

Bridging the gap: An online survey on how suicide prevention training shapes oncology professionals' confidence, practice, and training needs

Tamara Schwinn^{a,*}, Judith Hirschmiller^a, Jörg Wiltink^{a,b}, Rüdiger Zwerenz^a, Elmar Brähler^{a,c}, Manfred E. Beutel^a, Mareike Ernst^{a,d}

^a Department of Psychosomatic Medicine and Psychotherapy, University Medical Center of the Johannes Gutenberg-University Mainz, Mainz, Germany

^b University Cancer Center Mainz (UCT), University Medical Center of the Johannes Gutenberg-University Mainz, Mainz, Germany

^c Department of Medical Psychology and Medical Sociology, University Medical Center of Leipzig, Leipzig, Germany

^d Department of Clinical Psychology, Psychotherapy and Psychoanalysis, Institute of Psychology, University of Klagenfurt, Austria

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ABSTRACT

Purpose: Cancer patients have an elevated risk of suicidal thoughts and behavior (STBs). Therefore, healthcare professionals (HCPs) caring for them have a central role as gatekeepers in suicide prevention. However, there is considerable heterogeneity in whether and how they address patients' suicidality in practice. This study explored these variations, and the relevance of training.

Methods: An online survey was conducted among 228 oncology HCPs from several professions. The study examined sociodemographic differences in key variables (subjective knowledge, confidence, being emotionally overwhelmed, perceived control, self-efficacy, stigmatization) along with previous participation in and need for further training, routine exploration of STBs, and their interrelations. A Latent-Class Analysis (LCA) examined associations between HCPs' reports surrounding the active exploration of suicidality and their personal characteristics. A qualitative content analysis identified content recommendations.

Results: The majority of HCPs (81 %) reported a need for further training. Differences were found based on sociodemographic characteristics and profession. Previous participation in training was indirectly related to routine exploration through confidence and subjective knowledge. Self-efficacy statistically predicted less reported need for further training. The LCA identified three classes: (1) high exploration with low knowledge/confidence, (2) high exploration with high knowledge/confidence, and (3) less exploration with high knowledge/confidence. Participants also reported preferred training characteristics and content.

Conclusions: The findings underscore the need to include all cancer care professionals in suicide prevention training. Training should enhance confidence as well as evidence-based knowledge, and evaluate both. Actual clinical behavior such as the routine exploration of STBs is a crucial outcome in real-world practice.

1. Introduction

Cancer patients are at an elevated risk for suicidal thoughts and behavior (STBs) (Amiri and Behnezhad, 2019; Robson et al., 2010). Notably, the majority of individuals – including those affected by cancer - who die by suicide have had contact with a general practitioner within the month preceding their death (Andersen et al., 2000; Miller et al., 2008). This highlights the pivotal role of healthcare professionals (HCPs) in suicide prevention. The proactive inquiry of STBs can be seen as the starting point of prevention and has been recommended by

professional societies (Krebsgesellschaft et al., 2023; Nationaler Krebsplan, 2017). However, despite this imperative, patients experiencing suicidality often encounter stigma, especially from non-mental HCPs (Frey et al., 2016). Further, even within oncology, several studies indicate that professionals feel insufficiently prepared to address suicidality, citing a lack of knowledge, being emotionally overwhelmed, and unconfident (Granek et al., 2018; Schwinn et al., 2025; Senf et al., 2020). This may result in missed opportunities to identify and support patients at risk, even or also with systematic screening tools specifically designed for use in oncology (Turner et al., 2023).

* Corresponding author. Department of Psychosomatic Medicine and Psychotherapy University Medical Center of the Johannes Gutenberg-University Mainz, Untere Zahlbacher Str. 8, 55131, Mainz, Germany.

E-mail address: Tamara.Schwinn@unimedizin-mainz.de (T. Schwinn).

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To bridge this gap between expert recommendations and clinical practice, specific suicide prevention *training* has been widely proposed (Granek et al., 2019; Ozturk and Hicdurmaz, 2023; Valente, 2010). Several established training programs – such as QPR (Question, Persuade, Refer), ASIST (Applied Suicide Intervention Skills training), STORM (Skills Training on Risk Management), MHFA (Mental Health First Aid) and CALM (Counseling on Access to Lethal means) – have undergone extensive evaluation in various healthcare contexts (Appleby et al., 2000; Gask et al., 2006, 2019; Magness et al., 2023; Rimkeviciene et al., 2022; Sale et al., 2018; Shams and Hattingh, 2020; Siau et al., 2018; Silva et al., 2016; Slovak et al., 2019; Smith et al., 2014; Witry et al., 2020). However, these training courses have not yet been applied or adapted to the oncological context which has special features and challenges (Schwinn et al., under review). These include the necessity to distinguish suicidal crises from decisions around end-of-life care in palliative contexts (Granek et al., 2019; Schwinn et al., 2025), as well as the potential overlap between depressive and cancer-related symptoms (Hirschmiller, under review; Hartung et al., 2019; Schellekens et al., 2020).

It would be desirable to bring the aforementioned training courses into the psycho-oncological context, as research evaluating their effectiveness has shown promising results in other contexts across a range of outcomes. For example, a review and meta-analysis of 96 studies on simulation-based suicide prevention training reported improvements in attitudes (e.g., beliefs, confidence, self-efficacy), knowledge, and skills (Richard et al., 2023). Improvements in actual behavior, such as asking about STBs and managing suicidal crises with interventions, were observed as well, although they were examined in only a few studies. Thus, most training programs are not evaluated regarding their impact on actual clinical practice (e.g., Stuber et al., 2023). Furthermore, several studies indicate that not all training programs promote proactive risk assessment: Participants trained in ASIST were not more likely to explore suicide risk (Gould et al., 2013). Similar findings emerged in the study by Solin et al. (2021), with notable differences in professions and experiences, where a brief 3-h suicide prevention training improved HCPs' subjective competence, including in general practitioners, nursing staff, and social workers. However, most substantial gains were observed in nurses' willingness to raise and address suicidal concerns, whereas primary care staff reported only modest improvements in managing suicidal ideation and referral procedures. Likewise, Wakai et al. (2020) found that behavioral health clinicians who had received suicide-specific training were more skilled and confident to ask patients about suicidality than their untrained counterparts. Still, many respondents – trained and untrained – expressed the need for (additional) education, highlighting persistent gaps in training content and scope and the ongoing need for more specific education, particularly around formal screening, assessment, and treatment practices.

