The communication of suicidal intentions: a meta-analysis

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Background. Among the myths that are often cited about suicide is that 'people who talk about killing themselves rarely die by suicide', but the evidence seems to contradict this statement. The aim of this study was to conduct a meta-analysis of studies reporting a prevalence of suicide communication (SC), and to examine the diagnostic accuracy of SC towards suicide in case-control reports.

Method. Eligible studies had to examine data relative to completed suicides and report the prevalence of SC. Data relative to sample characteristics, study definition, modality and recipient of the SC were coded.

Results. We included 36 studies, conducted on a total of 14 601 completed suicides. The overall proportion of SC was 44.5% [95% confidence interval (CI) 35.4–53.8], with large heterogeneity ($I^2 = 98.8\%$) and significant publication bias. The prevalence of SC was negatively associated with the detection of verbal communication as the sole means of SC and, positively, with study methodological quality. Based on seven case-control studies, SC was associated with an odds ratio of 4.66 for suicide (95% CI 3.00–7.25) and was characterized by sufficient diagnostic accuracy only if studies on adolescents were removed.

Conclusion. Available data suggest that SC occurs in nearly half of subjects who go on to die by suicide, but this figure is likely to be an underestimate given the operational definitions of SC. At present, SC seems associated with overall insufficient accuracy towards subsequent suicide, although further rigorous studies are warranted to draw definite conclusions on this issue.

Introduction

Among the myths that are often cited about suicide is that 'people who talk about killing themselves rarely die by suicide'. In fact, many people who die by suicide give some kind of verbal clue or warning of their intentions, and several studies have shown that as many as two-thirds of *completed* suicides had previously communicated their intentions (Robins *et al.* 1959; Dorpat & Ripley, 1960; Barraclough *et al.* 1974; Beck & Lester, 1976; Beck *et al.* 1976).

In recent years, there have been several reports dealing with the communication of suicidal intention. The first major research project on this topic was carried out by Robins and colleagues (Robins *et al.* 1959), who conducted psychological autopsies on 134 consecutive completed suicides and identified 16 different ways that the suicidal intention had been communicated (Robins *et al.* 1959). These ranged from *direct* statements of intention to die by suicide, to indirect ones, such as telling the spouse that he/she should not buy new things for them, or cleaning out an office or bedroom. The authors found that 69% of subjects who died by suicide had communicated their intention to die by suicide during the previous year, often in multiple ways, and 41% had done so using direct, rather than indirect communication. This study prompted other researchers to explore this aspect of suicidal behavior: Dorpat & Ripley (1960) reported that 83% of their sample of completed suicides in Seattle had communicated their suicidal intention, while Barraclough *et al.* (1974) found that 55/100 of their sample of completed suicides had talked about

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death, dying and suicide (Dorpat & Ripley, 1960; Barraclough *et al.* 1974).

Despite several years of research on this issue, we have few clues as to which factors affect whether suicidal individuals will communicate their intention to die by suicide. Among the factors that might influence the frequency and type of suicidal communication (SC) are the individual's personal history, cultural background, personality, and psychiatric diagnosis Moreover, it is largely unknown to what extent a communication of suicidal intention predicts completed suicide, and what is the sensitivity and specificity of this predictive clue.

In order to effectively inform clinical practice, research on the communication of suicidal intention needs to take into account several methodological issues that were pointed out by Bernstein (1978). For example, in psychological autopsy studies, information given by the suicides' significant others and the reports made by clinicians, medical examiner staff or police might be biased. The significant others may not want to realize (or admit) that they missed clues to their loved one's suicide. The medical examiner's staff may want to avoid ruling the death a suicide. Furthermore, while a direct communication may be relatively easy to interpret, it is not easy to specify the criteria for an indirect communication (Bernstein, 1978).

Despite nearly 50 years of research, no systematic review has been conducted on this issue. Relevant questions that we plan to address in the following meta-analytical review are: (1) what is the proportion of suicides who had previously communicated their suicidal ideas/intentions, and (2) what are the factors affecting the proportion of communicators?

Method

Search strategy

We searched Index Medicus (for publications prior to 1966) and Medline, Excerpta Medica, PsycLit to November 2015 to identify research on the communication of suicide intention. Search terms included combinations of 'suicid*' (which comprises suicide, suicidal, suicidality, and other suicide-related terms), 'communication' and 'intent'. In addition, we reviewed bibliographies of identified reports and sought access to published research not indexed or found in the previous search. Two of the co-authors (M.P. and M.I.) independently reviewed all citations retrieved, blind to each other, in order to achieve a consensus on whether to include a report, consulting a third co-author (M.B.M.) in instances of initial disagreement. We also consulted a number of international experts in the field to retrieve further potential relevant

citations. The authors and the experts consulted performed a careful analysis of the literature data and agreed on a number of additional studies that were relevant to the aim of this paper. We will, therefore, provide an in-depth analysis of studies on the communication of suicidal intent by those who died by suicide.

Inclusion criteria and definitions

In order to be eligible for inclusion, studies had to: (1) examine data relative to completed suicides and report the number of subjects who communicated suicidal intentions (henceforth simply termed 'communicators'); (2) report at least minimal data describing the setting of the study and the type of population involved; and (3) adopt and report an unequivocal definition of SC applied in a systematic fashion for all individuals. We sought to include studies providing clear unambiguous data on the communication of suicidal ideas or intention. This would include, for instance, a statement that individual had a wish to die or was determined to die by suicide, was tired of being alive, was considering suicide as an option, that he/she would be better off dead, and similar utterances. Any relevant person could be the potential recipient of such communications, including family members, friends, clinicians and religious authorities. We excluded studies reporting insufficient information on the type of communication and those reporting data on communications that were related to non-fatal self-harm. We also excluded those studies which reported the number of patients contacting clinicians before suicide, if they did not report specific information on SC.

Both retrospective (psychological autopsy) and prospective studies were included, as well as those with a case-control design (i.e. comparing the communication of suicidal intention between suicides and non-suicides). For the case-control studies, we included only those studies which recruited controls from the same setting with a similar risk of suicide (e.g. patients with psychiatric disorders). (The flow diagram of study selection is reported in Supplementary Fig. S1.)

