

Listening to Depression and Suicide Risk in Medical Students: the Healer Education Assessment and Referral (HEAR) Program

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Abstract

Objective A growing body of literature documents high rates of burnout, depression, and suicidal ideation among physicians and medical students. Barriers to seeking mental health treatment in this group include concerns about time, stigma, confidentiality, and potential career impact. The authors describe a 4-year trial of the Healer Education Assessment and Referral (HEAR) program, designed to increase mental health services utilization (MHSU) and decrease suicide risk (SR) as assessed by an Interactive Screening Program (ISP) at one US medical school.

Methods Over a 4-year period, medical students were engaged in face-to-face, campus-wide, educational group programs and were invited to complete an individual, online, and anonymous survey. This survey contained the 9-item Patient Health Questionnaire (PHQ-9) scale to assess depression and items to identify suicidal thoughts and behaviors, substance use, distressing emotional states, and the use of mental health treatment. Students who engaged in this ISP by corresponding electronically with a counselor after completing the survey were assessed and when indicated, referred to further treatment.

Results The HEAR program was delivered to 1,008 medical students. Thirty-four percent (343/1,008) completed the online screening portion. Almost 8 % of respondents met the criteria for high/significant SR upon analysis of the completed screens. Ten out of 13 of the students with SR who dialogued with a counselor were not already receiving mental health treatment, indicating that this anonymous ISP identified a high proportion of an untreated, at risk, and potentially suicidal population. MHSU among medical students who completed

the survey was 11.5 % in year 1 and 15.0 % by year 4. SR among medical students was 8.8 % in year 1 and 6.2 % in year 4 as assessed by the ISP.

Conclusions This novel interventional program identified at risk, potentially suicidal medical students at one institution. Based on this single-site experience, we suggest that future multisite studies incorporate a comparison group, acquire baseline (prematriculation) data regarding MHSU and SR, and use an individualized yet anonymous identification system to measure changes in individual participants' mental health status over time.

Keywords Depression · Suicide · Medical student · Screening · Prevention

Physician and medical student depression, suicidal behaviors, and deaths by suicide are important issues, which impact individuals, their families, patients, institutions, and communities. Medical students' rates of depression are 15–30 % higher than those of peers of similar age and education [1]. Suicide deaths are more than 200 % higher in female physicians and 40 % higher in male physicians compared with those in other professions [2]. In the USA, over 300 to 400 physicians and medical students die by suicide each year [3]. Antecedent risk factors for suicide in physicians include inadequate treatment of mental illnesses and job stress [4].

Over the past 10 years, increasing attention has been given to identifying rates of burnout, depression, suicidal behaviors, and suicide in physicians [5–8]. In contrast to this epidemiological information, much less is known about the diagnosis and treatment of mental health disorders in both professionals and students who work in health-related fields [9]. Consensus opinion and recent investigations recommend more research to discover effective interventions to improve mental health

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disorder identification and treatment among physicians and medical students [4, 10].

For over 4 years, the HEAR program has addressed burn-out, depression, and suicide risk in medical students, pharmacy students, residents, and fellows across the specialties of medicine, at one US medical school using a two-pronged approach (Fig. 1). The initial development of this novel, educational, and web-based online anonymous screening program, which prioritizes privacy and refers at risk individuals to ongoing treatment, was described previously [11].

The first component of the HEAR program—education—was offered by a multidisciplinary committee and included School of Medicine (SOM) faculty members from the Departments of Family Medicine, Psychiatry, Orthopedics, Pediatrics, and Internal Medicine, as well as medical students and program counselors. The presentation usually consisted of a PowerPoint slide show, a 15-min American Foundation of Suicide Prevention (AFSP) film, *Struggling in Silence* [3], and a question and answer period. Presentations were tailored to the needs and wants of specific groups. The committee provided lectures, workshops, brief presentations, and other trainings to medical and pharmacy students, and departmental grand rounds. In addition, presentations were made at campus meetings for residency training directors, chief residents, SOM chairs, and Health Sciences Center executives, and at community and regional meetings (County and Medical Society), and national conferences (American Psychiatric Association, American Association of Pediatrics, and American Association of Directors of Psychiatry Residency Training).