On the other hand, a survey found no positive relationship between training participation and attitudes or skills among oncology professionals and the authors recommended specific training for this field (Inoue et al., 2021). To date, no study has systematically examined how suicide prevention training affects exploratory behaviors – directly inquiring about STBs – within oncological care. It, therefore, remains unclear how participation in training influences what were key variables in previous studies, such as perceived knowledge and control, as well as being emotionally overwhelmed, confidence, self-efficacy, and stigmatization. It also remains to be seen whether there are differences across sociodemographic characteristics and professions.

Collectively, these gaps underscore an urgent need for research investigating how suicide prevention training translates into oncology practice, meaning how well such training prepares oncology professionals for effective suicide risk assessment, and what additional content or components might be necessary. Furthermore, little is known about whether subgroups of oncology professionals can be identified based on specific variables and actual behavior – insights which could inform tailored, supportive interventions.

We thus formulated both explorative questions and directed hypotheses guiding the present study:

1. Are there sociodemographic differences (age, gender, professional group and professional experience) in *key variables* (subjective knowledge, confidence, being emotionally overwhelmed, stigmatization, self-efficacy, perceived control) and previous participation in training, the need for further training, and routine exploration of STBs?
2. a. Previous participation in training is associated with more routine exploration of STBs.
2. b. This relationship is mediated by the key variables.
3. a. There is an association between HCPs' reported need for further training and the key variables.
3. b. The reported need for further training is dependent on the key variables.
4. Are there distinct subgroups of HCPs characterized by their responses on the key variables and routine exploration of STBs?
5. Which elements should specific training for suicide prevention in cancer patients include, according to HCPs?

2. Methods

2.1. Study design and recruitment

The study utilized an online survey conducted via LimeSurvey, available in both, English and German. It combined standardized questionnaires with open-ended questions (available via the Open Science Framework: <https://osf.io/6tf92/>).

Participants were HCPs working with cancer patients (currently or in the past) and a sufficient knowledge of German or English. We aimed to include various professional backgrounds. Participants were recruited between September 2024 and March 2025 via emails sent to/further distributed by inpatient and outpatient clinics, counseling centers, training centers, and professional organizations within (psycho-) oncology in Germany. Participants were not paid. They were informed about the study's aims, handling of personal data and anonymity of responses and provided informed consent. The survey could be stopped any time without disadvantages for the participant. All contents and procedures were approved by the ethics committee of the Rhineland-Palatinate Chamber of Physicians (nr. 2023-16975).

2.2. Information and measures

The survey took about 30 min and assessed sociodemographic (e.g., age, gender, professional group and professional experience (measured with years working in oncology)) information as well as the following variables:

Subjective knowledge. Four items starting with “How do you estimate your personal level of knowledge” assessed subjective knowledge about (1) suicidality in general, (2) suicidality in cancer patients, (3) suicide prevention, and (4) legal regulations. Item (1), (2) and (4) had been used in a previous German study (Senf et al., 2022). They were rated from 1 = “insufficient” to 4 = “very good”.

Confidence. Feeling confident talking about suicidality with patients was rated with one item “How confident do you feel talking to patients about suicidal thoughts?” (Senf et al., 2022) on a scale from 1 = “very unconfident” to 4 = “very confident”.

Being emotionally overwhelmed. The item: “If a patient substantiates suicidal desire in conversation, do you feel overwhelmed?” was rated from 1 = “very overwhelmed” to 4 = “not at all overwhelmed” (Senf et al., 2022).

Self-efficacy. Self-efficacy was assessed with the ASKU (German for General self-efficacy short scale (Beierlein et al., 2013)) which comprises three items (e.g., “I can rely on my own abilities in difficult situations”). Answers were given from 0 = “does not apply at all” to 5 =

“applies completely”. Internal consistency was good ($\alpha = .83$).

Stigmatization. The Stigma of Suicide Scale (SOSS-SF-D, German version (Ludwig et al., 2020)) assessed stigmatization of people affected by suicide using sixteen items on three subscales (depression/isolation: e.g., “lonely”; glorification/normalization: e.g., “strong”; and stigmatization: e.g., “pathetic”). Participants responded on a scale from 1 = “strongly disagree” to 5 = “strongly agree”. While internal consistency for depression/isolation was acceptable ($\alpha = .78$), it was good for glorification/normalization ($\alpha = .81$), and stigma ($\alpha = .88$).

Perceived control. The Perceived Control Short Scale – 6 items (PCSS-6) assessed primary and secondary control with three items each (Hirschmiller et al., under review), which was framed by the introductory phrase “When something bad happens to me” with item-specific responses (e.g., primary control: “I ask others for help and advice”; secondary control: “I remind myself I am better off than others”). Answers were given from 0 = “strongly disagree” to 10 = “strongly agree” (sum scores ranging from 0 to 30 for each subscale). Internal consistency for primary control was moderate ($\alpha = .68$) and for secondary control ($\alpha = .75$) acceptable.