Data extraction

In order to examine which factors influence the proportion of subjects making SC, we coded available information related both to methodological factors and clinical characteristics. First, we coded information related to the study design, publication year, source of information (clinical charts, interview, or multiple sources) and sample size. Other characteristics of the samples were also coded, such as mean age of the sample, proportion of females, diagnoses (any psychiatric disorder and specific diagnoses), previous suicide attempts, and means of suicide.

Information on the study definition of SC was coded with details concerning its content (passive *v.* active ideas of suicide, intention, plan), modality (written, verbal, non-verbal), recipient (next of kin, clinician, others) and length of observation period. The main outcome variable was the number of suicides who communicated suicidal ideas. If studies reported data related to multiple types of communication (e.g. the proportion of suicides who made verbal threats and the proportion of suicides writing about their intentions), time-frame (e.g. data on communication in the past month and in the past year) or diagnostic subgroups. Only one estimate was kept for each study in the primary meta-analysis. In order to obtain greater homogeneity, we gave preference to the studies with larger samples, to verbal over other forms of communication, and to the longest time-frame of observation. However, the other estimates were coded and used for subsequent comparisons in subgroup analyses and in meta-regressions.

The evaluation of the study's methodological quality was based on a score computed from the following items (1 point each; maximum 5 points). (1) data collection based on multiple sources of information; (2) relatives of the deceased were interviewed; (3) SC: modality reported (e.g. verbal, written, behavioural); (4) SC: recipients of the communication reported; (5) SC: time-frame specified.

Data analysis

First, a pooled between-study estimate of the proportion of suicide communicators was calculated. Confidence intervals (95% CI) were calculated using the Freeman–Tukey double arcsine transformation method (Nyawira Nyaga *et al.* 2014). The meta-analysis was based on random-effects models, with an estimate of between-study heterogeneity based on the *Q* test (DerSimonian & Laird, 1986).

Second, subgroup and meta-regression analyses were carried out to examine the influence of methodological and clinical factors on the proportion of suicidal communicators (moderators). An exploratory multivariate meta-regression analysis was performed entering several moderators at the same time in order to reach the best explanatory model possible.

Third, we performed a meta-analysis to estimate the risk of suicide associated with the SC. Data on the proportion of communicators from suicides and controls from each study were used to calculate a pooled odds ratio (OR) with a 95% CI. We also computed the measures of accuracy of SC for each included study (pooled sensitivity and specificity, positive likelihood ratio (PLR), negative likelihood ratio (NLR) and diagnostic OR (DOR, with a corresponding 95%

CI) using a regression-based approach (Harbord & Whiting, 2009). Stata v. 12.0 (StataCorp, USA) was used for all analyses.

Results

Study selection

We identified 38 citations related to 36 study populations (Robins *et al.* 1959; Dorpat & Ripley, 1960; Yessler *et al.* 1960; Beisser & Blanchette, 1961; Farberow *et al.* 1966; Rudestam, 1971; Barraclough *et al.* 1974; Fowler *et al.* 1979; Breier & Astrachan, 1984; Shafii *et al.* 1985; Brent *et al.* 1988, 1993; Rich *et al.* 1988; Goh *et al.* 1989; Rihmer *et al.* 1990; Apter *et al.* 1993; Isometsa *et al.* 1994*a, c*, 1995, 1996; Foster *et al.* 1997; Heila *et al.* 1998; Marttunen *et al.* 1998; Pirkola *et al.* 1999; Harwood *et al.* 2000; Lindqvist & Gustafsson, 2002; Hawton *et al.* 2004, 2005; Yim *et al.* 2004; Portzky *et al.* 2005, 2009; De Leo & Klieve, 2007; Orbach *et al.* 2007; Owen *et al.* 2012; Sveticic *et al.* 2012; Zhou & Jia, 2012; McPhedran & De Leo, 2013; Giupponi *et al.* 2014). Seven citations reported data from different subsamples of the Finnish National Suicide Prevention Project (Isometsa *et al.* 1994*b, c*, 1995, 1996; Heila *et al.* 1998; Marttunen *et al.* 1998; Pirkola *et al.* 1999; De Leo & Klieve, 2007); two citations allowed the extraction of further data on SC for the same study samples (De Leo & Klieve, 2007; Portzky *et al.* 2009).

Characteristics of included studies

All studies had retrospective designs, and they comprised a total of 14 601 completed suicides, with a sample size ranging from 14 (Owen *et al.* 2012) to 7126 (Sveticic *et al.* 2012) subjects. Details on these studies are reported in Table 1.

Twenty studies relied on multiple sources of information, six from chart reviews only, eight from the next of kin only and, in two cases, the source of information was not specified.

While several studies reported qualitative descriptions, most reports did not use detailed, systematic definitions of SC. No study used *a priori* criteria to define the content of the communication (e.g. if the subjects expressed only suicidal intention *v.* an active plan). Regarding the modality of SC, ten studies did not specify this information, 21 studies reported on verbal communications, eight reported data on written notes, three included both verbal and written communications, and four studies included suicide behaviours. Only 18 studies reported information on who was the recipient of SCs (in most cases both next of kin and health professionals), while 20 studies reported on the duration of the observation period