The second component of the program—web-based screening, assessment, and referral—was described at the HEAR website [13]. This anonymous and confidential screening instrument included questions about depression, suicidal

ideation and behaviors, and other risk factors. The website also provided emergency contact information, listed additional resources, and provided names of physicians and therapists who agreed to provide care urgently to UCSD residents, fellows, and faculty. The dean of the SOM sent an initial series of e-mail invitations encouraging faculty, students, residents, and fellows to participate in the ISP. Subsequent invitations were sent by departmental chairs, division chiefs, residency directors, and other campus leaders. E-mail invitations to complete the ISP were sent after each of the educational programs. Once an individual completed the questionnaire, a counselor reviewed the responses and provided a customized written reply based on the level of depression and/or suicide risk that the anonymous participant's information indicated.

Use of the ISP has now expanded to over 60 campuses, including eight medical schools. This paper specifically reports on our experiences with 1,008 medical students who participated in the HEAR program from 2009 to 2013. The main goal of this report is to describe our single-site experience with the implementation, reach, and impact of this program and to generate preliminary effect sizes for specific outcome measures—increased mental health services utilization (MHSU) and reduced suicide risk (SR)—to help guide the implementation and expectations of a multisite study.

Methods

The HEAR program recorded the dates of educational presentations and numbers of e-mail invitations sent, phone and in-person evaluations, total contacts, and referrals. Most of the data in this study were collected via the ISP developed by the AFSP. The online survey contained items to assess predictors

Fig. 1 A two-pronged approach of HEAR program

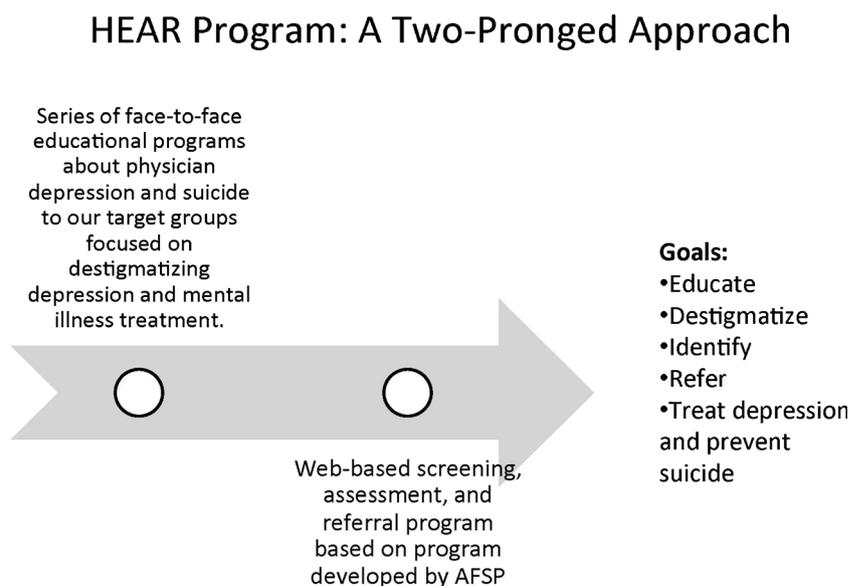


Table 1 Participants

	Year 1	Year 2	Year 3	Year 4
M:F	55:93	31:34	22:27	30:49
Mean age (y)	24.7	25.7	25.7	26.3*
Race (% Cauc:AA:Asian:Hisp)	37:0:44:6	47:3:26:16	41:0:35:2	47:3:26:10

*Year 1 <4, $p=0.001$

of suicide risk factors, including depression using the 9-item Patient Health Questionnaire (PHQ-9) [12], associated distressing affective states such as anxiety and hopelessness, functional impairment, and substance use. The survey also captured basic demographic information such as age, gender, race, and current mental health treatment with medications and/or counseling.

Participants were asked to create a username and password to log into the site and to provide an e-mail address to which a counselor could send a personalized assessment of the respondent's mental health along with directions for care, when appropriate. Confidentiality and anonymity were emphasized in a note that the student's e-mail would be encrypted to protect his/her identity. To protect confidentiality, personally identifiable information, such as usernames, was removed from the dataset prior to analysis. The study was approved by the Institutional Review Board (Protocol No. 081890), and the methodology of the program was approved by the Medical Center Ethics Committee. This included the fact that because the survey was anonymous, no formal informed consent was obtained.

Survey responses were collected from the program's inception in May 2009 through May 2013. Numbers of students exposed to the intervention were calculated by using an average medical student class size of 126. The program began in the spring; therefore, the first year of the program contained five discrete classes or 630 students. MHSU was defined as the percentage of individuals in treatment during a given year.