Previous participation in training. One item assessed the previous participation in a suicide prevention training: “Have you received training in which you received information on the topic of suicidality/suicide prevention or more specifically how to recognize suicidality/deal with potentially suicidal patients?” (yes/no). If participants answered with yes, additional questions were asked about context information on their received training (e.g., part of occupational training, part of education), duration (in hours), time since the last training session (from less than 1 year to more than 10 years) and the helpfulness (1 = “not at all” to 4 = “very”).

Need for further training. The following item was used to indicate a need for further training: “Would you like further training on the topic of suicidality/suicide prevention in oncological patients?” (yes/no). Participants were further asked about the professional group they would like to be trained by and what they would like a suicide prevention training to look like (three options to each category: e.g., online training, in-person training, both). With an open-ended question preferred content was asked “What content of suicide prevention training is important to you?”.

Routine exploration of STBs. This item was: “Do you actively address suicidal thoughts in your patients?” The answer possibilities were “Yes, in the following situations” with a free text field or “No, never”. The answers in the text field were categorized into *routine exploration* (e.g., when participants indicated to “always” proactively inquire, at least once for each patient, including in the initial conversation) and otherwise into *no routine exploration* (e.g., only with clear indications, like the patient expressing STBs).

2.3. Statistical analyses

Data were analyzed with R statistics version 4.4.2 using the packages readxl, psych, Hmisc, apaTables, effectsize, dplyr, lavaan, polCA, ggplot, car, and reshape2. Analyses related to the reported need for further training were based on $N = 185$ responses, as not all participants had responded to this item. All other analyses were conducted using the full sample ($N = 228$).

To address the *first research question*, gender differences (between men and women; $N = 227$) were analyzed using t-tests for the continuous key variables and a χ^2 tests for the dichotomous variables. For age and professional experience (years working in oncology practice), Pearson correlations were conducted for continuous variables (Supplemental Table 1), and t-tests for dichotomous variables. Differences between professional groups (excluding psycho-oncology when no other professional group was reported; $N = 214$) were assessed with ANOVAs for key variables, followed by Bonferroni corrected pairwise post-hoc comparisons in cases of significance. Dichotomous variables were examined using a Fisher’s exact test, with significant results further

explored through pairwise Fisher’s tests.

As basis for answering the *second research question*, a logistic regression was performed examining the association between previous participation in training and routine exploration of STBs. A 95 %-Confidence Interval (CI) and Odds Ratio (OR) were reported. Following this, probable mediating key variables were identified and the statistical assumptions required for mediation analysis (see proposed mediation model in Fig. 1) were tested and confirmed.

First, t-tests were conducted to determine which key variables were significantly associated with previous participation in training and routine exploration. For better interpretability, only those key variables showing at least medium effect sizes (Cohen’s $d \geq .5$) in both associations were selected.

Second, a statistical assumption-checking procedure outlined by Kane (2017) was applied: Multicollinearity was excluded by examining the correlation of the mediators, which was $< .80$ (Field, 2013). Linearity was assessed using residual plots, which showed no serious deviations between previous participation in training and the potential mediators (see Supplemental Fig. 1). Linearity of the logit was assessed by fitting a logistic regression model including the mediators and previous participation in training predicting routine exploration of STBs; residual plots revealed no major deviations (see Supplemental Fig. 2). A Box-Tidwell test was also applied (Shrestha, 2019) for the assumption of linearity between the mediators and their logarithmic transformation. It were not significant ($p > .05$), indicating that the assumption of linearity was not violated (see Supplemental Table 2). Homoscedasticity was examined using Scale-Location plots (see Supplemental Fig. 3), showing no problematic patterns, minor decreases were tolerated. Normality of estimation errors was checked using Q-Q-Plots (see Supplemental Fig. 4). While slight deviations at the extremes were observed, this is common for large samples (Yang et al., 2019). Moreover, these were deemed acceptable due to the use of bootstrapping with 10,000, which does not assume normality errors (Hayes, 2022). The independence of observations was ensured by the study design, as participants were sampled independently.

Third, the significant variables from the linear and logistic regressions from the first step were included in a parallel multiple mediation analysis (Hayes, 2022; Kane, 2017).

For the *third research question*, Pearson correlations (interpreted as point-biserial correlations; Tate (1954)) were calculated to explore the association between the key variables and the dichotomous variable need for further training. Subsequently, key variables showing significant correlation were entered as predictors into a multiple logistic regression model with need for further training as the dependent variable. To facilitate interpretation, the predictors were mean-centered (Iacobucci et al., 2016).

Research question 4 was explored using a Latent Class Analysis (LCA) on the key variables that were included in the mediation model of research question 2, predicting routine exploration of STBs, as well as routine exploration itself. Two- and three-class models with varying constellations of these variables were tested to determine the best model fit.

The open-ended responses for *research question 5* were analyzed using a qualitative content analysis (file available via <https://osf.io/6tf92/>), following the approach outlined by Kuckartz and Rädiker (2022).

3. Results

3.1. Study sample

The study included 228 HCPs with different professional backgrounds (see Table 1). The largest groups were psychologists (17.11 %), physicians (13.16 %), and nursing staff (14.91 %). The majority of participants had a master’s degree (41.87 %) or a doctorate/license (36.95 %). In total, 84 (36.84 %) HCPs had a psycho-oncologist specialization training of whom 43 indicated their certification. The

