \)). These 2 groups were similar on all other measures (\( Ps > 0.233 \)).

Sustained SI After Treatment

The continued expression of SI after completing treatment is an important clinical concern. To further understand this issue, exploratory analyses were conducted on the subset of 86 patients who endorsed SI at pretreatment. Specifically, the pretreatment and posttreatment scores of individuals who reported, at posttreatment, that they either did (\( n = 41 \)) or did not (\( n = 45 \)) continue to experience SI were compared.

The 2 groups were similar demographically, except that patients with sustained SI were younger (mean age = 44.27 ± 10.76 y vs. 48.53 ± 9.12 y; \( t_{185} = 1.99, \quad P < 0.05 \)). They also endorsed higher SI composite scores at baseline (mean = 3.00 ± 1.52 vs. 1.53 ± 0.76; \( t_{184} = 5.75, \quad P < 0.001 \)). A multivariate analysis of outcome measures revealed significant main effects for time (Wilks’ Lambda = 0.42, \( F_{6,70} = 17.89, \quad P < 0.001, \quad \eta^2_p = 0.58 \)) and sustained SI group (Wilks’...
Lambda = 0.82, \( F_{6,79} = 2.97, P = 0.011, \eta^2_p = 0.18 \), and a significant interaction (Wilks’ Lambda = 0.70, \( F_{6,79} = 5.74, P < 0.001, \eta^2_p = 0.30 \)).

The main effect of time indicated that patients with or without sustained SI both improved significantly from pretreatment to posttreatment on all measures (\( P_s < 0.028 \)). The main effect of group indicated that, collapsed across time points, patients with sustained SI endorsed greater depressive symptoms, overall distress, pain catastrophizing, and self-perceived burden (\( P_s < 0.011 \)), but comparable levels of pain intensity and functional limitations (\( P_s > 0.085 \)). However, this main effect is tempered by the finding of a significant interaction. When the 2 SI groups were compared at each individual time point, it was found that, at pretreatment, they were similar on all measures except self-perceived burden, which was higher in the sustained SI group (mean = 32.54 ± 10.53 vs. 27.20 ± 9.31; \( t_{84} = 2.50, P = 0.015 \)). At posttreatment, patients in the sustained SI group scored significantly higher on all variables (\( P_s < 0.024 \)) except functional limitations, which did not differ between the groups (\( P = 0.066 \)). This pattern suggests that patients with sustained SI at posttreatment experienced less overall improvement with the pain management program, and that their greater continuing difficulty was not limited to SI.

**DISCUSSION**

In this study of individuals attending an interdisciplinary rehabilitation program for CP, over one third (34.4%) reported some level of SI at pretreatment. Of these individuals, approximately one third (34.9%) endorsed more frequent thoughts of suicide, representing 12% of the entire sample. The present findings fall within the general parameters of previous research, which has found that up to 41.5% of pain clinic attendees endorse at least occasional thoughts of taking their own lives\(^22–30\) and between 1.2% and 16.6% report more frequent or active suicidal thinking\(^22,23,27,28,31\).

As in previous research, the pretreatment data revealed that depressive symptoms are elevated among individuals with either high or low SI\(^23,26–30\). Patients in the 2 SI groups also endorsed greater overall distress compared with those patients without SI. Because depression and

![FIGURE 2. Pretreatment and posttreatment scores for the outcome variables by time and suicidal ideation group (n = 250). For each graph, the y-axis is centered around the grand mean ± 1 SD. Solid lines represent the high suicidal ideation group. Dashed lines represent the low suicidal ideation group. Dotted lines represent the no suicidal ideation group.](image-url)
global distress did not differ between the high and low SI groups, the elevations, at least before treatment, seem to be associated with suicidal thinking in general, rather than to SI of a specific frequency or intensity.

Pain catastrophizing and self-perceived burden showed a different pattern of association with pretreatment levels of SI. Specifically, significant differences in catastrophizing were observed among the 3 SI groups, and the same general pattern was found with self-perceived burden. This suggests these cognitive and interpersonal variables may serve as sensitive markers for SI, such that increasingly prominent catastrophizing or sense of burden are associated with increasingly frequent SI in, perhaps, a direct linear way. Future research may address the relative significance of pain intensity and functional disability in the etiology of SI remains uncertain. It may be that among individuals attending interdisciplinary pain management programs, most of whom have long histories of relatively severe pain, a critical threshold for pain and disability has already been exceeded. In this event, individual differences in depression or cognitive and interpersonal responses to pain may be more relevant and proximally related to SI.

At the end of treatment, there were significant improvements on all outcome measures. Specifically, patients reported lower pain intensity, functional limitations, depressive symptoms, global distress, and pain catastrophizing. They also felt less burdensome to their significant others. Nevertheless, patients who had high SI at baseline still reported greater difficulty in all of these areas compared with those who began with no SI. They did not necessarily show less of a treatment response, but rather began with more extreme scores on most measures and, at discharge, remained more symptomatic despite significant improvements. This finding is consistent with those obtained in studies of depression, in which more severely depressed patients have been less likely to achieve a full remission, even with a reliable treatment response.