The ISP classified respondents into one of three tiers based on "risk," in accordance with the screening instruments developed and applied by the AFSP [11]. Tiers 1A and 1B represented individuals with one of the following: PHQ-9 score of 15 or higher; current suicidal ideation; a PHQ-9 score of 10–14 with prior suicide attempt; intense feelings of anxiety, panic, rage, desperation, or loss of control; or an indication that current problems are making it very or extremely difficult to function. Criteria for tier 1A represent the highest risk, for example, a PHQ-9 score of 15 or higher and past history of suicide attempt. While criteria for tier 1B represent high risk, for example, a lower PHQ-9 score of 10–14 and past history of suicide attempt. Tier 2 represented individuals with PHQ-9 score of 10–14, without a history of suicide attempt or current suicidal ideation and with problems related to alcohol or drug use or eating behaviors or an indication that current problems are making it somewhat difficult to function. Tier 3 consisted of individuals identified as minimal risk.

HEAR program counselors provided a detailed, personalized assessment, following a standardized prototype for each tier. The counselor invited respondents to communicate with him/her online if they desired further correspondence, using a website dialogue page that required no identification. All tiers 1 and 2 students were urged to call or e-mail the counselor to schedule an in-person evaluation. At this point, the counselor evaluated the participant more fully, discussed treatment options, and made referrals as appropriate.

Data Collection and Analysis

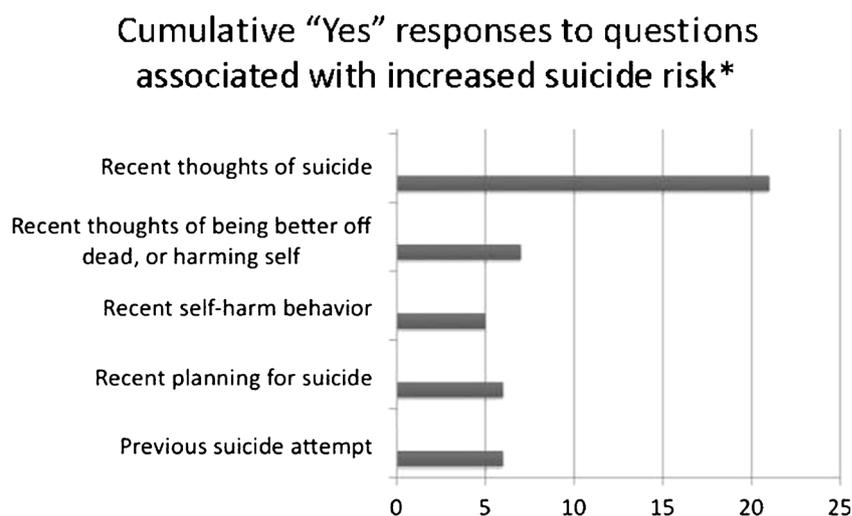
The anonymous nature of data collected by the ISP presented several challenges. First, there was no absolute method to insure that one individual did not submit a survey multiple times. To address this, we searched for multiple responses with the same encrypted e-mail and included only one survey from these multiple responders. This reduced the number of completed surveys from 353 to 343. Two students did not respond to all five of the questions related to suicide risk; thus, for analyses of suicide risk, $N=341$.

In addition to the tabulation of descriptive information related to *program reach* (e.g., number of participants and levels of pathology) and *impact* (e.g., number of resulting referrals and treatment type), exploratory chi-square comparisons and specific effect sizes (Cramér's V) were calculated for two outcome measures of particular relevance to ongoing multisite and future, larger controlled studies: (1) number of student's MHSU and (2) number of participants rated as being a SR. A univariate general linear model (GLM) ANOVA was used to test for changes in MHSU and SR over the course of this program, with year (1–4) as the between-subject factor and response (yes vs no) as the dependent measure.