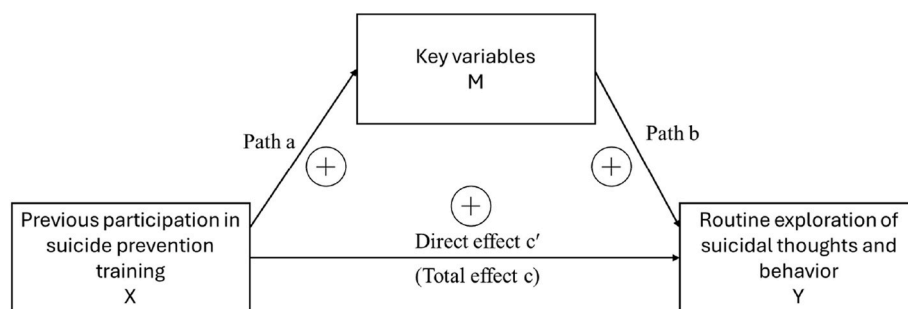


Fig. 1. Proposed parallel multiple mediation model

Figure legend: This figure shows the proposed parallel multiple mediation model of previous participation in training to routine exploration.

majority of the sample were women (83.33 %) and one person indicated to be diverse (0.44 %; complying with Germany's civil status act). Participants' ages ranged from 22 to 74 years. Overall, 187 (82.02 %) of the sample reported to still undergo training such as specialist training as physician, therapist, master's student, or psycho-oncologist. In total, 198 (86.84 %) HCPs indicated to work in oncology with experience ranging from $< \frac{1}{2}$ year to 45 years, while 94 (41.23 %) HCPs had (also) worked in psychiatry/psychotherapy and 86 (37.72 %) in other health settings. One HCP worked exclusively in England. The others were based in Germany, with one each additionally working in France, Spain, Norway, and USA.

3.2. Analysis of research question 1: differences in relation to sociodemographic characteristics and professional groups

Gender: Women reported more subjective knowledge about suicide prevention than men ($t(47.59) = -2.19, p = .033, CI[-.57, -.02]; d = -.43$). No significant gender differences were found for other variables.

Age: Age was only correlated with subjective knowledge about legal regulations in suicide prevention ($r = .19, p = .004, CI[.06, .31]$). Detailed correlation results are presented in [Supplemental Table 1](#).

Professional group: Significant differences between professional groups across all four subjective knowledge items, as well as confidence, being emotionally overwhelmed, and self-efficacy emerged, and post-hoc comparisons elucidated the group differences (see [Table 2](#)): Pair-wise Fisher's tests showed that psychologists were more likely than nursing staff ($p < .001$) and social workers ($p = .016$) to have previously participated in training. Psychologists were more likely to routinely explore STBs ($p = .024$).

There were no significant effects of *professional experience* on any of the variables.

3.3. Analysis of research question 2: previous participation in training and exploration of STBs and their associations

A total of 126 individuals reported previous participation in a suicide prevention training ([Supplemental Table 3](#)). Previous participation in training was positively associated with routine exploration of STBs ($\beta = .99, SE = .38, z = 2.61, p = .009, CI[.27, 1.78], OR = 2.70$).

Subjective knowledge about suicidality in general, about suicide prevention, and confidence showed significant associations with both previous training participation and routine exploration of STBs ($d \geq .73$) and were thus integrated into the parallel multiple mediation model that was the main analysis for this research question ([Fig. 2](#)).

Path a was significant for all three mediators, while path b was not. However, the combined indirect effect of all three mediators was significant, while the direct effect of previous participation in training on routine exploration of STBs was not, suggesting total mediation by the key variables (see [Table 3](#)).

3.4. Analysis of research question 3: need for further training

Reported need for further training was positively correlated with self-efficacy, and subjective knowledge about suicidality in general/in cancer patients. In the multiple logistic regression model including all significant key variables, only self-efficacy was a significant predictor of less reported need for further training (see [Table 4](#)).

3.5. Analysis of research question 4: latent class analysis of healthcare professionals based on key variables and exploration behavior

To identify the best fitting model, a LCA was performed using different combinations of the key variables subjective knowledge about suicidality in general/suicide prevention, confidence, and routine exploration of STBs. Two- and three-class solutions were tested ([Table 5](#)). The three-class model showed the best fit (AIC = 1067.50, BIC = 1146.37) with the lowest residual deviance ($G^2 = 4.83, X^2 = 4.44$).

The sample can be divided as follows, as illustrated by the heatmap in [Fig. 3](#).

- *Uninformed, unconfident explorer* (Class 1; 13.23 %): low subjective knowledge and confidence with high explorative behavior (100 % of this class explored routinely)
- *Informed, confident explorer* (Class 2; 59.93 %): more subjective knowledge and confidence with higher explorative behavior
- *Informed, confident sometimes-explorer* (Class 3; 26.83 %): more subjective knowledge and confidence, moderate exploratory behavior

3.6. Analysis of research question 5: characteristics of further training

Of 185 HCPs, 150 (81.08 %) expressed a need for further training. Reported preferences regarding the training format are presented in [Table 6](#). Sixty-eight participants (36.76 %) suggested relevant training content (see [Fig. 4](#)). Main topics were *Dealing with and reaction to STBs* (10.40 %), *Conversation and communication* (8.91 %), *Materials, case studies, role plays* (8.91 %), and *Recognizing and assessing STBs* (8.42 %).

4. Discussion

This study took a broad perspective on the potential effects of suicide prevention training on key psychological variables and actual clinical behavior – specifically the recommended routine exploration of STBs by each oncological HCPs. By combining several methodological approaches, it offers valuable insights into how such training impacts actual behavior, and informs the design and contents of such suicide prevention training in the future. The relevance of this topic is underscored by the fact that over 80 % of the participants reported regular contact with suicidal patients, nearly 30 % currently treating them, and many have encountered multiple suicide deaths in oncology.

Which professional groups should participate in suicide prevention

Table 1
Sample characteristics and reported practical experiences.

