NZHTA REPORT
30 April 2002 (revised)

Suicide prevention topic 5:

What are the presenting complaints that should alert clinicians in emergency departments and tertiary mental health settings to the possibility of suicidal ideation/threat/attempt?

A critical appraisal of the literature

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THE CLEARING HOUSE FOR HEALTH OUTCOMES AND
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The staff of NZHTA developed this review. Critical appraisal and report preparation was undertaken by Ms Marita Broadstock (Researcher). Critical appraisal, protocol development, coordination and client liaison was provided by Mr Peter Day (Researcher). The literature search strategy was developed and undertaken by Mrs Susan Bidwell (Information Specialist). Retrieval of articles was managed by Ms Margaret Paterson (Information Specialist). Ms Philippa Monkman and Miss Becky Mogridge assisted with the retrieval of articles. Mrs Ally Reid (Secretary/Word Processor) provided document formatting. Internal peer review was provided by Dr Ray Kirk.

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LIST OF ACRONYMS AND ABBREVIATIONS

DSH	–	deliberate self harm
ED	–	Emergency Department
ICD	–	International Classification of Diseases (ICD) (9^{th} revision)
NZ	–	New Zealand
NZGG	–	New Zealand Guidelines Group
NZHTA	–	New Zealand Health Technology Assessment
RCT	–	randomised controlled trial
SIGN	–	Scottish Intercollegiate Guidelines Network

Methods

STUDY SELECTION

The development of this systematic review involved consultation between the NZHTA and the Suicide Working Group.

The topic was ambiguously worded with respect to whether presenting complaints were indicative of past or future suicidality. Following further contact with the NZGG the topic was clarified as referring to what health problems or incidents tend to bring patients to the emergency department (ED) or tertiary mental health clinic *following* suicidal ideation/threat/attempt. Of particular interest were presenting complaints which are not immediately suggestive of suicidality but may be suicide attempt methods, such as injury following head-on road collision or poisoning/overdose. Identifying such methods is aimed to help alert clinicians to the sorts of presenting complaints that may be associated with suicidality, including those less apparently so.

Study inclusion criteria

Publication type

Studies published between 1990 and February 2002 inclusive in the English language, including primary (original) research (published as full original reports) and secondary research (systematic reviews and meta-analyses) appearing in the published literature.

Population

Studies reporting on persons presenting following suicide attempt, expressing suicidal ideation, suicide threat. By suicide attempt we mean self-inflicted injury, and/or ingestion of drugs in excess of the recommended therapeutic dose, *with some intention of ending one's life* (Vajda and Steinbeck 2000).

Setting

Studies set in emergency departments (including "trauma centres" in the United States) or tertiary mental health services – i.e., sub-specialty mental health/psychiatric services and not general psychiatric clinics or hospitals.

Study design

Studies employing one of the following designs:

- systematic review or meta-analysis
- randomised controlled trial (RCT)
- controlled clinical trial (CCT)
- cohort study
- case-control study
- quasi experimental – e.g., before and after study
- descriptive study.

Methods of suicide attempt as a presenting complaint are commonly referred to by studies concerning suicide in their sample descriptions regardless of the purpose of the study. In order to narrow the selection of studies to those which are relevant and which are more likely to use appropriate methods for the review topic (particularly regarding sample size, selection and analysis), studies were only included where one of their aims was pertinent to the topic. Broadly speaking, this restricted selection to studies amongst whose aims was to measure common presenting complaints or the proportion of identified presenting complaints that are relevant to suicidality.

Sample size

Studies with samples of at least six participants.

Study exclusion criteria

The following criteria was used to **exclude** studies from appraisal:

- study population concerned:
  - primarily (50% or more) those with deliberate self harm in the *absence* of suicide intent
  - primarily (50% or more) those involved in assisted suicide
  - primarily (50% or more) presentations for self-mutilation
  - primarily (50% or more) children 12 years of age and under
  - primarily a population with underlying personality and affective disorders (and therefore, potential confounder of study results and treatments)
  - homicidal people
  - criminal offenders
- studies concerned with:
  - the treatment of people with drug/substance abuse or dependence, that is treatment directed to their addiction rather than any suicide attempt
  - suicide prevention interventions specifically for people with HIV/AIDS
  - school-based suicide prevention interventions
  - economic analysis
- studies involved small numbers of case presentations (five or fewer cases)
- studies did not clearly describe their methods and results, or had significant discrepancies
- citations which were letters to the editor, comments, editorials, abstract only, conference proceedings, book chapters
- studies where population is primarily a special population – e.g., with underlying personality or affective disorder.