In some respects, patients in the low SI group showed the most favorable treatment outcome. Compared with patients with no SI, their pretreatment scores for depression, overall distress, and pain catastrophizing were all indicative of greater difficulty. At posttreatment, however, these 2 groups had comparable scores on all scales except the OQ measure of global distress. In this regard, they had moved from a pattern approaching that of the high SI group to one more similar to that of the no SI group.

Importantly, there was a robust decrease in SI for both the high and low SI groups. This was evident in the average SI scores, and in the movement of individuals between the high, low and no SI categories. Of the 86 participants endorsing at least some SI at baseline, over half reported none after treatment. To our knowledge, this is the first evidence that participation in an interdisciplinary chronic pain management program leads to a reduction in SI. This represents another important clinical benefit of programs of this type.

Most individuals with SI showed a reduction in their suicidal thinking; however, a small minority of patients reported an increase at the end of the program. There were also some patients whose SI scores did not change. Hence, suicidal thinking remains a clinical concern for some patients at posttreatment, especially those who had more frequent thoughts of self-harm at the start of the program. The comparisons of patients with or without sustained SI after treatment indicated that those with sustained SI also benefited less from participation (ie, they experienced a less favorable treatment response). It would seem, therefore, that identifying interventions for treatment-resistant SI is an important area for future research.

Of the psychological and pain-related characteristics that were assessed at baseline, self-perceived burden was the only one associated with sustained SI at posttreatment. This interpersonal construct was recently shown to be correlated with several clinically relevant variables in a chronic pain sample. Self-perceived burden refers to “empathic concern engendered from the impact on others of one’s illness and care needs, resulting in guilt, distress, feelings of responsibility, and diminished sense of self.” It is a relevant issue for people with health problems that impose some degree of hardship or caregiving requirements on significant others. Self-perceived burden is similar to the construct of “perceived burdensomeness” in mental-health research. Perceived burdensomeness refers to the belief that one has become a drain on loved ones or on society in general, and that others might actually be better off with the person gone.

Perceived burdensomeness is a central feature of the interpersonal theory of suicide, in which it is hypothesized to be a major precursor to the onset of serious suicidal behavior. The finding that high self-perceived burden at pretreatment was associated with sustained SI afterwards is compatible with this theory. As such, it suggests that the interpersonal theory of suicide may be a promising framework for future hypothesis-driven, rather than exploratory, research into the problem of suicidal behavior in chronic pain. If so, it would be expected that thwarted belongingness (lack of meaningful interpersonal connection), which is another central construct of the theory, would interact with perceived burdensomeness in the prediction of SI.

This study provides important information about the prevalence, correlates, and responsiveness to change of SI in people with CP. Nevertheless, a number of shortcomings are acknowledged. The assessment of change in SI was conducted as a pretreatment to posttreatment evaluation of an existing clinical program, rather than as an outcome of a randomized controlled trial. Because there was no control condition, the present results do not provide the highest standard of evidence that the interdisciplinary intervention actually caused the observed reductions in SI. Nonetheless, patients who remain on waitlists for pain clinics tend to deteriorate over time, rather than improve, including on measures of depression and anxiety. Although no studies to our knowledge have specifically examined change in SI of waitlisted patients, the available evidence suggests that the improvements observed in the current investigation on measures of depression and distress are unlikely due to regression to the mean. This logic extends to SI, but confirmation will depend on future research using randomized controlled designs.
The interdisciplinary pain management program was designed primarily to address issues related to functional rehabilitation. Although the importance of psychological adaptation is a central component of this approach, the intervention was not intended as a first-line treatment for suicidal behavior. The observed decrease in SI is likely associated with other improvements in emotional functioning, and the learning and implementation of adaptive coping strategies for managing both pain and distress. In a related vein, because treatment was offered in an intensive, interdisciplinary format, results might not generalize to other settings. Access to this type of program is increasing in many parts of the world; however, it is decreasing in the United States. Whether less intensive programs can help to reduce SI remains to be determined.

The assessment of SI was based on a composite measure derived from 2 symptom scales, rather than a questionnaire or interview developed specifically for the research assessment of SI in clinical populations. As well, the time frames assessed by the symptom scales differed (1 week for the QO and 2 weeks for the PHQ). Although this approach resulted in clinically meaningful SI groupings and a composite score that was sensitive to change, future research would benefit from the inclusion of more in-depth, standardized measures that have been developed expressly for this purpose. For example, the Columbia Suicide Severity Rating Scale has been recommended for inclusion in standard databases for clinical trials of pain treatment. In addition, this study was based on the literature on SI in CP, with less emphasis on the factors that are predictive of SI in mental-health settings. It is known, for example, that hopelessness, diagnosed mental disorders, and a history of suicide attempts are important predictors of suicidal behavior in psychiatric populations.

These factors might be equally relevant in the context of CP and could be included in future studies.

Finally, the current quantitative data are informative about the extent of SI among patients seeking treatment for chronic pain, but they do not address the underlying reasons, as might be expressed in the personal narratives of the patients themselves. There is an opportunity to learn more about suicidal thinking in people with CP by undertaking qualitative research to examine why these individuals might believe that they, and perhaps their families and loved ones, would be better off if they were dead. This would provide a greater depth to our understanding of the issue of suicide in CP and, perhaps, identify new treatment directions.

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