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Review article

Preventing adolescent suicide: A systematic review of the effectiveness and change mechanisms of suicide prevention gatekeeping training programs for teachers and parents

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ABSTRACT

Introduction: Suicide is a leading cause of death in young people, which may in part be because young people are notoriously poor help-seekers. Improving the identification of at-risk young people and connecting them to appropriate help is needed to prevent suicide in adolescents. The aim of this study is to examine the effectiveness of suicide prevention gatekeeper programs for parents and teachers, which are designed to improve their ability to recognise and respond to risks so that they may intervene before crisis occurs.

Methods: Academic databases and reference lists were searched for gatekeeper training programs involving teachers and parents, and which aimed to prevent youth suicide, between journal inception and May 2018. Information directly reporting on suicide literacy (knowledge, confidence, attitudes) and/or gatekeeper behaviours (identification, referral) was extracted and a qualitative synthesis was conducted.

Results: Thirteen studies fulfilled inclusion criteria. Significant moderate-to-large intervention effects were reported for suicide literacy outcomes among teachers and parents, with the largest gains among those with lowest baseline scores. No improvements in identification and referral behaviors among gatekeepers were noted. A need to improve evaluation research designs and outcome measurements was evident.

Conclusions: While gatekeeper programs lead to increased suicide literacy, there is little evidence for behavioural change. There is need to increase the reach and uptake of gatekeeper training by offering digital versions, which may lead to improved behavioural outcomes, and to employ targeted strategies to engage parents in this training as one of the most trusted sources of support for vulnerable youth.

1. Introduction

Adolescence marks the onset and rapid progression of many mental health disorders (e.g., depression, anxiety) that contribute to raised suicide risk (Boden, Fergusson, & Horwood, 2007). Suicide is the third leading cause of death in young people aged 10–19 years worldwide (Lancet Psychiatry, 2017), and rates of suicide among young people (15–19 years) are escalating at a faster rate than that of the general population (45% v. 26%) (Griffin et al., 2018). Moreover, non-fatal suicidal behaviours (ideation, attempt) far

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outweigh the number of suicide deaths, with estimates that approximately one-quarter of adolescents experience suicidal ideation within their lifetime (Evans, Hawton, Rodham, & Deeks, 2005). A heightened risk for suicide is observed between 12 and 17 years, with between 50 and 100 youth suicide attempts made for each suicide death (Nock et al., 2013; Shain et al., 2016). These attempts may be linked to developmental risks, including bullying, relationship breakdowns, and lack of cognitive maturity to cope with some of the major changes that occur during this period (Vajani, Annest, Crosby, Alexander, & Millet, 2007). Suicidal behaviours represent a significant burden of disease among young people, and the development and delivery of effective suicide prevention initiatives are highly warranted.

Early identification of 'at risk' youth is a critical component of delivering timely intervention to mitigate suicide risk. However, it is well evidenced that adolescents who are feeling distressed or suicidal are typically poor help-seekers, with less than one-third of those who experience suicidal thoughts actively seeking help (Calear et al., 2016; Pisani et al., 2012; Wu, Katic, Liu, Fan, & Fuller, 2010). Adolescents' reluctance to identify themselves as needing help, and to do so early enough, means that it is imperative to enhance risk identification capacity amongst persons who spend proportionally large amounts of time with adolescents, and who would be well suited to intervene in crisis situations. With school and home representing two of the primary agents of youth development and socialisation (Arnon, Shamai, & Ilatov, 2008), parents and teachers make ideal candidates for the delivery of interventions that can help them to identify early warning signs of suicidal behaviour and give them the confidence to intervene. Indeed, research indicates that family is a key source of support and safety for suicide-vulnerable adolescents (Hooven, 2013), and that parent relationships have been found to be the most consistent protective factor for adolescent suicide, even when compared to relationships in peer and school contexts (Kidd et al., 2006). Consistent with this, there is evidence that if young people do disclose suicidal risk to an adult, this is most likely to be a parent (Hooven, 2013).

There, however, appears to be a major gap between 'suitability' and the 'ability' to intervene among at risk youth in these groups. For example, it has been reported that while the majority of teachers feel they play a key role in identifying students at risk for suicide, only 9% have the ability to recognise risk factors for suicide attempt or respond effectively when a student presents as at risk for suicide (King, Price, Telljohann, & Wahl, 1999; Walsh, Hooven, & Kronick, 2013). Similarly, it has been reported that 86% of parents were unaware their children were experiencing suicidal ideation (Kashani, Reid, & Rosenberg, 1989), largely because they were not properly sensitized to identifying 'internalising' emotions and warning signs. Moreover, parents and teachers often falsely believe that talking about suicide or self-harm may put ideas in young, impressionable minds, and they are often unprepared for such discussions more broadly (Hooven, 2013). As such, teaching parents and teachers how to respond and provide support to young people, so that they are willing to disclose self-harm and suicidal thoughts, could have a crucial protective function against suicide.

Public health approaches to suicide prevention, such as gatekeeper training, are well suited to deliver at scale to develop the capacity of teachers and parents to identify vulnerable youth among and intervene before or during crisis. While gatekeeper training has been shown to be an effective strategy for facilitating knowledge and recognition of suicide-specific risks (Burnette, Ramchand, & Ayer, 2015; Kutcher, Wei, & Behzadi, 2017; Robinson et al., 2013), it is not known whether specific sub-groups are more likely to benefit from such training. To the authors' best knowledge, this is the first systematic review to address some fundamental knowledge gaps regarding suicide prevention gatekeeper training. These are:

(a) What type of suicide prevention gatekeeper programs are most suitable to deliver among adults who are natural gatekeepers for young people – parents and teachers – to effect suicide literacy and behavioural changes?
(b) Is there any evidence that suicide prevention gatekeeper training is more effective for teachers than parents, or vice versa?
(c) What are the specific components that make gatekeeper training effective?