Table 1. *Description of the studies included in the meta-analysis*

Study	Design, setting, selection of participants, country	Subjects, % of females, mean age, % with psychiatric diagnoses	Study definition of suicidal communication, recipient, time-frame	Characteristics of controls: number, type, % of females, mean age, matching (where available)	Percentage of communicators, % (95% CI)
Robins *et al.* (1959)	Retrospective, suicides from Coroner's offices, United States	134, 23%, nr, 52% (22% BD, 15% alcohol dependence)	Multiple definitions based on modality and content of communication (main outcome: statement of intent to commit suicide), NOK and HCP, 12 months		41 (33–49)
Yessler *et al.* (1960)	Case-control, suicides between 1952–1954 and 1956- 1957 from military service, United States	227, 0%, nr, 100%, mixed diagnosis (41% MDD, 10% SCZ, 9% BD)	Evidence of trying to communicate verbally to others that patient was thinking about suicide or actually intending to commit suicide, NOK and HCP, nr	104 attempted suicides randomly selected from the Army between 1956–1957, 0%, nr, matched for gender	25 (19–30)
Dorpat & Ripley (1960)	Retrospective, suicides from coroner's office between 1957–1958, United States	114, 31.2%, 51.3, 95%, mixed diagnosis (30% MDD, 12% SCZ)	Suicide notes and verbal expression of statements of intent, NOK and PCP, nr		82 (75 -89)
Beisser & Blanchette (1961)	Case-control, suicides between 1916–1958 from Mental Health Hospital, United States	71, 38%, 43.1, 92%, mixed diagnosis (83% MDD, 63% SCZ)	Verbal communication, nr, nr	69, psychiatric patients selected by taking the next case by number, nr, nr, matched for gender and ethnicity	51 (39–62)
Farberow *et al.* (1966)	Case-control, suicides from Veterans Neuropsychiatric Hospital, United States	218, 0%, 39.7, 100%, mixed diagnosis	(a) Suicidal threats recorded during previous hospital, HCP, nr (b) Previous suicidal activity and threats during current hospitalization, HCP, nr	220 psychiatric patients, nr, nr, not matched	a. 40 (33–46) b. 30 (24–36)
Rudestam (1971)	Retrospective, suicides from University Hospital and Coroner's office, Sweden and United States	100, 46%, 46.8, nr, mixed diagnosis	Written notes, nr, previous week	.	43 (33–53)
Barraclough *et al.* (1974)	Retrospective, consecutive suicides from Coroner's office between 1966–1968, UK	100, 36%, nr, 97%, mixed diagnosis (70% MDD, 3% SCZ)	Threats of suicide or talk about death, dying or suicide, nr, 52 previous weeks		55 (45–65)
Fowler *et al.* (1979)	Case-control, suicides from outpatients from Psychopathic Hospital, United States	15, nr, nr, 100% (only MDD)	Threats of suicide or previous attempts, nr, nr	144 depressed patients (non-suicidal death or still alive), nr, nr, not matched	100 (100–100)

Breier & Astrachan (1984)	Retrospective, suicides from Mental Health Center between 1970–1981, United States	20, 10%, 30.3 ± 8.2, 100% (only SCZ)	Suicidal threats, nr, 12 previous weeks		15 (0–30)
Shafii et al. 1985	Retrospective, adolescent suicides from Jefferson County Coroner between 1980–1983, United States	20, nr, nr, nr	Expression of wish to die, NOK, nr	17 friends of the deceased (alive), nr, nr, matched for age and gender	85 (69–100)
Brent et al. (1988)	Retrospective, adolescent suicide inpatients from psychiatric hospital in Pittsburgh between 1984–1986, United States	27, 22%, 18.0, mixed diagnoses (11% MDD, 44% bipolar spectrum)	Communication of suicidal intent, nr, nr		26 (9–42)
Rich et al. (1988)	Retrospective, suicides from San Diego county Coroner's Office between 1981–1983, United States	204, 30%, nr, mixed diagnoses (61% affective disorders; 5% SCZ, 75% alcohol related disorders)	Talk of suicide, nr, nr		36 (29–42)
Goh et al. (1989)	Retrospective, suicides from previous hospitalizations in mental health hospital between 1977–1985, UK	57, 40%, nr, 100%, mixed diagnoses (12% MDD, 27% SCZ, 10% BD)	Suicidal thoughts or verbal communication, nr, 2 previous weeks		23 (12–34)
Rihmer et al. (1990)	Retrospective, consecutive suicides from Budapest in 1985, Hungary	100, 45%, 52, 100% (53% MDD, 46% type II BD)	Communication of suicidal intent, family members, nr		18 (10–26)
Brent et al. (1993)	Retrspective, consecutive adolescent suicides from Pennsylvania between 1986–1990, United States	67, 15%, 17.1, mixed diagnoses (43% MDD)	Evidence of suicidal ideation with a plan, NOK, 1 week	67 community controls, 15%, 17.3, matched for age, gender, socio-economic status	76 (66–86)
Apter et al. (1993)	Retrospective, male suicides during military service in the mid-1980s, Israel	49, 0%, nr, 18%, mixed diagnoses (54% MDD, 7% SCZ, 5% BD)	Suicide note, nr, nr		33 (19–46)
Isometsa et al. (1994a)	Retrospective, suicides with MDD from Suicide Prevention Project between 1987–1988, Finland	71, 36.6%, 50, 100% (only MDD)	(a) Communication of suicidal intent, NOK and HCP, 12 previous weeks (b) Communication of suicidal intent, NOK, 12 previous weeks (c) Communication of suicidal intent, HCP, 12 previous weeks		a. 15 (7–24) b. 37 (25–48) c. 35 (24–45)
Isometsa et al. (1994b)	Retrospective, suicides with BD from Suicide Prevention Project between 1987–1988, Finland	31, 42%, 48.1, 100% (only BD)	(a) Verbal communication of intent to kill oneself in an explicit manner, nr, 12 previous weeks (b) Verbal communication of intent to kill oneself in an explicit manner, HCP and NOK, 12 previous weeks		a. 55 (37–72) b. 22.6 (8–37) c. 38.7 (22–56) d. 38.7 (22–56)

Table 1 (*cont.*)