Table 2 Program Reach

	Year 1	Year 2	Year 3	Year 4
Presentations	17	7	6	6
Invitations	1,049	600	639	680
Completed screens	148	65	50	80
% Screened students by tier				
Tier 1A—Highest Risk	8.8	6.2	10.0	8.8
Tier 1B—High Risk	20.9	21.5	42.0	17.5
Tier 2—Some Risk	68.2	70.8	48.0	71.3
Tier 3—Low Risk	2.0	1.5	0.0	2.5

Fig. 2 Cumulative “Yes” responses to questions associated with increased suicide risk. A “Yes” response to any of these questions identifies the student as a suicide risk (SR)



* A “Yes” response to any of these questions, identifies the student as a suicidal risk (SR)

Results

Participants

The HEAR program was delivered to a total of 1,008 medical students in four groups (years 1–4). There were no statistically significant differences between the four groups with regard to gender or race (Table 1). The ANOVA of participant age detected a significant main effect of the group ($F=5.46$, df 1 and 3, $p=0.001$), reflecting significantly younger participants in year 1 versus year 4 ($p=0.001$).

Program Reach

Over the 4 study years, the program provided 36 presentations to on-campus groups that included medical students, sent 2,968 e-mail invitations to complete the ISP, and screened 343/1,008 medical students (Table 2). The percentage of screened students in each tier level by year and the cumulative number of “yes” responses to questions associated with suicide risk are also seen in Table 2 and Fig. 2, respectively. The percentage of students in tier 1B (high risk) ranged from 17.5 to 42 %, while the percentage of students in tier 1A (highest risk) ranged from 6.2 to 10 %. Twenty-one students or 6.1 % of those participating endorsed thoughts of taking their own life in the preceding 2 weeks, while 7.9 % (27 of 341) was rated as a SR by the ISP screen.

Program Impact

Twenty-one percent of the participants who completed the screen (72/343) engaged in online dialogues with a counselor. Of these, ten were suicidal and not in treatment, and another

three were suicidal but already in treatment (Table 3). Overall, 23 (2.3 % of the total sample and 6.7 % of those who completed the survey) medical students were referred for care by a psychiatrist and/or psychologist as a direct result of the screening instrument.

Review of the total number of students in treatment over the 4 study years indicates that MHSU as reported by the screen was 11.5 % in year 1 and 15 % in year 4 (X^2 =years 1, 2, 3, and 4=1.27, df 3, NS; Cramér’s $V=0.061$); a univariate GLM ANOVA also did not detect a significant effect of year on MHSU ($F<1$) (Fig. 3). Data provided by the on-campus counseling center show a range of MHSU from 15.7 % in year 1 to 18.7 and 18.3 % in years 3 and 4, respectively (X^2 =years 1, 2, 3, and 4=2.58, df 3, NS; Cramér’s $V=0.036$). The percentages of students who reported specific treatment types by year are seen in Table 4.

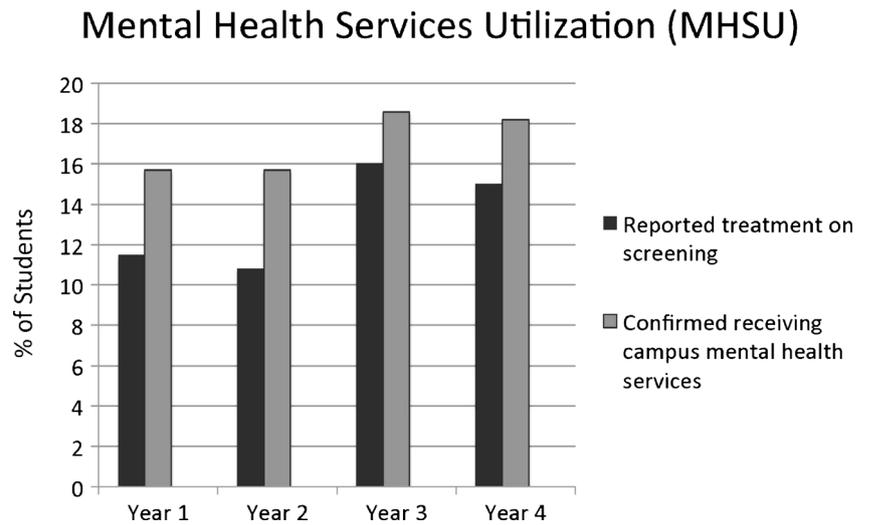
The percentages of students reporting use of depression, anxiety, and sleep medications and counseling by year are seen in Table 4, and the percentages of students reporting use of alcohol, illicit, or prescription drugs by year are seen in Table 5. The percent of students ranked as SR by study year is presented in Fig. 4, showing SR rates ranging from 8.8 % in