Understanding what training works for whom is critical to informing future efforts regarding the development and/or modification of existing programs to optimally impact suicide, and to determine future investment in this strategy.

2. Methods

We undertook a single-wave combined search of peer-reviewed academic abstracting databases (PsycINFO, Medline, Scopus, PubMed), from the earliest available date to articles indexed as of May 30, 2018. The search aimed to identify English-language evaluation studies of gatekeeper training programs designed to reduce suicide in young people by improving suicide literacy and behaviors among gatekeepers.

2.1. Study inclusion criteria

Studies were included if the target audience of the gatekeeper program evaluations were teachers and/or parents. The studies also had to report on the following constructs as primary outcomes of interest of this review:

- Knowledge (*literacy*): The extent to which an individual understands suicide warning signs, the magnitude of the problem, and/or knowledge of how to intervene. Usually measured as whether an individual can recognise risks so that they know to ask someone about whether they are suicidal.
- Confidence (*also known as 'self efficacy'*; *literacy*): The extent to which an individual feels comfortable and competent to identify, care for, and facilitate referral for at risk youth. Usually measured as a rating of 'how confident' an individual would be to ask about suicidality or provide help if suicidality was disclosed.

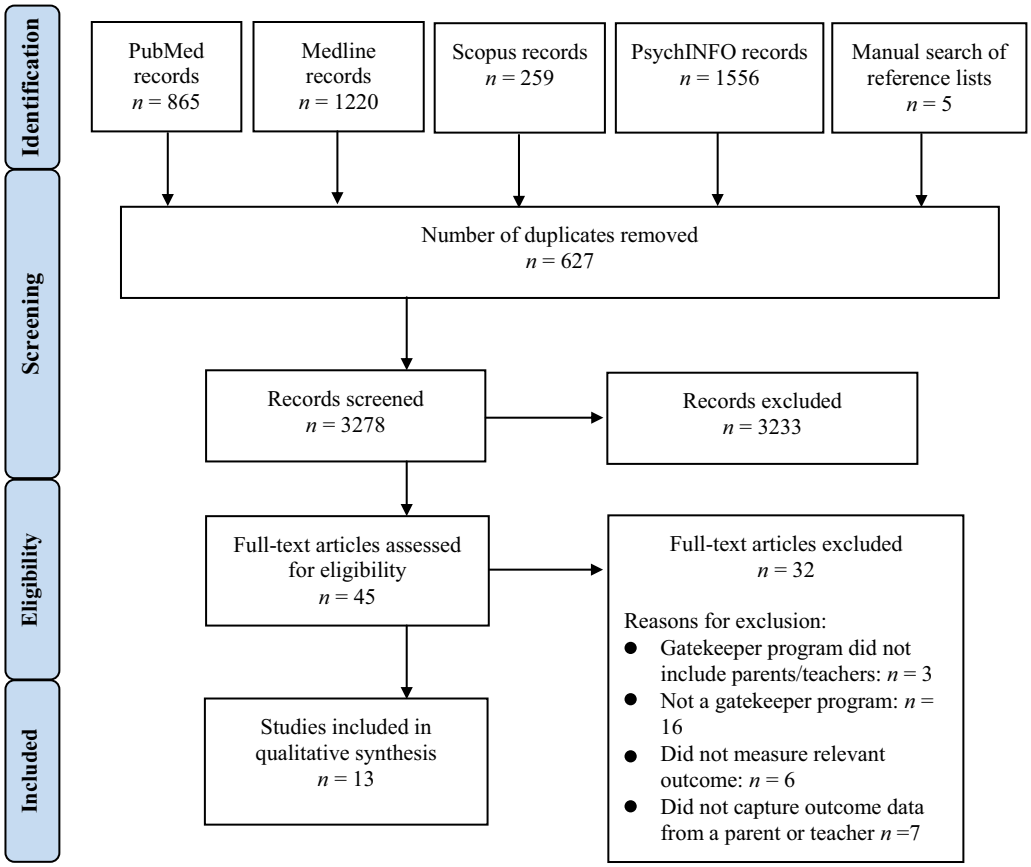

Fig. 1. PRISMA diagram for study selection process.

- Attitudes (*literacy*): Attitudes is usually discussed in the context of stigma. It is usually measured by asking individuals whether they believe suicide is preventable, and/or believe whether suicide risk should be directly asked about.
- Gatekeeper behaviours: Measured as the *identification* of at risk young people, and/or, the *referral* of young people. .

No restrictions were placed on setting, and all types of designs were eligible, including experimental (randomized controlled trial [RCT] or quasi-experimental) or non-experimental (pre-post).

Narrative/systematic/meta-analytic review studies were excluded from the final dataset, as were non-English articles.

2.2. Search strategy

Search terms were used which best reflected the target population were combined in the following ways: suic* (suicide, suicidal, suicidality) AND gatekeep* (gatekeeper, gatekeeping) AND constructs for youth (youth, adol*, teen*, school) AND parent OR teacher. In addition, a manual ancestry search of references lists of the identified studies and of literature or systematic reviews for suicide prevention gatekeeper training was undertaken to identify further relevant studies that may have been missed in the database search. Five additional studies were identified via manual searching. Where available, database subject indexing terms were used to identify relevant articles. Where subject heading Results were limited, additional text keyword searches were conducted. For indexed databases, abstracts were downloaded.