Study	Design, setting, selection of participants, country	Subjects, % of females, mean age, % with psychiatric diagnoses	Study definition of suicidal communication, recipient, time-frame	Characteristics of controls: number, type, % of females, mean age, matching (where available)	Percentage of communicators, % (95% CI)
			(c) Verbal communication of intent to kill oneself in an explicit manner, NOK, 12 previous weeks		
			(d) Verbal communication of intent to kill oneself in an explicit manner, HCP, 12 previous weeks		
Isometsa *et al.* (1995)	Retrospective, Suicide Prevention Project between 1987–1988, Finland	570, 30%, 46.4, 69%	Suicidal threats or communication, HCP, 4 previous weeks		22 (19–26)
Isometsa *et al.* (1996)	Retrospective, Suicide Prevention Project between 1987–1988, Finland	66, 28%, nr, 100% (only PD)	(a) Verbal communication of intent to kill oneself in an explicit manner, NOK, nr		a. 42 (31–54)
			(b) Verbal communication of intent to kill oneself in an explicit manner, HCP, nr		b. 20 (10–29)
Foster *et al.* (1997)	Retrospective, suicides from coroner's office reported between 1992–1993, Ireland	118, 21.2%, nr, 86%, mixed diagnoses (32% MDD, 10% SCZ, 4% BD)	Verbal and written unequivocal communication of intent to commit suicide, nr, 48 previous weeks		36 (27–44)
Heila *et al.* (1998)	Retrospective, suicides with SCZ from Suicide Prevention Project between 1987–1988, Finland	(a) 73, 33%, 38, 100% (only SCZ)	(a) Suicidal threats, HCP, 12 previous weeks		(a) 42 (31–54)
		(b) 68, 33%, 38, 100% (only SCZ)	(b) Suicidal threats, NOK, 12 previous weeks		(b) 40 (28–51)
Marttunen *et al.* (1998)	Retrospective, adolescent suicides from Suicide Prevention Project between 1987–1988, Finland	92, 0%, 19, 91%	(a) Suicidal talks, HCP and NOK, previous week		(a) 60 (50–70)
			(b) Suicidal talks, HCP, 24 previous hours		(b) 5 (0.8–1)
Pirkola *et al.* (1999)	Retrospective, suicides with SD from Suicide Prevention Project between 1987–1988, Finland	117, 41,9%, 44, nr (26% MDD, 11% SCZ)	Suicidal threats or communication, HCP, 4 previous weeks		71,8 (63–79)
Harwood *et al.* (2000)	Retrospective, suicides from Coroner's office, UK	195, 32.3%, 72.2, 51%, mixed diagnoses (44% MDD)	Suicidal threat or others types of verbal communication, nr, 48 weeks previous		49 (42–56)

Lindqvist & Gustafsson (2002)	Retrospective, suicides autopsied between 1983–1985 from Institute of Forensic Medicine, Sweden	19, 15%, 43.5, nr	(a) Verbal suicide communication, nr, nr (b) Written note, nr, nr (c) Verbal or written communication of suicidal threats, nr, nr		(a) 42 (19–64) (b) 21 (3–39) (c) 16 (0–32)
Hawton et al. (2004)	Retrospective, suicides among medical practitioners between 1991–1993, UK	38, 26%, nr, mixed diagnoses (47% MDD, 5% BD)	(a) Verbal suicidal communication, nr, nr (b) Suicide note, nr, nr		(a) 36 (19–52) (b) 66 (49–82)
Yim et al. (2004)	Retrospective, suicides after discharge from psychiatric hospital between 1996–1999 in Hong Kong	73, 43.8%, 38, mixed diagnoses (SCZ 64%, MDD 19%)	Direct or indirect communication of suicidal intent, NOK, nr		25 (15–35)
Hawton et al. (2005)	Retrospective, suicides by coproxamol ingestion from coroner's offices between 2000–2001, UK	123, 52%, nr, mixed diagnoses	(a) Unequivocal communication of intent, nr, nr (b) Suicide note, nr, nr		(a) 22 (14–29) (b) 49 (40–58)
Portzky et al. (2005, 2009)	Case-control, suicides aged 15–19 from Coroner's office, Belgium	19, 10.5%, 17.7, 64% mixed diagnoses	(a) Verbal and non verbal suicidal communication, NOK, nr (b) Only verbal communication	19 psychiatric inpatients with suicidal ideation or attempts, 10.5%, 17.7, matched for age and gender	(a) 79 (60–97) (b) 16 (0–32)
De Leo & Klieve (2007)	Retrospective study, suicides from Queensland Suicide Register between 1994 and 1998, Australia	135, 21.5%, 34.2, schizophrenia	Expressed suicidal intentions, nr, 48 previous weeks		77 (69–85)
Orbach et al. (2007)	Retrospective qualitative study on military suicides in the Israel army in the 1990s	67, 26.9%, 18–21 years, nr	Explicit, direct communication of suicide intent, NOK, HCP and soldiers; 3 weeks preceding suicide		37 (26–49)
Sveticic et al. (2012)	Retrospective, suicides from Suicide Register, Australia	7126, 21.1%, nr, mixed diagnoses	Suicidal threats or communication, nr, 48 previous weeks		13 (12–14)
Owen et al. (2012)	Retrospective qualitative study, confirmed suicides from Coroner's office who were not in contact with mental health services, London, Southwest England and South Wales	14, 14.3%, nr, nr	(a) Suicidal intent, threats or plans, NOK and HCP, previous year (b) Suicide note, nr, nr		(a) 36 (10–61) (b) 43 (17–69)
Zhou & Jia (2012)	Retrospective, suicides, nr, China	200, nr, nr, 32%, mixed diagnosis	Verbal and/or behavioral communication, nr, nr		51 (44–57)
McPhedran & De Leo (2013)	Retrospective, suicides from Queensland Suicide Register since 1990, Australia	3203 urban and rural living men, 0%, 43.4, 42%, mixed diagnoses	Expressed suicidal intentions, nr, 48 previous weeks		58 (56–60)

Table 1 (*cont.*)

Study	Design, setting, selection of participants, country	Subjects, % of females, mean age, % with psychiatric diagnoses	Study definition of suicidal communication, recipient, time-frame	Characteristics of controls: number, type, % of females, mean age, matching (where available)	Percentage of communicators, % (95% CI)
Giupponi *et al.* (2014)	Retrospective, suicides from South Tirol Register between 1997 and 2007, Italy	396, 24.3%, 52.7, mixed diagnoses (14% MDD, 10% BD, 6% psychoses)	Communication of suicidal intent, nr, nr		29 (25–34)

CI, Confidence interval; MDD, major depression; SCZ, schizophrenia; BD, bipolar disorder; SD, substance dependence; PD, personality disorder; NOK, next of kin; HCP, healthcare professional; PCP, primary-care physician; nr, not reported.

for the SCs (on average 24 weeks; range 1–52 weeks). The study population mean age was 40 years (range 17–72 years), and the percentage of females was 25% (range 0–52%).