Table 3 Program Impact

	Year 1	Year 2	Year 3	Year 4
Cumulative # of students who dialogued with counselor				
Total	48	57	65	72
Dialogued and Suicidal	8	10	12	13
Dialogued, suicidal, not in Tx	6	7	9	10

Tx status of therapy

Fig. 3 Review of the total number of students in treatment over the 4 study years



year 1 to 6.2 % in year 4 (X^2 =years 1, 2, 3, and 4=0.45, df 3, NS; Cramér’s V =0.036); a univariate GLM ANOVA did not detect a significant effect of year on SR (F <1). The 28 % reduction from year 1 to year 4 SR rates reflected a very small effect size (X^2 =0.17; NS; Cramér’s V =0.044).

Discussion

The goals of the HEAR program are to educate, destigmatize, identify, refer, and treat individuals with depression, particularly those with increased suicide risk. Building on principles of preventive psychiatry [14], this program uses secondary and tertiary prevention strategies to address depression and suicide. HEAR interventions designed to reduce suicidal behaviors and/or death due to suicide include educating the medical community to recognize and treat depression [15-17], screening and engaging high-risk individuals in clinical treatment [18], and follow-up interventions for suicide attempters [19].

The HEAR program achieved several goals of an effective suicide screening and mental health referral program for

medical students. Over 4 years, 343 medical students were directly screened and characterized according to the severity of their suicide risk. Of these students, 72 interacted with a HEAR counselor, and 23 students were referred into treatment with a mental health professional; of the 13 identified suicidal students, 10 were receiving no mental health care at the time of screening. Thus, HEAR identified and interacted directly with a noteworthy number of at risk medical students, many of whom were then encouraged to engage in treatment, including ten who were both suicidal and untreated.

The number of student’s MHSU increased from 11.5 to 15 %. While the single-site HEAR experience did not incorporate either the requisite sample size to detect statistically significant effects or a controlled design and comparison intervention, these preliminary results indicate that the HEAR program reached a meaningful proportion of an untreated, at risk population. This ability to identify high-risk individuals and bring them to mental health treatment is a strong indicator of the potential utility of this program.

There are many challenges to assessing and demonstrating statistical significance of interventions designed to reduce the risk of suicide and deaths by suicide. Suicide risk is difficult to assess due to false negatives (individuals conceal intent or act impulsively) and false positives (suicidal thinking is expressed, but there is no true intent to end one’s life). In

Table 4 Treatments reported by students

	Year 1	Year 2	Year 3	Year 4
% Students reporting Tx	11.5	10.8	16.0	15.0
% Students reporting Tx types				
Counseling	8.1	7.7	2.0	13.8
Medication				
Anxiety	3.4	4.6	2.0	6.3
Depression	7.4	6.2	14.0	8.9
Stress	2.0	1.6	3.0	2.5
Sleep	3.4	4.6	10.0	8.9

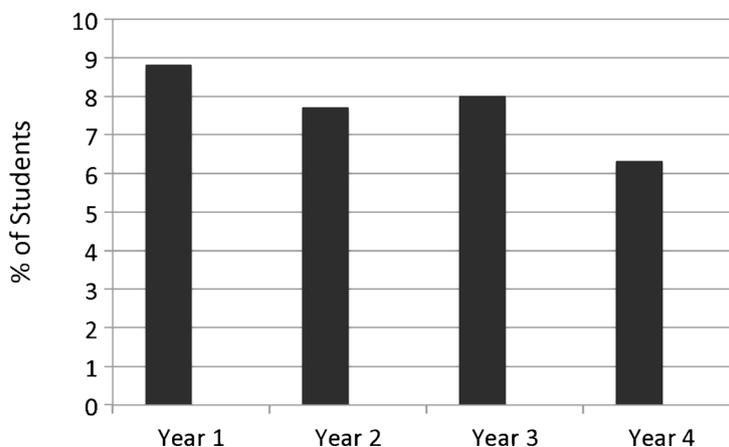
Tx treatment

Table 5 Student-reported substance use

	Year 1	Year 2	Year 3	Year 4
% Students				
Drinking>usual	17.6	21.5	26.0	15.0
Drinking too much	14.9	12.3	18	11.4
Drinking affects performance	0.7	3.1	2.0	2.5
Illicit or Rx drugs	4.7	10.8	6.0	12.5