This search strategy identified 3905 articles in total (Fig. 1). All article titles and abstracts were systematically screened by MT and AS in an initial process to remove those papers ineligible for inclusion. The researchers achieved 99.5% concordance in determining eligible studies using a 20% subsample of 781 papers prior to commencement of screening the full sample. Articles that remained as possible candidates for inclusion in the study were then obtained in full-text form (n = 45) and again assessed by the same researchers for inclusion.

2.3. Data extraction

Papers that fulfilled the inclusion criteria were coded by MT and AC, with all relevant data extracted. Where effect sizes were not reported in papers, but data was available, standardised 'between group' effect size estimates were calculated using Cohen's *d* (Cohen,

Table 1
Description of included studies.

Author(s), year	Relevant Participants	Setting	Sample Size (*n*)	Study design	Control condition	Intervention condition	Delivery method	No. sessions delivered	Duration per training session
Condron et al. (2014) USA	Teachers; School counsellors; Mental health professionals Other staff	Elementary, middle + high school	1084 (n = 303 teachers)	Non-experimental (no baseline data)	No	< 3 h (93% did QPR); 3–8 h (77% SafeTalk & Connect); > 8 h (98.3% did ASIST)	F2F	Not described	Not described
Cross et al. (2011) USA	Teachers; School personnel (school counsellors/bus drivers) Parents	Secondary school	147 (n = 91 teachers; n = 56 parents)	RCT	QPR	QPR + Behavioural Rehearsal	F2F	1	QPR only = 60 min QPR + BR = 85 min
Groschwitz et al. (2017) Germany	Teachers, school psychologists, other staff	Secondary school	236 (n = 55 teachers)	Pre-test/post-test non-experimental	No	Strong Schools against Suicidality and Self-Injury	F2F	1	2 days
Hooven (2013)	Parents	Home	343	Pre-test/post-test non-experimental	No	P-CARE	F2F	2	90 min
Johnson and Parsons (2012) USA	Teachers + school personnel	Secondary school	36	Pre-test/post-test non-experimental	No	QPR	F2F	3	90 min
Klingman (1990) Israel	Teachers	Secondary school	30	Pre-test/post-test quasi-experimental	Problem-oriented workshop	Group-oriented workshop	F2F	2	Group-oriented = 178 min; Problem-centred = 165 min
Lamis et al. (2017) USA	Teachers + school personnel	Middle school + high school	700 (n = 620 teachers)	Pre-test/post-test non-experimental	No	Making Educators Partner in Youth Suicide Prevention (MEP)	Online	1	2 h
Reis and Cornell (2008)	Teachers + school counsellors	Elementary, middle + high school	410 (n = 263 teachers)	Quasi-experimental (no baseline data)	Yes (no intervention)	QPR	F2F	1	QPR: 60–180 min
Robinson et al. (2016) Australia	Teachers + other school personnel	Secondary school	84 (n = 25 teachers)	Pre-test/post-test non-experimental	No	STORM	F2F	2	2-days
Shannonhouse et al. (2017) USA	Teachers + school counsellors and administrators	K – 12 at school	149	Pre-test/post-test quasi-experimental	Yes (no intervention)	ASIST	F2F	2	14 h (over 2 days)
Tompkins et al. (2010) USA	Teachers + school personnel	Secondary school	141	Controlled trial with non-equivalent control group	Yes (no intervention)	QPR	F2F	1	60 min
Walsh et al. (2013)	Teachers + school personnel	Secondary school	237 (n = 100 teachers)	Pre-test/post-test non-experimental	No	Not specified	F2F	1	90 min
Wyman et al. (2008) USA	Teachers + other school staff	Middle and high school	249 (n = 151 teachers)	RCT	Yes (wait-list control)	QPR	F2F	Mean = 2.7 Range: 1 - 8	90 min

GKT = Gatekeeper training; F2F = Face-to-Face; STORM = Skills-based Training on Risk Management; QPR = Question, Persuade, Refer; [a] = Oxford Centre for Evidence-Based Medicine.

1988) or phi. Cohen's *d* (1998) is interpreted in the following way: an effect size of 0.20 is considered small, 0.50 is moderate, and 0.80 or more is large. Phi was used to calculate the effect size of studies with a dichotomous outcome variable, where an effect size of 0.10 is considered small, 0.30 moderate and 0.50 large (Cohen, 1988). Trials that reported multiple measurement occasions were deemed effective if a significant difference between the intervention and control condition was reported on at least one measurement occasion. Significance level was set at $p < 0.05$.

3. Results

Searches identified 3905 articles. Following removal of 627 duplicates and exclusions by title and relevance (n = 3233), 45 articles were retrieved with 13 meeting inclusion criteria (Fig. 1). Table 1 provides descriptive information and study characteristics.

3.1. Trial characteristics

Overall, 13 relevant papers were identified, describing 13 unique studies. Table 1 presents the characteristics of each study. The highest level of evidence found for gatekeeper training was that of the RCT ($n = 2$; 15%), while three studies (23%) utilised a quasi-experimental design (with control group), and the remaining eight studies (62%) used a non-experimental (no control group) study design. Twelve of thirteen studies (92%) recruited teachers as a target audience for training, while only two studies (15%) involved parents. Gatekeeper training was delivered within secondary schools (including middle, high school) in 92% of studies, of which 25% also delivered training within elementary schools. Only one study delivered gatekeeper training in a home setting. Question, Persuade, Refer (QPR) was the most commonly used program, delivered in 54% of studies, followed by the ASIST program (23%). The duration of training ranged considerably from 60 min to 2 days (14 h total). Ten studies (77%) offered 'brief' gatekeeper training, lasting three hours or less, and delivered within a single session with no follow-up training.

