Effective programs and strategies on suicide prevention: combination of review of systematic reviews with expert opinions

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Abstract

Background

Suicide is a complex and ongoing public health crisis which is a misinterpreted course of death that strongly affects communities’ and individuals’ mental health and quality of life. Health managers often do not have adequate information for decision making on what strategy makes an effective impact on suicide prevention. Despite the availability of global Suicide Prevention Programs (SPP) around the world, no previous investigation has developed combinations of a review of systematic reviews with expert opinions. The present study was aimed to identify effective community-based strategies for suicide prevention.

Methods

We used two methods for selecting the best and effective SPP: 1) review of systematic reviews: we systematically searched to find relevant review studies through Medline, Cochrane Library, PsycINFO, and grey literatures, from January 1, 2011, and December 30, 2014. 2) Expert panel opinions: effective strategies identified from the previous step were combined with field and academic expert views via the Hanlon method. Then the strategies have been rated based on the following five criteria: feasibility, importance, cost-effectiveness, timeliness, acceptability.

Results

Of the total of 489 identified records, 9 reviews included in the review of systematic reviews. A total of 12 effective SPP were found. Expert panel then prioritized strategies based on Hanlon method as following: 1) case management of attempters to prevent future attempts, 2) identification and treatment of depression, 3) improving registry for suicide, 4) identification and investigation of suicidal behaviors’ risk factors, 5) public education campaigns in hotspots, 6) gatekeepers’ training, 7) conducting research, 8) school-based training 9) improving knowledge and attitudes, 10) restricting access to means of suicide, 11) screening of suicide ideation and at-risk people, and 12) mass media role, respectively.

Conclusion

Management of suicide attempters, developing a registry for suicide, and treatment of depression were three priority and basic interventions suggested after evidence combined with the expert panel. Suicide is a multifaceted phenomenon that is strongly affected by local beliefs. Effective management of suicide requires up-to-date information through a combination of evidence with expert views at the local level where SPP are implemented.

Background

Suicide is responsible for almost one million death every year. On average, 132 suicides occur per day. In other words, more than one person every 40 seconds [1]. Currently, suicide is a high-burden phenomenon throughout the lifespan. It is a global concern which imposes huge costs on health care systems. The age-adjusted suicide rate is 10.5 per 100 000 persons globally. In both sexes of young people aged 15–29, suicide is the second leading cause of death, after road traffic accidents. The majority of suicides occur in low- and middle-income countries [2].
Suicide is a complex and multifactorial phenomenon that is affected by culture and social stigma. This makes the research on suicide prevention a highly challenging work. A comprehensive and high-quality Suicide Prevention Program (SPP) and registry for suicide for providing valid data and the best-match suicide prevention strategies are urgently needed in all settings and societies. According to the WHO, developing and improving SPP is important in order to inform strategies and evaluation in health care systems, and for valid assessment of the progress towards global suicide mortality objectives. Evidence-based and effective strategies can be implemented at the community, at-risk population, individuals and local levels to prevent suicide and Suicidal Behaviors (SB) [3, 4].

Some countries have developed comprehensive SPP to address the burden of suicide as a collective political commitment and effort. Lack of evidence on the effectiveness of SPP is one of the most challenging concerns [5]. A few SPPs have been rigorously investigated and assessed for their effectiveness to reduce rates of suicide and SB. A wide variety of interventions have been implemented to prevent suicide but are not systematically assessed [6].

Despite the problem of a lack of valid and reliable outcome measures, most SPPs also suffer from a low-base suicide rate. For instance, mortality and morbidity are often used to measure the effect size of the health problems and to set priorities for health resource allocation. As a result, the SPP often ranks as a relatively low priority in resource allocation [2, 7].

There is no confident document regarding the most effective SPP until now [8]. Up-to-date and high-quality evidence along with effective strategies are required for developing and implementing a good SPP.

A single strategy clearly cannot guarantee the achievement to a successful outcome measure of SPP. Combinations of best evidence-based interventions from systematic review studies with investigators and field experts' opinions at the local level can lead to desirable outcomes and success in SPP. The present study was aimed to determine the best community-based strategies and interventions for developing a comprehensive suicide prevention program in Malekan County, Iran during 2014–2017.

Methods

A health community assessment found suicide is a public health priority in Malekan County, East Azarbaijan Province, Iran 2014 (incidence rate of 12 per 100,000 persons). Then a regional community-based SPP was developed in Primary Health Care (PHC) of Malekan County during 2014–2017.

Malekan County is located in northwestern Iran with a population of 111,319 people (female: 53,653; male: 57,666) according to the 2015 national census. The native language of all the people of this County is Turkish (Azerbiajan) and all of them are Muslims. Almost, 70% of the county population lives in rural areas. Their main occupations are farming or farming-related. For developing a local (Malekan County) suicide prevention program, a mixed-method study was conducted to determine and prioritize the best practice and strategies of multilevel elements of suicide prevention.