Twenty-eight studies provided at least some data on the psychiatric diagnoses of the suicides, such as the percentage of suicides diagnosed with any psychiatric disorder (average proportion: 80%, range 18–100%). The vast majority of studies comprised samples with mixed diagnoses; 16 studies provided the proportion of patients suffering from major depression (mean 32%, range 0–100%), which was >70% in four cases, whereas three studies were entirely focused on patients with schizophrenia (Breier & Astrachan, 1984; Heila *et al.* 1998; De Leo & Klieve, 2007). One study examined patients with bipolar disorder (Isometsa *et al.* 1994*c*), one personality disorders (Isometsa *et al.* 1996) and one subjects with previous substance dependence (Pirkola *et al.* 1999).

Prevalence of SC among suicides

Overall, 4347 cases out of 14 601 suicides had communicated their suicidal intention before the act. The proportion of communicators ranged from 13.2% (942/7126; Sveticic *et al.* 2012) to 100% (15/15; Fowler *et al.* 1979).

In the meta-analysis (see Fig. 1), the overall proportion of suicidal communicators was 44.5% (95% CI 35.4–53.8). An extreme degree of between-study heterogeneity was observed (Q test $\chi^2 = 2914$, df = 35, $p < 0.001$, $I^2 = 98.8\%$). One study yielded an outlier value, and was therefore removed from further analyses (Fowler *et al.* 1979). However, the prevalence of communicators did not change substantially: 42.7% (95% CI 33.6–52.0, Q test $\chi^2 = 2866$, df = 34, $p < 0.001$, $I^2 = 98.8\%$).

Sources of heterogeneity

Using subgroup analyses and meta-regression, we examined whether factors related to the study methodology and to the composition of the sample were associated with the observed proportion of communicators (see Table 2).

In the meta-regression analyses, study publication year ($p = 0.41$) sample size ($p = 0.20$) and methodological quality ($p = 0.38$) were not significantly associated with the proportion of communicators.

Studies relying on information from chart reviews yielded a lower proportion of communicators than those using interviews of next of kin or using multiple sources of information (29.4 *v.* 51.5 and 46.7%, respectively), but this difference did not reach statistical significance. Concerning the modality of communication, when studies examined both verbal and written communication, the proportion of communicators was
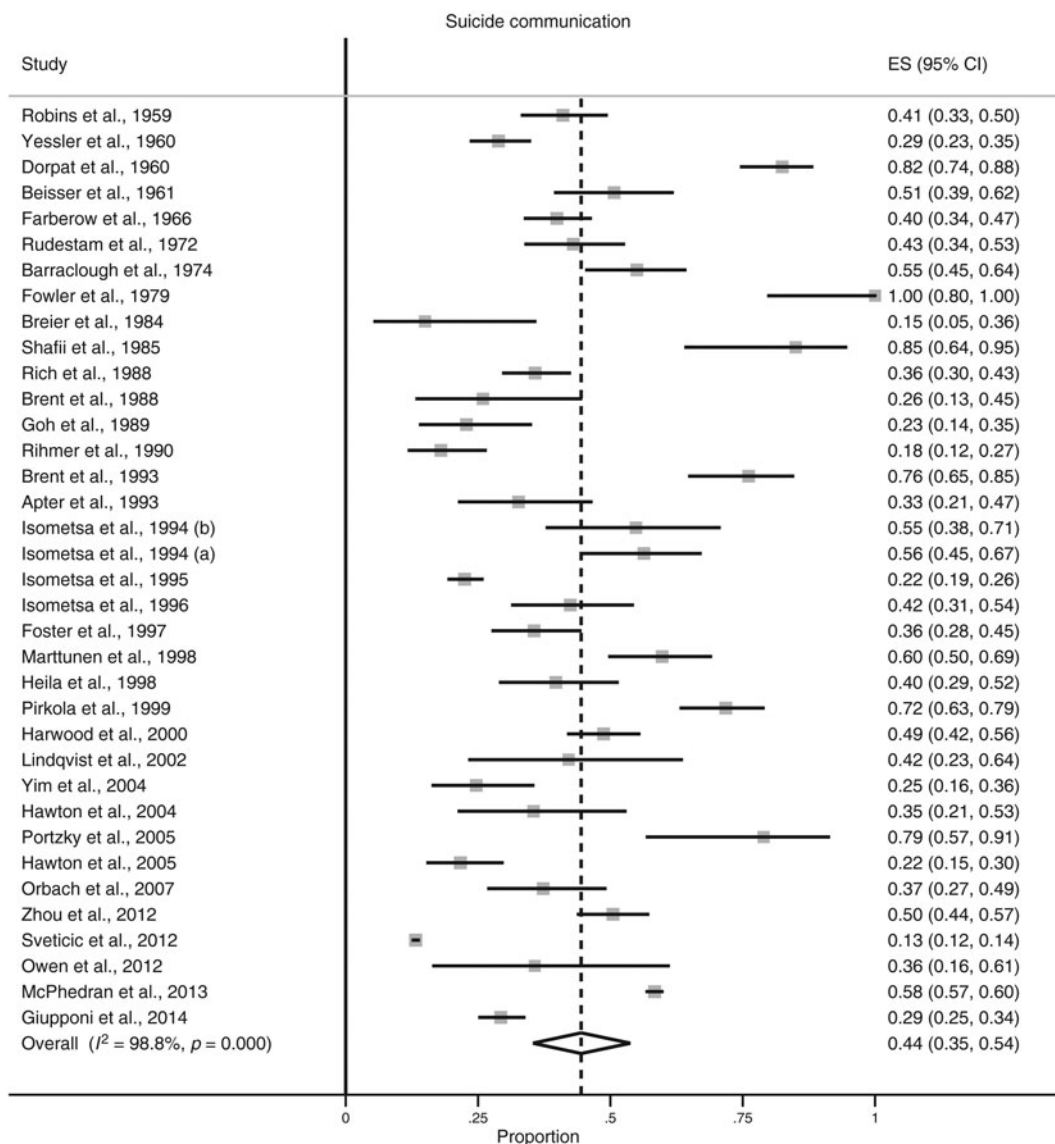
Fig. 1. Meta-analysis of the proportion of suicide communicators among suicides. ES, Effect size; CI, confidence interval.