3.2. General suicide literacy outcomes

Suicide literacy outcomes were reported in n = 12 (92%) studies (Table 2), all of which found significant improvements in at least one of the domains at post-intervention. Of these, 50% used an experimental design to examine the overall treatment effect. Among these six studies, 83% reported significant treatment x time effects, whereby the intervention condition reported significantly greater improvements in at least one suicide literacy measurement at post-intervention (d = 0.20–3.63, Median: 1.15) relative to the control condition. The remaining study (Cross et al., 2011) found no overall treatment effect, but did report significant, large improvements in knowledge of suicide and confidence to intervene in both conditions (QPR v. QPR + BR). Six studies used a non-experimental pre-/post-intervention design, reporting 'within-group' effects for suicide literacy. All six reported significant effects for at least one measure of suicide literacy at post-intervention ($d = 0.10$–1.66; phi = 0.44–1.41).

More specifically, ten studies (77%) measured knowledge outcomes (either between group, or within), all of which reported significant improvements among those who received gatekeeper training. The effect sizes for knowledge outcomes ranged from small ($d = 0.15$) to very large ($d = 3.63$), with a median effect size of $d = 1.32$ (83% of effect sizes were in the range of large-to-very large).

Similarly, eleven studies (85%) measured gatekeeper recipients' perceived self-efficacy to assist a suicidal young person and/or to intervene, all of which reported significant pre-post changes.

For 'confidence', effect sizes ranged from small ($d = 0.10$) to very large ($d = 1.68$), with a median very large, effect size of 1.12 (76% of effect sizes were in the range of large-to-very large). Finally, eight studies (62%) assessed changes in attitudes of gatekeepers towards suicide, of which six (75%) reported significant improvements (effect size range: 0.21–1.15; median: 0.83) at post-intervention.

3.3. General behavioural outcomes

Changes in gatekeepers' behaviours were reported in 46% of studies. Of these, one-third (Cross et al., 2011; Wyman et al., 2008) examined overall intervention x time effects, with both reporting very-small-to-small negative or null training effects for the identification of at-risk students ($d = 0.11$–0.18) and referrals to appropriate services ($d = 0.01$–0.09). Examination of within-group outcomes, among those who received gatekeeper training, similarly support that gatekeeper training did not improve identification or referrals for teachers (Condron et al., 2014; Hooven, 2013; Johnson & Parsons, 2012).

Significant effects for identification of at-risk youth were limited to gatekeeper training programs that were longer than eight hours duration (phi = 0.20–0.22; Condron et al., 2014), while referrals significantly increased among school counsellors (phi = 0.12–0.22; Condron et al., 2014; Reis & Cornell, 2008). However, it was not possible to discern whether these improvements were a direct result of the gatekeeper intervention, as neither of these studies collected baseline data.

3.4. Specific effects for teachers and parents

Eight studies reported 'knowledge' outcomes for parents and/or teachers. Of these, 87.5% had data for teachers and 25% had data for parents. Of the seven teacher-included studies, six (86%) reported that teachers had significantly larger increases in pre-post scores than non-teaching staff (e.g., school counsellors, other mental health staff). Moreover, suicide prevention gatekeeper training consistently did not enhance knowledge of suicide among school staff with a mental health background.

Table 2
Primary outcomes.

Author	Suicide Literacy outcomes						Behavioural outcomes			
	Intervention v. Control			Within-group effects			Intervention v. Control		Within-group effects	
	Knowledge	*Confidence*	*Attitudes*	*Knowledge*	*Confidence*	*Attitudes*	*Identification*	*Referrals*	*Identification*	*Referrals*
Condron et al., 2014[a]	No control condition	No control condition	No control condition	NA	NA	NA	No control condition	No control condition	Longer training (> 8 h) was associated with sig. higher identification rates ($\chi^2_{(2)} = 16.74$; $p < 0.01$; phi = 0.20)	Counsellors made sig. more referrals for 'at risk' youth than teachers or administrative staff ($\chi^2_{(1)} = 6.27$, $p < 0.05$; phi = 0.12)
Cross et al. (2011)	No overall treatment effect for declarative knowledge about suicide ($d = 0.35$) or perceived knowledge ($d = 0.90$).	No overall treatment effect for self-efficacy to intervene in at risk youth at post-test ($d = 0.16$). Significant higher total QPR skill scores among INT group ($d = 0.46$) compared to controls.	NA	Significant improvement in both groups for declarative knowledge of suicide (INT: $d = 0.61$; CON: $d = 0.57$) + self-perceived knowledge (INT: $d = 2.08$; CON: $d = 2.01$). In INT group: Significant increase in perceived knowledge for teachers and parents ($d = 2.32$) but not school counsellors.	Significant improvements for both conditions for self-efficacy (INT: $d = 1.27$; CON: $d = 1.34$). In INT group: Significant increase in self-efficacy for both teachers and parents (but no differences between them) ($d = 0.27$). No sig. differences between parents and teachers total QPR skill scores ($d = 0.10$)	NA	NA	No significant treatment effect for self-reported referrals of at-risk youth ($d = 0.01$) at 3-mo follow-up.	NA	School staff reported making sig. more referrals than parents among those who received any training ($d = 0.26$) at 3-mo follow-up.
Groschwitz et al. (2017)	No control condition	No control condition	No control condition	Significant increase in perceived knowledge at post-test ($d = 1.67$) and follow-up ($d = 1.41$); teachers had the largest increase in pre-/post-test mean scores for perceived	Significant increase in confidence at post-test ($d = 1.68$) and follow-up ($d = 1.56$); Teachers	No significant difference in attitudes to suicide at post-test ($d = 0.44$) and follow-up ($d = 0.23$)	NA	NA	NA	NA