We used two methods for selecting effective programs and interventions for suicide prevention: 1) A review of systematic reviews and 2) Field expert opinions and priority through the Hanlon technique. The identified programs and strategies from electronic search (research evidence) were combined with expert comments to select and prioritize the best and effective interventions for community-based suicide prevention in Malekan society.

1) Review Of Systematic Reviews
Search strategy

A review of systematic reviews has been performed by Christina et al [9] in 2011 related to the best practice and interventions or programs for suicide prevention. Accordingly, we systematically searched for all English language published systematic review studies through Medline, Cochrane Library, PsycINFO, and grey literature from January 1, 2011, and December 30, 2014.

Our search focused on effective community-based interventions and programs that were used for suicide prevention overall, and in particular among the general population and young people. Grey literature and relevant sites, such as WHO and CDC, were explicitly explored. The initial search used the relevant MeSH terms (i.e., Medical Subject Headings) in conjunction with “suicide” “prevention” and “review” in the title and/or abstract. Then the primary search was combined with “programs, strategies, methods, control, intervention, depression, suicidal behavior/behavior, suicide attempted, primary health care, family physicians, mass media, schools, adolescents, and health promotion”. Boolean operators including AND, OR, NOT was used to combine the terms.

We selected community-based strategies or interventions in the review of systematic reviews that were effective in reduction of suicide and SB. The target group was also the general population, especially with an emphasis on adolescents and young people.

All primary researches, narrative and scoping reviews, critical and literature reviews, pharmacological interventions, reviews which assessed single intervention or special groups of people or patients, records with poor information, and reviews that not identified an effective SPP reduce suicide rates were excluded.

Two experts independently reviewed the included papers and extracted and summarized the required data (authors, year, name and type of SPP, and target group) in MS Excel 2010 software. For discrepancies, a third expert made the final decision. At the end of this stage first draft of list of interventions or programs was prepared by the two experts.

2) Expert Panel Opinion

The effective strategies and programs identified from the review of systematic reviews (evidence-based) were assessed and prioritized by an expert panel in Tabriz University of Medical Sciences including academics from the Department of Psychiatry and executives from the Department of Mental Health (the provincial Deputy of Health), and the County Health Network experts. The panel used the Hanlon method to prioritize the best strategies for developing an SPP for Malekan County. Interventions from published evidence (review studies) were discussed in accordance with the local level by experts including health managers, psychiatrists, psychologists, mental health experts, adolescent health experts, epidemiologists, health system researchers, family physicians, community health workers, and nurses of the hospital emergency ward.

In the Hanlon method, a list of suicide prevention strategies and programs has been identified from the review of systematic reviews, then the strategies were ranked by the panel members using a five-point scale. Then, strategies have been rated by expert panel members based on following 5 criteria: feasibility: the degree of being simply or conveniently done), effect/importance: is the program suitable for the health problem?, cost-effectiveness: compares the relative costs and outcomes of different courses of programs and actions based on field expert views in the present study, timeliness: the time/speed of the steps, from obtaining information up to the action in a surveillance system, and acceptability: will the community accept the program? Is it wanted? Based on the five
criteria rankings assigned to each strategy or program from the previous step, and then the priority scores were calculated for each particular strategy/program.

Results

We initially identified 489 relevant records focused on community-based suicide prevention strategies and programs, which targeted all age groups or the general population. After removing duplicates, titles and abstracts of the records were screened. Then the remaining records were assessed for eligibility according to inclusion and exclusion criteria. A total of 9 records (7 systematic reviews and 2 reports by international organizations) were included in the synthesis for selecting the best practice and effective interventions on suicide prevention (Fig. 1).

Table 1 summarizes the identified community-based strategies for suicide prevention. To prioritize and select the best strategies and well-organized interventions, identified interventions from electronic search were combined with expert panel of field and academic experts by using the Hanlon Technique.
Table 1
The best suicide and suicidal behaviors prevention strategies and programs identified in the review of systematic reviews