Sociodemographic characteristics	N = 228
Gender N(%)^a	
Men	37 (16.23)
Women	190 (83.33)
Diverse	1 (.44)
Age Mean (SD)	47.63 (12.29)
Age Range [in years]	22–74
Highest degree/level of education N(%)	
Bachelor's Degree (e.g., BA, BS), undergraduate education/college degree or equivalent	14 (6.90)
Master's Degree (e.g., MA, MS, MEd), state examination or equivalent	102 (41.87)
Doctorate (e.g., PhD, EdD), license or equivalent/higher	80 (36.95)
Other	32 (14.04)
Professional group N(%)^a	
Physician	30 (13.16)
Psychologist	111 (48.68)
Nursing staff	34 (14.91)
Social worker	22 (9.65)
Other (Pastoral care, medical technologist for radiology, ergo-/physiotherapist, lawyer)	17 (7.46)
Psycho-oncologist ^{b,c}	84 (36.84)
Psychotherapist/Psychologist in psychotherapy training ^b	76 (33.33)
Form of institution N(%)^d	
Comprehensive Cancer Center	64 (28.07)
University Medical Center	66 (28.95)
General hospital	55 (24.12)
Outpatient clinic/practice	47 (20.61)
Rehabilitation facility	21 (9.21)
Day clinic	15 (6.58)
Advice center	41 (17.98)
Other	9 (3.95)
Professional experience (years working in oncology practice) N(%)	
<1 year	6 (2.63)
1–5 years	65 (28.51)
6–9 years	29 (12.72)
10–19 years	57 (25.00)
20–29 years	24 (10.53)
30–39 years	13 (5.70)
40–45 years	2 (.88)
Not applicable ^e	30 (13.16)
Frequency of contacts with suicidal patients in oncology practice N(%)	
None	35 (15.35)
1–3 times/year	122 (53.51)
>3 times/year	71 (31.14)
Number of suicide deaths in oncology unit N(%)	
None	138 (60.53)
1–3	77 (33.77)
4–10	13 (5.70)
Currently working with suicidal patients N(%)	
Yes	67 (29.39)
No	161 (70.61)

Note. ^acomplying with Germany's civil status act, ^a HCPs indicated a single or multiple professions (n = 91), showing their highest or for the study relevant position, ^b additional professional group, ^c n = 14 HCPs indicated only Psycho-oncologist as profession, ^d multiple answers, ^e treatment of cancer patients in psychiatric/psychotherapeutic or other health practice.

training?

A major strength of our study is the broad perspective, considering multiple professional groups, which expands on many studies examining the effects of suicide prevention training that focused on single professional groups (e.g., Coppens et al. (2018); Ferguson et al. (2018)) or did not differentiate between them (Elyoseph et al., 2024; Stuber et al., 2023). While the sociodemographic variables age, gender, and professional experience showed few to nonsignificant differences regarding key variables, the most notable variations emerged between professional groups. This aligns with findings by Ramberg et al. (2016), who reported that time spent working in psychiatry did not significantly predict attitudes toward prevention, nor did it influence clarity or confidence in working with suicidal patients. In our study, psychologists were

Table 2
One-way analysis of variance and pairwise t-test for differences in professional groups and key variables.

Variable	F(df)	p-value	η ²	Statistically significant pairwise comparisons ^a Groups
Subjective knowledge				
about suicidality in general	9.95 (1)	.002*	.04	3 < 1, 3 < 2, 4 > 3, 5 < 2
about suicidality in cancer patients	5.97 (1)	.015*	.03	3 < 2, 4 > 3, 5 < 2
about suicide prevention	14.72 (1)	<.001***	.06	3 < 1, 3 < 2, 5 < 2
about legal regulation in suicide prevention	5.25 (1)	.023*	.02	3 < 2, 4 > 3, 5 < 2
Confidence	11.54 (1)	<.001***	.05	3 < 1, 3 < 2, 4 > 3, 5 < 2
Being emotionally overwhelmed	9.84 (1)	.002**	.04	3 < 2, 5 < 1, 5 < 2
Self-efficacy	6.72 (1)	.010*	.03	2 > 1, 3 < 1, 3 < 2, 5 < 2, 4 > 3, 5 > 4
Stigmatization subscales				
Depression/isolation	.84 (1)	.360	<.01	
Glorification/normalization	.37 (1)	.546	<.01	
Stigma	.004 (1)	.950	<.01	
Perceived control				
Primary control	3.57 (1)	.060	.02	
Secondary control	.65 (1)	.420	<.01	

Note. ^a with Bonferroni correction, *p < .05, **p < .01, ***p < .001, η² ≥ .01 small, ≥.06 moderate, ≥.14 large, Groups: 1 = Physicians, 2 = Psychologists, 3 = Nursing staff, 4 = Social Workers, 5 = Other.

significantly more likely to have previously participated in suicide prevention training and to routinely explore STBs than other professional groups. They also reported more subjective knowledge across all four items, greater confidence, higher self-efficacy, and being less emotionally overwhelmed, than nursing staff and the mixed “Other” category. Surprisingly, social workers reported significantly greater subjective knowledge, higher confidence, and had higher self-efficacy than nursing staff, which contradicts previous research (Levine and Sher, 2020) and emphasizes the need and potential to expand the role of social workers in suicide prevention. A similar pattern was observed when comparing physicians and nursing staff. Low subjective knowledge and confidence among nursing staff were also documented in a German sample by Senf et al. (2020).

Professional guidelines recommend that all HCPs involved in cancer care should proactively address STBs (Krebsgesellschaft et al., 2023). This is particularly important for nursing staff, who constitute one of the largest professional groups in our sample. In Germany alone, there were over one million nurses registered in 2022 (Eurostat, 2024). Nursing staff have often close, sustained contact with patients and may spend more time with them than physicians (Butler et al., 2018; Westbrook et al., 2011). Moreover, nursing staff consider the interaction with patients' families and getting to know them as fairly important (Astedt-Kurki et al., 2001). Encouragingly, studies showed that training can significantly increase (among other aspects) nurses' confidence (Solin et al., 2021).