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Table 2 (*continued*)

Author	Suicide Literacy outcomes						Behavioural outcomes			
	Intervention v. Control			Within-group effects			Intervention v. Control		Within-group effects	
	Knowledge	*Confidence*	*Attitudes*	*Knowledge*	*Confidence*	*Attitudes*	*Identification*	*Referrals*	*Identification*	*Referrals*
				knowledge (*M* √1.44, *SD*√ 0.67)	reported highest increase in confidence (*M* = 1.41, *SD* = 0.68)					
Hooven (2013)	No control condition	No control condition	No control condition	Improvement in knowledge from first to second session (*d* = 0.15)	Significant improvement in motivation to use gatekeeper skills from session one to session two (*d* = 0.10); Significant improvement in parental support offered to child from session one to two (*d* = 0.26)	Significant improvement in attitude towards positive change (*d* = 0.21) from session one to 2-mo follow up; no change from session one to two (*d* = 0.01)	No control condition	No control condition	No significant improvement in identifying behaviours from session one to 2-mo follow up (*d* = 0.02)	NA
Johnson and Parsons (2012)	No control condition	No control condition	No control condition	Significant, large improvements in knowledge of: suicide facts (*d* = 1.01), suicide prevention (*d* = 0.82), how to ask someone about suicide (*d* = 1.28), how to persuade someone to get help (*d* = 1.03)	Significant, large improvement in confidence developing/ using a safety plan (*d* = 0.82)	Significant, large improvement that asking about suicide is appropriate (*d* = 1.15)	NA	NA	Non-significant effect: 1 staff member (of 36) had identified an at-risk student at 3-mo follow-up.	Non-significant effect: 1 staff member (of 36) had referred an at-risk student using the QPR protocol at 3-mo follow-up.
Klingman (1990)	Both groups scored significantly higher on general knowledge (INT: *d* = 3.30; CON: *d* = 3.63) + knowledge of warning signs (INT: *d* = 1.36; CON: *d* = 1.53) No treatment effect.	Both groups scored significantly higher on perceived personal competency in approaching and assisting at risk students (INT: *d* = 1.04; CON: *d* = 1.24). No treatment effect.	NA	INT group: Teachers in both conditions had significantly higher scores on general knowledge (*d* = 5.78) and knowledge of warning signs (*d* = 2.17).	INT group: Teachers in both conditions had significantly higher scores on perceived personal competency in approaching and assisting at risk students (*d* = 3.09)	NA	NA	NA	NA	NA
	No control condition	No control condition					NA	NA	NA	NA

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Table 2 (*continued*)

Author	Suicide Literacy outcomes						Behavioural outcomes			
	Intervention v. Control			Within-group effects			Intervention v. Control		Within-group effects	
	Knowledge	*Confidence*	*Attitudes*	*Knowledge*	*Confidence*	*Attitudes*	*Identification*	*Referrals*	*Identification*	*Referrals*
Lamis et al. (2017)			No control condition	Significant increase in knowledge about suicide risks/warning signs (d = 1.51); Teachers + classroom aids had the largest mean changes in pre-post test scores.	Significant increase in self-efficacy/ confidence (d = 1.66); Teachers had the largest mean changes in pre- to post-test scores.	Small, significant increase on attitude scores (d = 0.29) for teachers only.				
Reis and Cornell (2008)	INT group had small, but significantly higher knowledge scores than CON group (d = 0.20).	NA	NA	NA	NA	NA	Significantly more students were questioned about suicide by trainees (d = 0.44)	Significantly more students referred to mental health services (d = 0.37) by trainees.	Counsellors questioned more students about suicide than teachers in intervention and control conditions) d = 0.36; non-significant)	Counsellors referred significantly more students than teachers in intervention and control conditions) (d = 0.37)
Robinson et al. (2016)	No control condition	No control condition	No control condition	Significant gains in mean knowledge scores from pre- to post-test (d = 0.56).	Significant increase in confidence dealing with mental illness at post-test (d = 0.58) and follow-up (d = −0.14) and in dealing with self-harm at post-test (d = 1.12) and follow-up (d = −0.09)	No significant improvements in mean scores for attitudes to children who self-harm at post-test (d = −0.05) or follow-up (d = 0.08)	NA	NA	NA	NA
Shannonhouse et al. (2017)	Significant treatment effect for knowledge of suicide (d = 0.26).	Significant treatment effect for: confidence in ability to intervene (d = 0.26) and competence (d = 1.08)	Significant improvement in attitudes about suicide (d = 0.83).	In intervention group: Being a teacher was not significantly predictive of increases in knowledge of suicide	In intervention group: Being a teacher was not significantly predictive of increases in comfort/ competence/	In intervention group: Being a teacher did not significantly predict improvements in attitudes about suicide.	NA	NA	NA	NA

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Table 2 (*continued*)