<table>
<thead>
<tr>
<th>Author-year</th>
<th>N of included study</th>
<th>Effective programs and interventions</th>
<th>Target group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christina M- 2011, (review of systematic review) [9]</td>
<td>6</td>
<td>Training general practitioners</td>
<td>General population</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Treating depression</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improving accessibility of care for at-risk people</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restricting access to means of suicide</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improving case registration and conducting research</td>
<td>individual level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Using the Key gatekeepers for prevention and education</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restricting access to means of self-harm/suicide</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mobilizing communities</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Identification and treatment of mental disorders</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring and evaluation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Screening and suicide risk assessment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intervening to increase coping to ensure safety</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Treating and caring for persons at-risk of suicide</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow-upping suicidal behaviors people</td>
<td></td>
</tr>
<tr>
<td>Szumilas M- 2011 [27]</td>
<td>16</td>
<td>Post-suicide attempt interventions</td>
<td>school-based, family-focused, and community-based</td>
</tr>
<tr>
<td>Author-year</td>
<td>N of included study</td>
<td>Effective programs and interventions</td>
<td>Target group</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Georgina R Cox – 2013 [28]</td>
<td>14</td>
<td>Restricting access to means</td>
<td>Hotspots area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Encouraging help-seeking</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surveillance</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>staff training</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Encouraging responsible media</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>reporting of suicide</td>
<td></td>
</tr>
<tr>
<td>Anton C – 2013 [29]</td>
<td>9</td>
<td>Community prevention</td>
<td>Indigenous people</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gatekeeper training</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>education</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>attitudes, and help-seeking behaviors</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>treatment, and decreasing isolation</td>
<td></td>
</tr>
<tr>
<td>Robinson J – 2013 [31]</td>
<td>43</td>
<td>Gatekeeper training</td>
<td>School-based</td>
</tr>
<tr>
<td></td>
<td></td>
<td>screening programs</td>
<td></td>
</tr>
</tbody>
</table>

A total of 12 suicide prevention strategies were found and discussed in the expert sessions by the Hanlon method. Of these, 7 strategies had the highest score for implementing according to the field and academic experts' views. Case management of persons who attempted suicide to prevent future attempts (re-attempt) was identified as the most effective strategy. According to the Hanlon method, the following interventions and programs had the highest score for implementation in Malekan County: 1) follow-up monitoring of attempters, 2) identification and treatment of depression, 3) improving registry for suicide and suicidal behavior, 4) identification and investigation of risk factors of suicidal behaviors, 5) public education campaigns in hotspots, 6) training health service providers (gatekeeper), and 7) conducting research (Table 2).
### Table 2
Hanlon method for prioritizing and combination of strategies through evidence-based with field and academic expert views

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Expert panel*</th>
<th>Total score</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>feasibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>effect/importance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cost-effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timeliness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>social acceptability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Identification and treatment of depressive disorders</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Follow-up monitoring of attempters</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Improving suicidal behavior registration</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>School-based training</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>public education campaigns in hotspots</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Training health service providers (gatekeeper)</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Identification of suicidal behaviors’ determinants and risk factors</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Restricting access to means of suicide</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Suicide ideation and at-risk people screening</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Improving knowledge and attitudes</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

* Health manager, Psychiatrist, Family Physician, Epidemiologist, Health care providers, mental health expert, and Psychologist
### Discussion

Suicide is a complex and misunderstood term of death that strongly affects mental health and the quality of life of individuals and communities [10]. Policy-makers and health managers often do not have adequate information for decision making on what strategy makes an effective role, let alone which strategy meets these criteria. Adequate research-based evidence is required for decision making and evaluating the existing SPP, as well as intervention strategies, to guarantee that target populations are being supported effectively. Policy-makers and funding bodies should be informed of the necessity of an evidence-based SPP, and also should include the evaluation in their policies and funding criteria [3, 7, 11].

To resolve this problem and developing a regional SPP in PHC system of Malekan County, this study with a novel approach, evaluated how community-based suicide prevention programs affected suicide and suicide attempt rates based on combinations of the highest level of evidence (review of systematic reviews) with field and academic expert opinions. Suicide is an intricate and multifaceted problem, which often implicates numerous interdisciplinary efforts to prevent it. This paper provides a framework and approach for selecting effective and feasible programs that help suicide prevention in the community. The method used in this study to select the most effective SPP can be used in all communities. Because suicide is an influential issue of culture and custom, combining the highest level of evidence with field experience can be very helpful. The findings of this study can provide valuable evidence for the Malekan County and provincial health care system and decision-makers can adopt appropriate strategies to reduce suicide. These findings could also be a robust pattern for other distinct and health systems.

Based on evidence-based strategies which were identified from the review of systematic reviews and their combination with comments of experts of healthcare field, 12 strategies were extracted, three of which had the highest score and effectiveness in suicide prevention: 1) case management and following up the attempters to prevent future attempts, 2) identification and treatment of depression, 3) improving registry for suicide and suicidal behavior. All of these strategies are consistent with systematic review and meta-analysis studies that are effective to reduce suicide in most societies [1, 8, 12–15].

Management of suicide attempters can have a notable impact on re-attempt prevention. The previous suicide attempt history is the robust predictor for future (re-attempt) suicidal behaviors [16]. A 5-years follow-up study of 302 suicide attempters, 37% of them made at least one re-attempt and 6.7% died by suicide [17]. A systematic
review with a sample size of 21,385 (14 cohort studies) reported that people with a history of suicidal behaviors are at-risk for suicide 25 times than the general population [18].