In Germany, certified cancer centers of the German Cancer Society follow quality standards that integrate social services, psycho-oncologists, and multidisciplinary case discussions (Kowalski et al., 2017). However, in many clinical settings, psychologists are typically involved after referral, and fewer than half of the cancer patients diagnosed with a mental disorder have actually received psychological support (Fallor et al., 2017). Therefore, it is crucial that all professional groups are equipped to recognize psychological distress, including STBs, making early detection (Li and Rodin, 2022) and communication skills

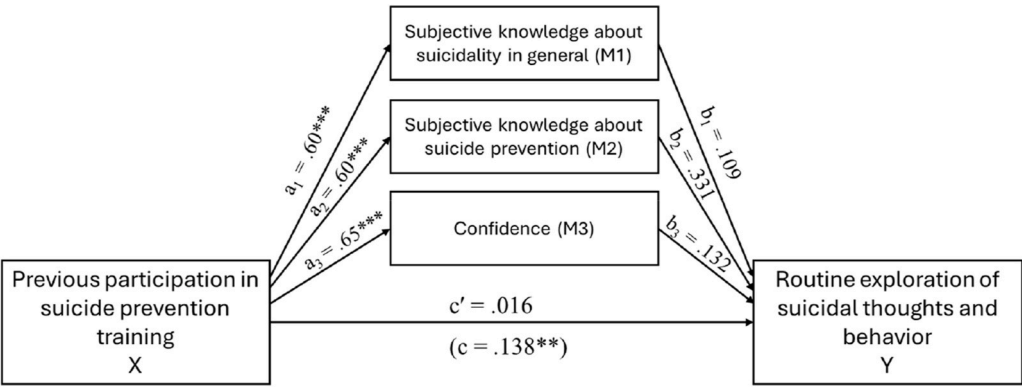


Fig. 2. Final parallel multiple mediation model
Figure legend: This figure shows the final parallel multiple mediation model of previous participation in training to routine exploration. Path a was between precious participation in suicide prevention training and the three mediators significant, while path b was not. The indirect effect (c') was not significant. The total effect (c) was significant; ** $p < .01$, *** $p < .001$.

Table 3
Parallel mediation model of the influence of previous participation in training on routine exploration via key variables.

Effect	Mediator (key variable)	Estimate	p-value
<i>Path a: Previous participation in training to key variable</i>			
	Confidence	.60	<.001***
	Subjective knowledge about suicidality on general	.60	<.001***
	Subjective knowledge about suicide prevention	.65	<.001***
<i>Path b: Key variable to routine exploration</i>			
	Confidence	.07	.107
	Subjective knowledge about suicidality on general	.05	.339
	Subjective knowledge about suicide prevention	.08	.134
<i>Indirect effect (a x b)</i>			
	Confidence	.04	.118
	Subjective knowledge about suicidality on general	.03	.355
	Subjective knowledge about suicide prevention	.05	.140
	Direct effect (participation in training to routine exploration)	.016	.783
	Total indirect effect	.122	<.001***
	Total effect	.138	.005**

Note. ** $p < .01$, *** $p < .001$.

Table 4
Multiple logistic regression analysis of the reported need for training.

Predictor	B	SE	Z	p-value	OR	95 %-CI
Intercept	1.59	.21	7.56	<.001***	4.91	[3.32, 7.60]
Subjective knowledge about suicidality in general	-.64	.36	-1.77	.077	.53	[.25, 1.07]
Subjective knowledge about suicidality in cancer patients	-.25	.34	-.73	.466	.78	[.40, 1.51]
Self-efficacy	-.81	.39	-2.06	.039*	.45	[.20, .95]

Note. SE = Standard Error, OR = Odds Ratio, 95 %-CI = 95 %-Confidence Interval, * $p < .05$, *** $p < .001$.

(Merckaert et al., 2005) essential across all disciplines involved in cancer care. In conclusion, suicide prevention training should be developed/adapted and implemented across all professional groups to ensure comprehensive suicide prevention efforts.
Which behavioral changes should suicide prevention training initiate?
The present study found that suicide prevention training impacts

several key variables including subjective knowledge and confidence. Notably, previous participation in training influenced actual behavior – the routine exploration of STBs – indirectly through increasing these key variables. These findings align with a study that identified sufficient suicide prevention training as a predictor for job clarity and confidence, as well as attitudes toward suicide prevention (Ramberg et al., 2016). Similarly, a study by Betz et al. (2013) demonstrated that greater self-confidence was associated with a greater likelihood to screen for suicidal ideation. These key variables should therefore be central targets for suicide prevention training and must be systematically addressed and evaluated, as is already the case in many studies (Elyoseph et al., 2024; Ko, 2024; Shirzad et al., 2024).
Moreover, self-efficacy emerged as a significant negative predictor of participants’ perceived need for further training. Still, even individuals who view themselves as competent may remain motivated and aware of their limitations, which informs their interest in ongoing professional development. Wakai et al. (2020) similarly reported a continued demand for training even among those who had already participated. This mirrors results emphasizing the need for specific training in oncology (Inoue et al., 2021), a point echoed by findings indicating that oncology nurses specifically need guidance on handling patient loss in the context of suicide prevention (Ozturk and Hicdurmaz, 2023).
Our study also revealed subgroups among HCPs. In general, high levels of subjective knowledge and confidence were associated with more frequent routine exploration of STBs and vice versa. A paradoxical group also emerged – individuals reporting high subjective knowledge and confidence, with low routine exploration of STBs. This suggests that the subjective nature of self-reported knowledge may not always reflect actual competence. Lai and Teng (2011) also found that self-perceived competence did not correlate with objectively measured competence. Therefore, training should incorporate objective assessments, such as standardized knowledge tests (Porte et al., 2020) and prioritize the evaluation of observable behavior changes in daily clinical practice.
Which content and characteristics should suicide prevention training contain?
Participants identified several important content areas for suicide prevention training. Most frequently mentioned was the ability to effectively deal with and respond to STBs, highlighting a strong need for practical, intervention-focused competencies that go beyond basic referral procedures. Skills like recognizing/assessing suicidality and effective communication, were repeatedly mentioned, reflecting a clear demand for behavioral competence applicable in real-world clinical settings. A recent review found that most of the investigated training programs were focused on factual knowledge about suicide, but also on how to provide help for patients including identifying suicide risk, asking and responding appropriately, intervening, and making

Table 5
Fit-Indices of two- and three-class models of different variable combinations.