Author	Suicide Literacy outcomes						Behavioural outcomes			
	Intervention v. Control			Within-group effects			Intervention v. Control		Within-group effects	
	Knowledge	*Confidence*	*Attitudes*	*Knowledge*	*Confidence*	*Attitudes*	*Identification*	*Referrals*	*Identification*	*Referrals*
					confidence in responding to risk.					
Tompkins et al. (2010)	Significant intervention effect for knowledge of QPR (d = 1.52) and self-evaluation of knowledge of warning signs/ resources etc (d = 1.63); gains not maintained at follow-up.	Significant intervention effect for self-perceived efficacy in assisting a suicidal person (post: d = 1.51/follow-up: d = 1.26) + likelihood to intervene (post: d = 0.47/follow-up: d = 0.33).	Significant intervention effect for seeing suicide as preventable (d = 0.93) at post and follow-up (d = 0.24), but not for other attitude measures.	INT group: Teachers had the greatest mean increases on QPR knowledge scores (t = −10.21).	NA	INT group: Significant improvements in attitudes about suicide for teachers (t = −2.87).	NA	NA	NA	NA
Walsh et al. (2013)	No control condition	No control condition	No control condition	NA	Significant increases in: (i) likelihood of asking directly about suicide (phi = 1.29); (ii) comfort asking about suicide risk (phi = 1.41); (iii) confidence in ability to question youth about their feelings (phi = 1.32)	Significant improvement attitude to asking about suicide (phi = 1.08 p < 0.01) and the importance of prevention for suicidal students (phi = 0.44)	NA	NA	NA	NA
Wyman et al. (2008)	Significant intervention effect for knowledge of QPR (d = 0.44) and youth suicide (d = 1.32) at follow up.	Significant intervention effect for perceived preparedness (d = 1.21) and self-efficacy (d = 0.95) at follow up.	NA	INT group: Significant improvement among teachers on knowledge of QPR (d = 0.58) and youth suicide (d = 1.76) but not for other staff.	INT group: Significant improvement among teachers in perceived preparedness (d = 1.53) and self-efficacy (d = 1.89).	NA	No intervention effect for asking students about suicide (d = 0.11) at 12-mo follow up.	No intervention effect for referring at risk students (d = 0.09) at 12-mo follow up.	INT group: Moderate, non-significant increase in asking about suicide for teachers already asking students about suicide at 12-mo follow up.	INT group: Significant, moderate increase in referrals by teachers (d = 0.42) at 12-mo follow up.

NA = This measure was not assessed within the study; INT: Intervention condition; CON: Control (comparator) condition.

The two studies which reported knowledge outcomes for parents (Cross et al., 2011; Hooven, 2013) found improvements in knowledge, although Hooven (2013) only measured knowledge changes from the first to second training session, not from pre-to post. In the Cross et al. (2011) study, both parents and teachers reported significantly higher increases in their knowledge of suicide relative to school counsellors, and no differences were reported between parents versus teachers.

Seven studies reported confidence (self-efficacy) outcomes (teachers: $n = 6$/parents: $n = 2$). In respect to teachers, five of the six (83%) studies found that teachers achieved significantly higher mean scores on self-efficacy to intervene ($d = 0.27$–3.09; phi = 1.32), preparedness ($d = 1.53$), and comfort asking about suicide (phi = 1.41) compared to non-teaching staff. Similarly, both 'parent' studies reported significant improvements in self-efficacy outcomes post-training ($d = 0.10$–0.27; mean: 0.18).

No studies reported specific effects for teachers for measures of attitudes towards suicide, while one study found that parent attitudes changed from the first to the second training session ($d = 0.21$), but the effect was not maintained at a 2-month follow up.

For behavioural outcomes, two studies looked at gatekeeper skills in relation to identifying at risk youth among teachers. It was found that there was a small, null effect for teachers in identifying at risk students ($d = 0.24$), however, among teachers who had been asking students about suicide prior to the training intervention, a moderate improvement in early identification behaviours was reported (relative change = 2.00, 95% CI: 0.25, 3.84). Four studies reported on referral behaviours of teacher, but only one study (Wyman et al., 2008) found a moderate training effect for all teachers in relation to appropriately referring students displaying suicidal behaviours ($d = 0.42$; CI: 0.08, 0.75). Gatekeeper training did not lead to significant improvements in identifying, or making referrals for, young people (Cross et al., 2011; Hooven, 2013).

3.5. Effect of intervention components

The specific intervention program (i.e., QPR, ASIST, other) did not appear to have an impact on suicide literacy outcomes, as nine different programs were delivered across the thirteen studies, and all studies reported significant, positive effects. In respect to behavioural outcomes, QPR was the primary program delivered, and based on the RCT, this brief training (60–90 min duration) did not appear to be sufficient to effect behavioural change. In the one study which assessed multiple gatekeeper training programs by the duration of the program (Condron et al., 2014), it was found that programs which lasted for more than eight hours (e.g., ASIST) were positively associated with greater identification of at-risk students (phi = 0.20), and a greater awareness of the help that at-risk youth received post-referral (phi = 0.12).

Two studies (Cross et al., 2011; Klingman, 1990) compared a didactic gatekeeper training to an 'interactive' training (didactic + behavioural rehearsal component). Both studies found that knowledge and confidence outcomes improved in both training conditions, however, Klingman (1990) reported larger knowledge gains in the didactic condition.

Twelve of thirteen studies (92%) delivered training face-to-face, while only one used an online delivery method (Lamis, Underwood, & D'Amore, 2017). The online training program delivered similarly large effect sizes for knowledge ($d = 1.51$), confidence ($d = 1.66$), and a small, but significant improvement in attitude ($d = 0.29$) as did the more common, face-to-face delivery method.

The number of training sessions delivered ranged from one to eight (Median: two). All studies reported positive, significant effects regardless of number of sessions delivered, however, the largest effect size reported ($d = 3.63$) was in a study that delivered two training sessions (Klingman, 1990).