Table 2. *Factors influencing the proportion of communicators in the meta-analysis*

1. Subgroup analyses (categorical moderators)

	Prevalence of communicators			Between-study heterogeneity		
	k	Proportion	95% CI	Q test	I^2	p
Total	35	42.7%	33.6–52.0	2866	99%	<0.001
Source of information						
Only next of kin	8	51.5%	36.0–67.0	91.7	92%	<0.001
Only chart review	6	29.4%	20.1–40.0	29.4	83%	<0.001
Multiple sources	19	46.7%	35.0–58.6	1005	98%	<0.001
Modality of communication						
Only verbal	21	40.5%	33.2–48.1	293	93%	<0.001
Only written	8	43.8%	36.6–51.2	18.6	62%	0.01

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Table 2 (*cont.*)

1. Subgroup analyses (categorical moderators)

	Prevalence of communicators			Between-study heterogeneity		
	k	Proportion	95% CI	Q test	I^2	p
Verbal and written	3	32.8%	23.8–42.5	3.4	41%	0.19
Includes behavior	3	61.1%	48.0–73.4	9.0	78%	0.01
Recipient						
Next of kin	11	43.0%	29.4–57.1	106	91%	0.001
Healthcare professional	8	28.7%	21.0–37.0	60.1	88%	<0.001
Both	13	47.9%	35.2–60.8	207	94%	<0.001
Diagnosis[a]						
Mixed	20	41.2%	32.2–50.5	467	96%	<0.001
Depression	4	38.5%	20.7–58.0	36.8	92%	<0.001
Schizophrenia	3	63.9%	36.4–87.4	25.4	92%	<0.001
Other	4	39.0%	14.8–66.4	61.0	95%	<0.001
Age groups						
Adolescents	6	59.9%	41.1–77.4	44.1	89%	<0.001
Adults	28	39.0%	29.2–49.3	2676	99%	<0.001
Elderly	1	48.7%	41.7–55.7	–	–	–

2. Univariate meta-regression analyses (continuous moderators)

	k	Beta	tau^2	p
Publication year	35	-17×10^{-4}	0.034	0.41
Sample size	35	-32×10^{-6}	0.033	0.20
Time of observation	20	26×10^{-5}	0.056	0.31
Sample mean age	30	-35×10^{-4}	0.042	0.23
Proportion of females	30	-23×10^{-5}	0.046	0.84
Methodological quality	35	23×10^{-3}	0.034	0.38

3. Multivariate meta-regression analysis

	Beta	S.E.	p
Modality of communication: only verbal	−0.16	0.06	0.02*
Study methodological quality	0.06	0.03	0.03*
Sample mean age	-2×10^{-3}	2×10^{-3}	0.44

The effect of moderating factors on the proportion of communicators was examined using: (1) subgroup analyses; (2) univariate meta-regression analyses and (3) a multivariate meta-regression. In the first panel, a meta-analysis is repeated for each category of the moderating factor. We report the proportion of communicators (with 95% Confidence Intervals) for the total number of studies (total, after exclusion of the outlier), then within each subgroup and the results of Q test. I^2 indicates the test proportion of between-study heterogeneity and p the statistical significance of the Q test within each subgroup. Comparing different subgroups, if the proportions of communicators have similar values and large overlaps of confidence intervals, this indicates that the moderator is unlikely to play a role in determining heterogeneity. The second panel reports the results of separate meta-regression analyses: the predictor is used as the independent variable and the proportion of communicators as the dependent variable. For each moderator, we report the values of the coefficient (beta), standard error (S.E.), estimate of between-study variance (tau^2) and the statistical significance of each moderator (p). The third panel reports the results of an exploratory meta-regression, obtained combining multiple moderators. Categorical moderators were dummy-coded. Proportion of between-study variance explained by the model (adjusted R^2): 14%. Model: $F_{3,36} = 3.00$, $k = 40$, $p = 0.04$; tau$^2 = 0.032$.

* $p < 0.05$
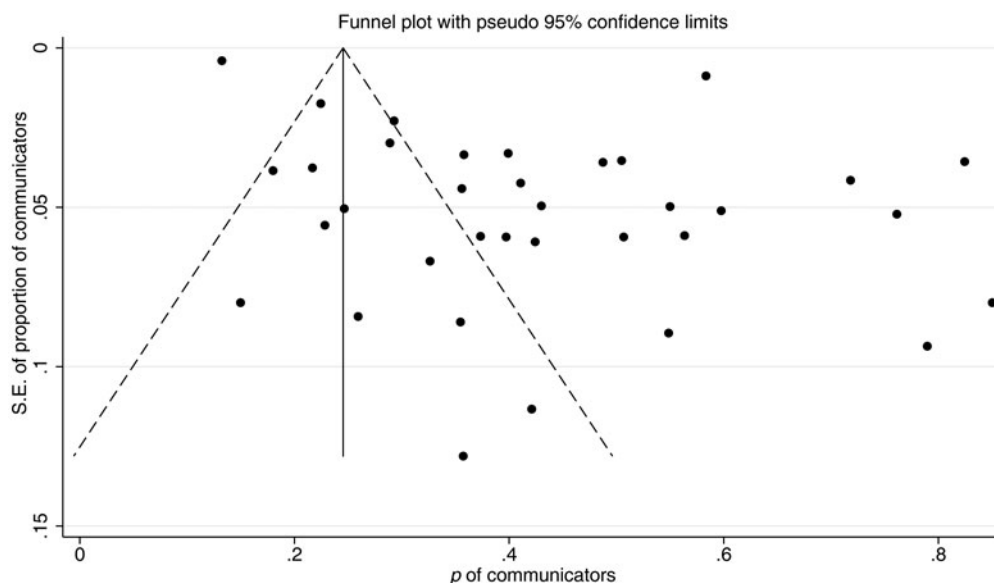
[a] More than 70% of the sample.