Model Variables	Classes	AIC	BIC	Maximum Log-Likelihood	G ²	χ ²	Estimated parameters
Subjective knowledge about suicidality in general and on suicide prevention, confidence, routine exploration	Two	1447.35	1519.36	−702.67	144.15	267.81	21
	Three	1385.17	1494.90	−660.58	59.97	97.22	32
Subjective knowledge about suicide prevention, confidence, routine exploration	Two	1093.79	1145.23	−531.89	36.45	41.76	15
	Three	1089.08	1164.96	−520.04	12.74	12.51	23
Subjective knowledge about suicidality in general, confidence, routine exploration	Two	1086.17	1137.31	−528.08	39.50	44.81	15
	Three	1067.50	1146.37	−510.75	4.83	4.44	23

Note. AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, G² = Likelihood Ratio/Deviance Statistic, χ² = Chi Square Goodness of Fit.

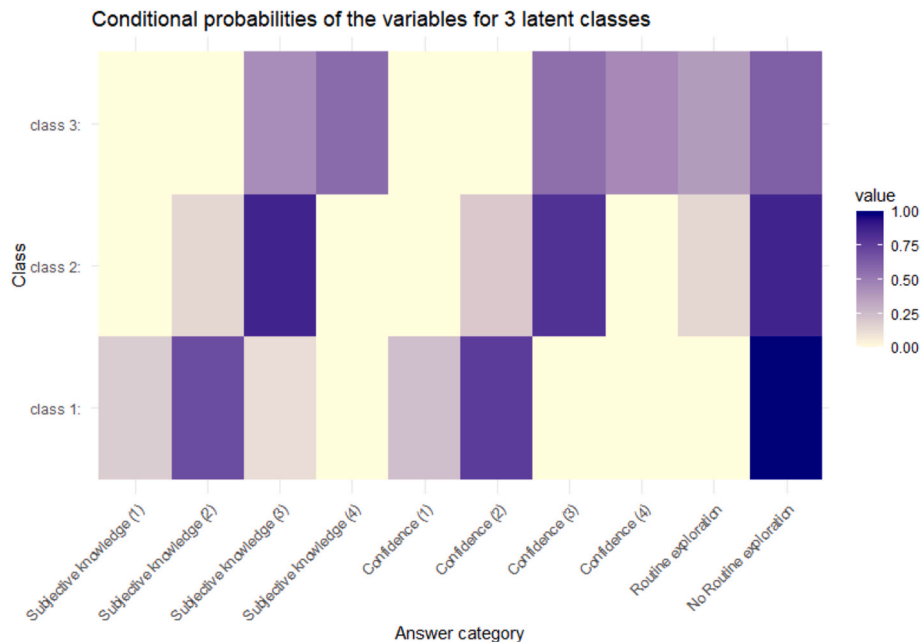


Fig. 3. Heat map of the Latent Class Analysis
Figure legend: Three-class model of subjective knowledge in general, confidence and routine exploration showing Class 1: Uninformed, unconfident explorer, Class 2: Informed, Confident explorer, Class 3: Informed, confident sometimes-explorer.

references to other professionals (Black et al., 2023). However, many existing studies prioritize subjective knowledge gains rather than measurable behavioral outcomes. In contrast, our findings suggest that training should not only establish a theoretical foundation but also place strong focus on action-oriented learning that enhances clinical behavior in oncology care. This is especially relevant given that actual behavioral outcomes are underexamined in current research (Richard et al., 2023). Beyond content, participants also expressed preferences regarding training characteristics. While psycho-oncologists and psychologists were preferred as trainers, participants appreciated the inclusion of other professionals, such as legal experts, indicating an interest in interdisciplinary and multi-perspective approaches. This is consistent with the preference of an interdisciplinary group of training participants. Indeed, suicide prevention training has already been evaluated across various disciplines (Osteen et al., 2017; Siau et al., 2018). Regarding the delivery format, a hybrid model was favored – combining passive and active elements, and theoretical and practical content. This matches the growing body of training programs delivered online (Lavigne et al., 2024; Stone et al., 2005), in person (Hawgood et al., 2021; Kawashima et al., 2020) or through blended approaches (Jasperson et al., 2023; Rimkeviciene et al., 2022). The inclusion of diverse methods was also investigated, e.g., lectures (Darnell et al., 2024; Richard et al., 2024), role plays (O’Brien et al., 2024; Slovak et al.,

2019), and vignettes (Lavigne et al., 2024; Song, 2018). In terms of duration preferences, it was distributed over different lengths, which has already been tested for both shorter training sessions of less than an hour (Wentworth, 2017) and longer training sessions of up to four days (Lygnugaryte-Griksiene et al., 2017). Most participants preferred voluntarily participation, which appears practical given the already high workload and mandatory education demands faced by many HCPs. Research shows voluntary participation is also associated with greater motivation and transfer (Curado et al., 2015; Salamon et al., 2021). Nonetheless, mandatory training may help reduce self-selection bias, ensuring broader engagement beyond those already interested in the topic, particularly among individuals who report high levels of knowledge and confidence that are not reflected in actual behavior. Although numerous suicide prevention programs exist, only seven studies report programs with specific information for the oncology setting. However, these often fall short of criteria essential for broader implementation, for example by including suicide only as a minor topic, or not being available in English (Schwinn et al., under review). Taken together, these findings emphasize the need for tailored, practically oriented, and interdisciplinary suicide prevention training in oncology. Such programs should aim to enhance knowledge and confidence, but most importantly, promote actual behavioral changes,

Table 6
Characteristics of further training from the view of healthcare professionals.