4. Discussion

This review sought to identify and describe all studies of gatekeeper training delivered to parents and/or teachers for the prevention of youth suicide. To the authors' best knowledge, it provides the first synthesised body of evidence relating to a specific group of gatekeepers who have a high rate of contact with young persons, and thus may be best suited to detect early signs of suicidal behaviour to prevent premature mortality and disability in this population.

While all studies included teachers as training recipients, only two studies included parents (Cross et al., 2011; Hooven, 2013). Unfortunately, this is not a sufficient amount of evidence to be able to discern differences in the effectiveness of gatekeeper training for parents as compared to teachers. Preliminarily, however, both groups appeared to similarly benefit from suicide prevention gatekeeper training, based on reporting similar mean improvements in knowledge and perceived confidence to intervene among youth (Cross et al., 2011). Similarities in improvements may be due to both groups having similarly low levels of baseline suicide literacy (Cross et al., 2011), and therefore for genuinely benefit from psychoeducational interventions. However, neither group improved on behavioural outcomes, suggesting these groups may require more intense, or more skills-based training to recognise risk in their students or children, and to develop the ability to intervene. Further evaluative research of gatekeeper training targeting parents is warranted to improve literacy and confidence to intervene, particularly given that at-risk youth prefer to disclose risk to parents more than any other group (Kidd et al., 2006).

All but one included study measured suicide literacy outcomes. Of these, all reported significantly higher mean scores on at least one literacy domain among those who received suicide prevention gatekeeper training (both across- and within-groups). In the two studies which used two active control conditions (Cross et al., 2011; Klingman, 1990), both reported a significant effect for time, but not for treatment, on measures of knowledge and confidence. Such findings suggest that the type of program used may not be as important as ensuring that some form of suicide prevention gatekeeper training is implemented in key gatekeeper groups.

Moreover, studies which conducted within-group analyses, comparing teachers to counsellors, consistently reported significant mean gains in knowledge and confidence literacy outcomes for teachers only (Cross et al., 2011; Lamis et al., 2017; Reis & Cornell,

2008; Shannonhouse, Lin, Shaw, & Porter, 2017; Wyman et al., 2008). Counsellors already had sufficiently strong knowledge of suicide risks and of how to intervene in suicidal youth, therefore, training had a null effect. Accordingly, future efforts warrant increased investment in teaching staff, who lack a sound 'baseline' understanding of risk, rather than school staff with prior mental health training (e.g., counsellors) who do not appear to benefit from this type of brief training. Overall, however, the consistency of suicide literacy gains, regardless of the type of program delivered, coupled with the size of the gains (primarily medium to very large effect sizes), indicates that suicide gatekeeper training appears to be a safe, effective, strategy to assist teachers (and parents) in increasing awareness of suicide risk in young people.

Despite improvements in suicide literacy, however, there was insufficient evidence that gatekeeper programs elicited significant behavioural change. However, as only four studies assessed the identification and referral patterns of gatekeepers (Condron et al., 2014; Hooven, 2013; Tompkins, Witt, & Abraibesh, 2010; Wyman et al., 2008), it was difficult to accurately assess intervention effects on behavioural outcomes. This difficulty was further problematized by the poor methodological quality of these studies, with three failing to include a control condition (Condron et al., 2014; Hooven, 2013; Johnson & Parsons, 2012) and/or not capturing baseline data (Condron et al., 2014; Hooven, 2013; Reis & Cornell, 2008). In the single methodologically rigorous RCT, Wyman et al. (2008) found small, non-significant effects for identification of at-risk students *and* referrals to appropriate services among persons with no history of engaging students about suicide risk. It appears then that existing gatekeeper programs, such as QPR, in their current form are not capable of instilling a skill set that is consistent with the prevention of suicidal behaviours. This finding is consistent with other studies in this area, which have failed to find conclusive evidence that improvements in gatekeeper skills (e.g., knowledge, confidence) increases the use of those skills (Cross, Matthieu, Lezine, & Knox, 2010).

It should be a goal of future research to ensure that behavioural outcome measures are included in experimental designs. This would allow us to better understand whether gatekeeper programs do indeed have little effect on early identification and intervention, or whether non-significant Results are an artefact of underpowered and methodologically poor trials. Such information is critical to the development, or modification, of gatekeeper training for behavioural change. It would also be important for future research to link behavioural change in the targets of gatekeeper training to actual decreases in suicide attempts amongst youth.

Examination of the specific components of the training programs indicates that brief trainings, such as QPR, appear to be similarly as effective as longer trainings (e.g., ASIST) in respect to increasing suicide literacy outcomes among youth suicide prevention gatekeepers. However, for behavioural change to occur, the duration of training appears to be important. That is, Condron et al. (2014) compared gatekeeper trainings of varying lengths and found that programs running for more than eight hours incurred the most significant identification and referral behaviours. However, rather than length of 'exposure' itself being the mechanism by which gatekeeper training engenders behavioural change, it is likely that longer training programs may lead to increased identification and referral behaviours because they typically include an interactive, or behavioural rehearsal component, unlike brief training programs (e.g., QPR), allowing recipients to learn and practice intervention skills.

The current review also found preliminary evidence that the delivery format (i.e., face-to-face versus online) did not affect outcomes, as both methods produced similar effects regarding increases in suicide literacy. However, with only one online training evaluation identified it is difficult to properly assess the functionality and effectiveness of this medium.