Case management of suicide attempter is a major strategy to be integrated into WHO reports for suicide prevention [4]. Based on the results of the present study and the opinions of the panel of experts, recommended strategies and programs of the WHO for the countries were much more comprehensive and effective on suicide prevention. However, most systematic reviews have focused on specific strategies or special age and sub-population groups [14, 19].

Effective management of suicide and suicidal behaviors requires up-to-date information at the local level where plans are implemented. Information at this level allows health managers to know which health care system is meeting specific goals. Based on the published evidence and the findings of the present study, to help obtaining this information, developing and launching a comprehensive electronic system for registering the suicidal behaviors at the beginning of suicide prevention programs is a basic necessity to reduce undetected cases. However, merely 18% of countries have a registry system for suicide [20, 21].

Treatment of people with depressive disorder was another effective strategy selected in the present study to prevent suicide. Globally, depressive disorders have been identified as a noticeable cause of disability and burden of diseases. Among people who die by suicide, depressive disorders are the most prevalent psychological disorder. Depression is a major predictor of suicide. Awareness of predictors for suicide in depression is imperative for health care systems [22]. Previous evidence indicated that antidepressants have a positive effect on suicide prevention [23, 24]. A systematic review study by Lapierre and et al. found that depression screening and treatment and depression awareness programs are the most efficient program for suicide prevention in elderly and also student of university [13, 25].

Most of the studies included in this research focused mostly on suicide prevention programs for youths and young adults. The emphasis of prevention strategies on youths and young adults may reflect public responsiveness to the strategy of young suicide. Therefore, the need for prevention in other age groups such as middle-aged and elderly seems to be ignored. Yet, it does not mean the absence of strong evaluation in most of the programs targeted at these population [2].

**Strengths And Limitations**

This study had some limitations. We were unable to generate (the measure of association) effect sizes of OR and RR due to the lack of meta-analyses in included systematic reviews. Therefore, we could only describe the review studies. This concern is minimized by a combination of evidence-based strategies and expert panel views via Hanlon method for selecting effective SPP.

This research was conducted to identify effective strategies on suicide prevention for implementing a community-based SPP in Malekan County Health care system during 2014–2017. It concerns data from a while ago. We believed that these numbers are still representative (in 2020) because we used a novel method to select and identify effective SPP. Moreover, suicide is a multifaceted phenomenon that is strongly affected by local beliefs. The combination of published evidence with expert opinions is a good approach. Field experts in health care may have well-imperative of unpublished opinions and comments which applicable in all societies.

**Conclusion**
In this study, we used a novel and innovative approach as a combination of a review of systematic reviews (highest evidence) with field and academic expert panel opinions for selecting the best strategies on suicide prevention. A total of 12 best effective community-based strategies were identified on suicide prevention. Case management of suicide attempters to prevent future re-attempts, developing and improving a registry for suicide, and identification and treatment of depressive disorders were three priorities and basic interventions that were recommended after combining the evidence of systematic reviews with the opinions of the expert panel. All these strategies and evidence point the same direction which the SPP can be effective at several levels. Since suicide is a multifaceted phenomenon that is strongly affected by local beliefs, to achieve optimal outcomes, our study suggested combining evidence-based strategies with local expert comments.

As well as, a key point in developing SPP is to select interventions that are appropriate to the local culture and context considerations, the capacity of the local health care system, and advocacy efforts to increase inter-sectoral collaborations and political commitment.

**Abbreviations**

SPP: Suicide prevention program; SB: Suicidal behaviors; PHC: Primary health care

**Declarations**

**Ethics approval and consent to participate**

The present study was approved by the Ethics Committee of Tabriz University of Medical Sciences, to number IR.TBZMED.REC.1394.674.

**Consent for publication**

All authors, funding organization, and also experts that participated in this study are consent for publication.

**Availability of data and materials**

The datasets generated and/or analyzed during the current study are not publicly available, but are available from the corresponding author (via email) on reasonable request.

**Competing interests**

The authors declare that there is no conflict of interest and financial disclosure.

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**Authors’ contributions**

All Authors read and approved the final manuscript. HA: developed original idea and protocol, interpretation and analysis of the data, data collection and drafted and edited all sections of the manuscript. MF and AF contributed in the design, preparing of the manuscript draft. EDE: contributed to the manuscript development and interpretation of
the data, and data collection and drafted all sections of the manuscript. MM and VA: contributed to the protocol development, interpretation. HB: contributing in editing of the first draft and technical comment.

Acknowledgements

We express our gratitude to our colleagues in Malekan County Health Network.

References


Figures
Records identified through electronic search = 486

Records excluded after abstract and screening

Full-text articles (review) excluded, with

Records included in the final

Figure 1

PRISMA flow diagram for review of systematic reviews on strategies for prevention of suicide