Training aspects (N = 180)	N (%)
Training by which professional group ^a	
Psycho-oncologist	123 (68.33)
Psychologist	88 (48.89)
Physician	53 (29.44)
Pastoral care	28 (15.56)
Attorney	46 (25.56)
Other	10 (5.56)
Training characteristics	
Online	25 (13.89)
In-person	61 (33.89)
Both	94 (52.22)
Passive/lecture	35 (19.44)
Active (e.g., role plays)	41 (22.78)
Both	104 (57.78)
Theoretical content (e.g., facts)	4 (2.22)
Practical content (e.g., case studies)	31 (17.22)
Both	145 (80.56)
One to 2 h	44 (24.44)
One to two days	63 (35.0)
Both	73 (40.56)
As part of internal training	31 (17.22)
As part of external training	38 (21.11)
Both	109 (60.56)
Voluntary participation	85 (47.22)
Mandatory participation	50 (27.78)
Both	45 (25.00)
Interdisciplinary participants	95 (52.78)
Participants from specific professional groups	32 (17.78)
Both	53 (29.44)

Note. ^a multiple answers possible.

including the routine exploration of STBs in clinical care. Existing training programs that are established and evaluated could be adapted to the specific local context.

4.1. Limitations

As a cross-sectional design was used, causal inferences must be drawn cautiously. The sample almost exclusively consisted of German-speaking HCPs working in German oncology/healthcare settings, limiting the generalizability of results to healthcare systems in other countries, where e.g., physician assistants may have greater involvement in cancer care. Despite a diverse sample of ages and professional experiences, psychologists were overrepresented. Not all relevant professional groups were reached (e.g., nutritional counselors), and some underrepresented professions were subsumed under a mixed “Other” category. The sample was also not gender-balanced, mirroring the

overrepresentation of women in healthcare, potentially influencing responses. Further limitations include potential self-selection and social desirability biases, as those more interested in suicide prevention and more personally affected by confrontation with suicidal cancer patients may have been more likely to participate and respond favorably. As a result, the reported levels of need for further training (which could also be interpreted as interest), subjective knowledge, confidence, and even routine exploration behavior might be overestimated. Importantly, all variables were based on self-reports, which are subject to recall bias and may not reflect actual behavior in clinical practice or objective knowledge. Future research should integrate standardized knowledge assessments and observational methods (including exploration behavior, intervention, or referral behavior) to better capture real-world practice. Longitudinal studies could further investigate causal and long-term effects as well as cross-national comparisons could contextualize findings and training needs across systems.

5. Conclusion

This cross-sectional online survey underscores the need for targeted suicide prevention training in oncology. It demonstrated that previous participation in training has an indirect effect on routine exploration of STBs via increased subjective knowledge and confidence. The findings highlight the importance of addressing all HCPs involved in cancer care, with a particular focus on knowledge and confidence. Evaluating the effects of suicide prevention training should include objective measures as well as behavioral changes. Importantly, training should not only cover theoretical concepts but also emphasize practical, behavior-oriented content to support proactive inquiry of STBs in oncology settings.

CRedit authorship contribution statement

Tamara Schwinn: Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Judith Hirschmiller:** Writing – review & editing, Investigation, Conceptualization. **Jörg Wiltink:** Writing – review & editing, Investigation. **Rüdiger Zwerenz:** Writing – review & editing, Investigation. **Elmar Brähler:** Writing – review & editing, Investigation. **Manfred E. Beutel:** Writing – review & editing, Supervision, Investigation. **Mareike Ernst:** Writing – original draft, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

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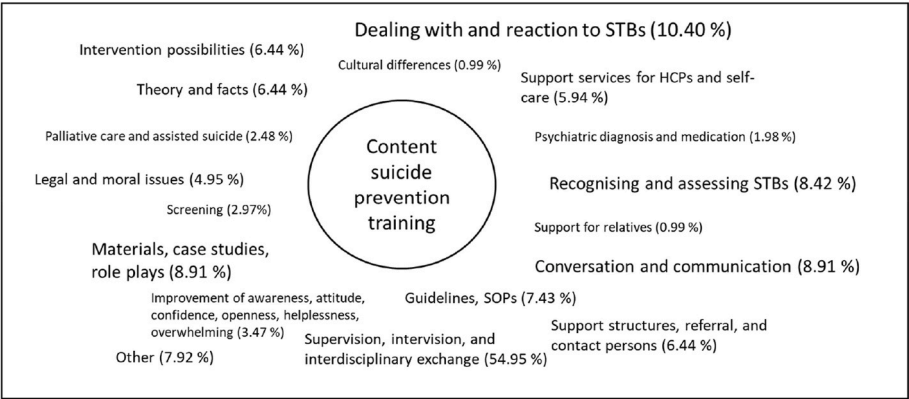


Fig. 4. Categories of content mentioned by healthcare professionals.
Figure legend: The larger the font size of the category, the more frequently it was mentioned. A total of 202 mentions from N = 68 HCPs were coded. STBs = Suicidal thoughts and behavior, SOPs = Standard Operating Procedures.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. This work is part of the dissertation of the first author.

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Appendix A. Supplementary data

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