Fig. 2. Funnel plot for the meta-analysis. These figures show the correlation between the proportion of communicators and their standard error (S.E.) with pseudo 95% confidence limits.

lower (32.8%) compared with studies including only verbal (40.5%) or only written communications (43.8%). When suicide behaviours were also included in the definition of communications, the proportion of communicators was greater (61.1%). However, these differences were not statistically significant. Similarly, there was no significant difference in the proportion of communicators on the basis of who was the recipient. However, when only communication to healthcare professionals was considered, the prevalence was lower (28.7%). Last, the length of the time of observation was not significantly associated with the proportion of communicators ($p = 0.31$).

Participant characteristics, such as the proportion of females ($p = 0.84$) and mean age ($p = 0.23$) were not associated with the proportion of communicators, whereas studies examining adolescents yielded slightly higher values than those examining adults (59.9% v. 39.0%). Again, this difference did not reach statistical significance. When we subdivided the studies by diagnosis, those examining patients with schizophrenia yielded a slightly higher proportion of communicators than did those examining depressed patients (63.9% v. 38.5%), but this difference was not statistically significant. The high prevalence of communicators among schizophrenic patients was driven in particular by one large study, reporting a prevalence of 77% (De Leo & Klieve, 2007). All subgroup meta-analyses and meta-regression were characterized by high degrees of residual heterogeneity.

When the most significant moderators were entered in the exploratory multiple meta-regression, the proportion of communicators was negatively associated with recording only verbal communications ($B = -0.16$, $p = 0.02$) and, positively, with study methodological quality ($B = 0.05$, $p = 0.03$). The model explained 14% of the between-study variance in the outcome ($F = 3.00$, $p = 0.04$; $tau^2 = 0.032$).

Publication bias

By inspection of the funnel plot asymmetry and conducting Egger's test ($t = 3.17$, $p = 0.003$) it was evident that the available studies suffered a significant degree of publication bias (see Fig. 2).

Case-control studies

We pooled the six studies comparing the proportion of communicators in suicides and psychiatric controls (Yessler *et al.* 1960; Beisser & Blanchette, 1961; Farberow *et al.* 1966; Shafii *et al.* 1985; Fowler *et al.* 1986; Portzky *et al.* 2009). The pooled OR was 4.66 (95% CI 3.00–7.25), characterized by a high degree of heterogeneity (Q test $\chi^2 = 55.9$, df = 5, $p < 0.001$, $I^2 = 91.1\%$) (see Fig. 3). Thus, those who had made a communication of their suicidal intention had a 4-fold higher odds of being suicides than those not making SCs. Of note, four of these studies examined adult samples and yielded a slightly higher effect size (OR 4.99, 95% CI 3.13–7.96, Q test $\chi^2 = 30.8$, df = 3, $p < 0.001$, $I^2 = 90.3\%$), while the studies examining adolescent samples yielded a non-significant effect (OR 1.83, 95% CI 0.57–5.89, Q test $\chi^2 = 21.7$, df = 1, $p < 0.001$, $I^2 = 95.4\%$).

The same pool of studies was examined with a meta-analysis of diagnostic accuracy: SC was not associated with a significant diagnostic accuracy for suicide
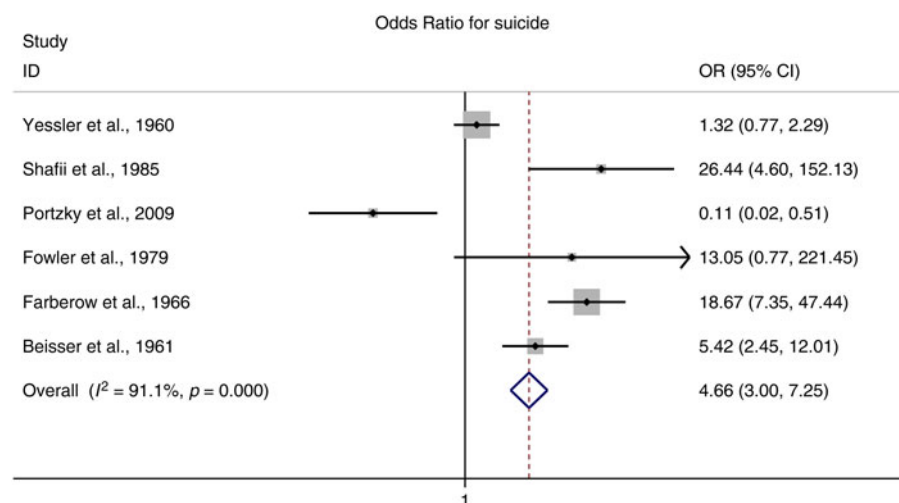
Fig. 3. Meta-analysis of case-control studies: odds ratio (OR) of suicide according to suicide communication. CI, Confidence interval.

(specificity: 76%, 95% CI 47–92; sensitivity: 57%, 95% CI 23–85; PLR: 2.34, 95% CI 0.92–6.00; NLR: 0.57, 95% CI 0.26–1.26; DOR: 4.13, 95% CI 0.86–20.0). However, after the removal of studies conducted on adolescents, the diagnostic accuracy increased, displaying higher levels of specificity than sensitivity (specificity: 80%; 95% CI 45–95%; sensitivity: 58%, 95% CI 19–89%; PLR: 2.98; 95% CI 1.21–7.31; NLR: 0.52; 95% CI 0.23–1.19; DOR: 5.74, 95% CI 1.67–19.8).

Discussion

The present meta-analysis, the first on SCs, found that about half of suicides communicate their intentions prior to death. The estimates of the prevalence of SC were highly heterogeneous across different studies, and this seemed to depend, at least in part, on methodological factors. In particular, studies recording only verbal communications tended to detect lower rates of communication, while studies with higher methodological quality detected higher number of communicators. Based on few available case-control studies, it would appear that subjects who make SCs are associated with a 4-fold greater likelihood of being suicides, compared with non-communicators. As a marker of suicide, SC might have fair specificity but displays a low sensitivity.