Though no restrictions were placed on the setting in which training was delivered, most training was delivered in school settings. Of these, one-third of the studies delivered training to teachers in elementary schools *as well as* secondary or high schools, however, none of these evaluations made a distinction between the appropriateness or efficacy of the training programs for teachers interacting with children in mid-to-late stages of childhood versus adolescence. The lack of developmental delineation in youth-targeted suicide gatekeeper training may be problematic, as the nature, precipitants, and meaning of suicidal thinking can be different depending on the stage of development (Vander Stoep, McCauley, Flynn, & Stone, 2009). As such, the modification of gatekeeper training programs to address age-relevant risks should be an area for further development and evaluation. Nonetheless, given that all studies reported at least one significant, positive suicide literacy and/or behavioural outcome, teaching staff appear to be a promising audience in which to promote, and target, early suicide prevention of young people.

4.1. Critical considerations and future directions

Emerging from this review are some critical considerations. Firstly, there is a clear gap in the provision of gatekeeper training to parents. As parents have the opportunity for more targeted, meaningful access to their children than do teachers, and are the adults that young people are most likely to disclose suicide risk to (Kidd et al., 2006) careful consideration should be given to what, and how, training could best engage parents. Gatekeeper training may need to be modified to appropriately deal with the unique dynamics and sensitivities of the parent-child relationship, and consideration given to how parent and teacher roles can best interact and communicate with each other to provide a more comprehensive approach to the early identification of, and intervention in, suicidal behaviour.

Secondly, there appears to be significant scope to adapt existing gatekeeper programs to online or mobile ('app-based') delivery modes, to increase uptake and achieve scalability. Scalability is an important consideration for programs such as gatekeeper training, as the overall efficacy of the strategy is likely to increase, positively, with the extent of saturation in target populations, thus enabling the 'protective' function that gatekeeper training is intended for. Certainly, there is increasing evidence that the digitization of gatekeeper training is feasible (Lancaster et al., 2014; Sueki & Ito, 2015).

Thirdly, youth suicide prevention efforts need to carefully consider how to improve help-seeking skills among young people *alongside* increasing gatekeeper training in adults (e.g., parents, teachers) to optimise prevention effects. Relatedly, future studies should consider capturing such data from young people (the recipients of gatekeeper efforts) to understand whether the gatekeeping

skills being taught to parents and teachers are youth-appropriate. Research has shown that young people respond better to interventions that are youth-specific (Mathias, 2002), however, based on this review, it appears that most programs delivered to teachers and/or parents are generic (e.g., QPR, ASIST), and have not been designed specifically for risk in youth.

Finally, and perhaps most importantly, no research has yet examined whether, in the period following gatekeeper training, there is a corresponding reduction in suicidal thoughts, planning, or behaviours of young people. Given the highest purpose of gatekeeper training is to prevent suicide in youth, this is a major knowledge gap. While it would be difficult to evaluate this, it could be potentially done in closed settings (i.e., schools). To see effects, however, there would need to be a high level of participation in gatekeeper training among school staff and multiple baseline data gathered for students to accurately understand temporal trends in suicidal behaviour in the student population.

4.2. Study limitations

There are some limitations to the current review that should be acknowledged. Despite our rigorous systematic search strategy, it is possible that some studies were not captured, and subsequently will not have been included in this review, potentially altering the conclusions made. Also, the studies generally lacked methodological rigour, with only two RCTs identified and no comparator condition in half the studies. Moreover, there was a general lack of use of validated scales to measure literacy or behavioural outcomes. Only five studies (Cross et al., 2011; Groschwitz, Munz, Straub, Bohnacker, & Plener, 2017; Robinson, Green, Spittal, Templer, & Bailey, 2016; Wyman et al., 2008) used scales that had been validated (e.g., the Knowledge of Deliberate Self-harm Questionnaire [KDS; Crawford, Geraghty, Street, & Simonoff, 2003], Attitudes towards Children who Self-harm Questionnaire [ACS; Crawford et al., 2003], Suicide Intervention Response Inventory 2nd edition [SIRI-2]; Neimeyer & Bonnelle, 1997) or used questions adapted from existing studies (e.g., Washington's Youth Suicide Prevention Program; Goldston et al., 2010). All other studies used scales that were developed specifically for the evaluation, and while the Cronbach alpha's for these were in the ranges of acceptable to excellent (knowledge: 0.92–0.97; confidence: 0.80–0.84; attitudes: 0.69–0.84), the lack of validation makes it difficult to know if the studies were measuring the same constructs. This variance in scientific quality and lack of measurement standardisation makes it difficult to determine efficacy and provide specific recommendations for future prevention initiatives. There is a clear need for gatekeeper training programs to be evaluated using more rigorous research designs, with longer-term follow up, to better understand skill retention and application among gatekeepers. Meta-analysis was not possible due to the extent of variation in the study design and characteristics, however, effect sizes for each study were presented where possible.

4.3. Conclusion

At present, the relative paucity of methodologically robust studies limits the strength of recommendations that can be made from the Results of this systematic review. The tentative implications of the findings are that gatekeeper training is a safe strategy to increase awareness and knowledge among trusted adults regarding the risks for suicide in young people. As yet, however, there is no clear evidence that these programs lead to increases in adults recognizing, and responding to, at risk young people.

There is opportunity to improve the behavioural impacts of gatekeeper training by offering digital interventions to increase the reach and uptake of these programs, and employing targeted strategies to engage parents in this training given they are one of the most trusted sources of support for vulnerable youth. The findings of this review need to be confirmed and added to by large-scale prospective studies so that the mechanisms that lead to increased behavioural change (identification and referral) can be determined.

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