Fig. 4 The percent of students ranked as SR by study year

Suicide risk: Percentage of medical students rated as suicide risk by screening, per year



addition, even in high-risk populations, e.g., physicians, suicide death rates are low—approximately 40–50 per 100,000 [20]. Clinical trials to assess the efficacy of an intervention to reduce suicide require large samples to achieve sufficient power to detect a statistically significant effect on suicide deaths [21]. O'Connor et al. estimate that with a death rate of 100 per 100,000 and a target to decrease suicide by 40 %, a controlled study would require 83,000 subjects in each group to achieve acceptable power [22]. Based on these estimates, appropriately powered suicide intervention studies in US physicians would require close to 200,000 subjects or more than 1 out of 5 of the estimated 834,769 physicians and 69,456 medical students in the USA.

These challenges were borne out in the current study. Despite making 36 presentations to on-campus groups that included medical students, sending nearly 3,000 e-mails, and screening over 340 medical students, the present sample size provided low power to detect statistically significant HEAR effects on SR.

Our experience to date suggests that this HEAR program is feasible and trended toward its goals of increased MHSU and reduced SR among medical students. As a result of this program, untreated medical students at risk of suicide were identified and subsequently referred into mental health treatment. However, the program was neither designed as a prospective, randomized controlled trial nor included a comparison group, and this clearly limits more definitive conclusions regarding its efficacy as an intervention.

Even as an uncontrolled trial, several aspects of the present design may have limited our ability to detect and interpret the impact of this program. For example, differences in ascertainment and the nature of the groups receiving educational interventions across years 1–4 may have impacted the outcome measures, either in a manner that artificially inflated or

deflated the apparent impact of the intervention. Our sensitivity to detect changes in MHSU and SR would likely have been enhanced by baseline measures acquired prior to or immediately upon matriculation and by longitudinal measures that tracked students across the 4 years of medical school. The cross-sectional design is subject to cohort effects: for example, the observed increase in MHSU in group 4 versus 1 might reflect shifts in medical school admission patterns that result in classes with higher rates of mental illness or higher health-seeking behaviors. The significantly higher age in group 4 versus 1 might have affected MHSU, since some studies report that older students are more likely to seek treatment [23].

The study was also constrained by the need to be blinded to each student's year in medical school to maintain strict confidentiality: Information regarding the respondents' year (MSI-IV) might have helped in the interpretation of yearly utilization patterns, as year in medical school has been found to be a significant factor contributing to rates of depression and other measures of mental distress [1]. Lastly, the restriction of this study to a single, state-affiliated medical school may limit our ability to generalize the present findings to other campuses with different geographic and cultural characteristics.

Hopefully, some or many of these limitations will be addressed in data that emerge from ISP programs currently being administered at diverse settings across a number of different academic institutions. Suggested improvements for further studies include acquiring baseline (prematriculation) data regarding MHSU and SR, as well as the use of an individualized yet anonymous identification system which will allow for tracking of individual participants' mental health status over time. Given the expansion of ISPs over the last several years, we also strongly recommend incorporating an appropriate

control group. Lessons learned from this HEAR experience can enhance our ability to achieve the critically important goals of identifying and effectively treating students in the health professions at risk for burnout, depression, and suicide.

Implications for Educators

- Most medical students, including those with depression and suicide risk, do not avail themselves of treatment.
 - This paper provides a 4-year update to an anonymous web-based suicide prevention program for student mental health currently implemented at over 60 colleges and 8 medical schools.
 - Repeated assessments of well-being in a medical student population do not result in decreased engagement with care and likely result in increased engagement.
 - An individualized and anonymous web-based program was effective in detecting several medical students with suicidal ideation who were not in treatment, and engaging them in mental health treatment.
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Implications for Academic Leaders

- A program that provides educational enhancement to inform students and destigmatize depression and mental health care and that uses a web-based anonymous screening survey can be implemented effectively on a medical school campus.
 - This research fills a gap in the literature identifying interventions which may effectively diagnose and treat distress, depression, and suicidality in the medical school population.
 - Large, multisite studies are needed to learn if programs such as HEAR effectively reduce suicide risk on a population level.
 - Further studies using an anonymous screening for depression and suicide risk should acquire baseline data related to utilization of mental health services and suicide risk.
 - Future studies using an anonymous screening for depression should provide an anonymous tracking system to facilitate measuring changes in individual participants' mental health status over time.
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