Among the general population and some health professionals, an incorrect assumption is that those who talk about killing themselves rarely die by suicide. On the contrary, studies shows that a large proportion (about half) of people who die by suicide have given at least some kind of verbal clue or non-verbal warning of their intentions. In some cases, as many as two-thirds of completed suicides share their intentions before

dying by suicide (Dorpat & Ripley, 1960; Barraclough *et al.* 1974). Scholarly papers routinely cite three major psychological autopsy studies to support the notion that the communication of suicidal intention is present in the vast majority of completed suicides (Robins *et al.* 1959; Dorpat & Ripley, 1960; Barraclough *et al.* 1974). Our study found a somewhat lower figure for the communication of suicidal intentions. Comparisons of psychiatric patients and people with no mental disorders find substantial differences, with the former communicating more often than the latter.

Shneidman (1996) stated that the common interpersonal act in suicide is the communication of intention, and many individuals choosing to die by suicide consciously or unconsciously provide clues to their intention, signals of distress, mention of helplessness, or pleas for intervention. However, a recent study showed that such communication can often be indirect, ambiguous, humorous and euphemistic; listeners frequently found it difficult to judge the meaning and intention of utterances referring to suicide (Owen *et al.* 2012). Moreover, subtle or ambiguous forms of communication would fall below the threshold that studies usually set to define a clear 'communication' and, therefore, would go unrecorded. Hence, it is possible that any study adopting a systematic methodology and a rigorous definition of SC might underestimate the proportion of communicators.

Another important issue related to SC is the response that follows such an event. Our data shows that SC seems to have a good positive predictive value, at least among adults. Therefore it is critical that any explicit SC be followed by a referral to a mental health professional and the arrangement of an

adequate prevention plan. Rudestam ([1971](#)) investigated the response to SCs among 100 informants and found that 38% of them met it with scepticism and denial, 47% with concern and 25% with fright. There has been scarce research to date on the behavioural response of those who received the communication. How did they respond, and how often did they contact a mental health professional? For mental health professionals (whether in the mental health sector or in other settings), many factors can impair a proper consideration and response to communication of suicidal intentions, including incorrect and incomplete knowledge about suicide (including acceptance of some of the 'myths'), poorly conducted psychiatric evaluations (many people who kill themselves are not clinically depressed), excessive reliance on clinical intuition (subjective feelings) rather than evidence, failure to rely on family and community support for the suicidal individual, conflict between staff members, poor staff morale, a belief that suicide may be prevented just by impersonal means, and negative psychological reactions (countertransference) (Maltsberger & Buie, [1989](#)). Once more, it needs to be stressed how education about suicide should be a key element of continuing education for all health professionals.

At present, there is little evidence that that patient diagnosis has an impact on SC; however this analysis was based on relatively few studies, hence deserve to be interpreted cautiously. Moreover we did not find an association between patients' age and the prevalence of communicators; despite this, studies conducted on adolescents yielded slightly higher rates of communication than studies on adults. Notably, among adolescents, communication was not associated with an increased risk of suicide. This should prompt further research on communication in specific age groups and prevent generalizing findings from adult populations.

The results from this study need to be weighed against its limitations. Overall, these results should be taken with caution, as they are based on studies with several methodological limitations. Studies had generally low methodological quality. In particular, there was little consensus among investigators regarding the definition of communication of suicidal intention, and the studies differed, not only with respect to the criteria they used, but also in terms of how clearly the criteria were specified in the published reports. Some studies relied primarily on case histories, public records, and written reports, while other investigators interviewed relatives and acquaintances of the suicides. Each source of data alone is likely to underestimate the incidence of SC. Some of the studies used a psychological autopsy design. Pouliot & De Leo ([2006](#)) have noted that data derived from these studies should not be generalized without proper

understanding of the shortcomings of this methodology. In fact, reports and records may often be incomplete and inaccurate. The main weakness of interviews is that the acquaintances of the decedent may not be aware of SCs made to others or may have forgotten or suppressed evidence. Other major issues include to whom the communication is addressed (physicians/other personnel/next of kin) and within what time-frame. For example, in the seminal study by Robins *et al.* 93/134 suicides made prior communications of their intention (Robins *et al.* [1959](#)). Communications were most often made to spouses (60%), relatives (51%) and friends (35%). All of these factors might limit the degree of accuracy of the estimates of SC presented in the literature. Furthermore, the present authors chose to report those studies available in the literature that could support a broad analysis of the topic so as to offer a sound analysis of SCs prior of suicide. Despite careful and systematic search, we extrapolated those studies that presented original data; however, a number of additional papers could exist as source of information.

There are also limitations in the meta-analysis. Since a shared definition of SC has not yet been formulated, the inclusion of studies was based on the study definition as they were conceived by the individual authors as reported in each study. When attempting to study such a complex phenomenon, the operational definitions are likely to be heterogeneous and might be vulnerable to bias related to researchers' culture and experience. Also, a degree of subjective interpretation in the process of deciding to include a study is unavoidable. However, we applied clear criteria for the selection of studies and adopted a blind consensus method for inclusion in order to minimize this risk. Second, few studies have been published on this topic and were available for inclusion, especially those with a case-control design. The included studies were conducted over a period of many years and were characterized by great methodological diversity. As expected, this was reflected in high levels of between-study heterogeneity and wide confidence intervals for the estimates of prevalence. However, publication year did not seem to have an influence on the rates of communication suggesting the absence of secular trends. As is warranted in such cases, we applied a random effect model for the meta-analysis, but the presence of significant publication bias warrants caution in the interpretation of results nonetheless (Bulpitt, [1988](#); Evidence-Based Medicine Working, [1992](#)).

Conclusion

Approximately half of all suicides communicate their suicidal intentions prior to their suicide, and it is

important that mental health professionals are aware of this. Future studies on this issue should rely on multiple sources of information, define SCs more precisely, explore the content of communications in more depth, distinguish between non-verbal communication, verbal communication and suicidal behaviour, take into account the length of the observation period, and examine the role of age, psychiatric diagnoses and other clinical factors.

Supplementary material

The supplementary material for this article can be found at http://dx.doi.org/10.1017/S0033291716000696.

Declaration of Interest

None.

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