SEARCH STRATEGY

A systematic method of literature searching and selection was employed in the preparation of this review.

Searches were limited to English language material published from 1990 onwards. The searches were completed on 22 February 2002 and were undertaken in two sections following additional refinement of the topic.

Principal sources of information

The following databases were searched using the search strategy outlined in **Appendix 1: Search strategies**.

Bibliographic databases

Medline
Embase
Cinahl
Psychinfo
Current Contents
Science/Social Science Citation Index
Index New Zealand

Review databases

Evidence-based medicine reviews
Cochrane Database of Systematic Reviews
DARE
NHS Economic Evaluation Database
Health Technology Assessment Database

The search was restricted to information from 1990 in English. Hand searching of journals, or contacting of authors for unpublished research was not undertaken during the search process.

Search terms used

Medline subject terms (MeSH terms): suicide, suicide-attempted, emergency medical services, emergency service-hospital, emergency services-psychiatric, risk factors, risk assessment, mental health services, comorbidity, violence, accidents.

Psychinfo subject terms: at risk populations, risk perception, risk analysis, premorbidity, attempted suicide, suicidal ideation, suicide, suicide prevention, motor traffic accidents.

Additional keywords: suicid*, suicide assessment, hidden adj3 suicid*, covert adj3 suicid*, recogni* adj3 suicid*, identif* adj3 suicid*, firearm*, accident*, emergenc*, comorbid*, co-morbid*, suicid* adj3 threat, suicid* adj risk, suicidal ideation, suicidality, autocide.

STUDY SELECTION

Studies were selected for appraisal using a two-stage process. Initially, the titles and abstracts (where available) identified from the search strategy, were scanned for eligibility. Selection of articles for retrieval was performed by the Researcher (MB) and additional articles for retrieval were identified by the external consultant (Dr Beautrais). Full text articles retrieved were appraised by the Researcher (MB) and (PD) if they fulfilled the study selection criteria outlined above.

EVIDENCE TABLES

Evidence tables for primary research studies present key information summaries employing column headings described below.

Summaries of appraisal results are shown in tabular form and include:

- study reference and country
- study design
- study quality grading and evidence level
- patient inclusion and exclusion criteria
- number of patients included in study sample
- study outcomes and p-values and/or 95% confidence intervals
- comments on the study and its internal validity issues arising from the study appraisal.

P-values unless otherwise stated relate to between group comparisons.

Systematic reviews and meta-analyses were described and critiqued in terms of their search strategy, inclusion/exclusion criteria, data synthesis and interpretation.

APPRAISAL AND LEVELS OF EVIDENCE

Validated criteria were used to appraise the studies selected for review. Articles were formally appraised and graded for study quality using the checklist schedules and hierarchy of evidence coding system developed by the Scottish Intercollegiate Guidelines Network (SIGN). The SIGN levels of evidence grading system is described below.

1++ High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.

1+ Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.

1 - Meta-analyses systematic reviews of RCTs, or RCTs with a high risk of bias.

2++ High quality systematic reviews of case-control or cohort studies.

High quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal.

2+ Well conducted case control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal.

2 - Case control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal.

3 Non-analytic studies – e.g., case reports, case series, cross-sectional descriptive studies looking at incidence/prevalence.

4 Expert opinion.

Key features of the selected studies (including the SIGN grading and study limitations) were documented in the evidence table. While this report is limited to evidence tables rather than a formal synthesis of data, a broad overview of results is presented.

STUDY LIMITATIONS

Systematic reviews are limited by the quality of the studies included in the review. There were two broad categories of studies relevant to this topic. The first focuses on determining the proportion of people presenting with a particular presenting complaint that have made a suicide attempt/ideation/threat. The second considers a sample (of general admissions or only those expressing suicidality) and identifies the presenting complaints which are common for those post-suicide attempt/ideation/threat. These studies tend to be cross-sectional descriptive papers, which provide details of methods of suicidal attempts/acts in patients presenting at ED/specialist psychiatric services. However, these studies tend to sample people with known suicidality and so are biased toward those where the method of injury is clearly indicative of a suicide attempt. Such methods would be less likely to identify covert suicide attempts – e.g., an apparently accidental car crash that was actually a suicide attempt. Studies which address covert suicide attempt methods specifically tend to be expert opinion/case study papers and these were excluded from the review.

Definitions of suicide attempt and deliberate self harm vary considerably within the literature, with overlapping populations. Part of the reason for this is that it is not always clear to the clinician and even to the patient themselves whether their motivation was a clear desire to end their life or whether they wanted a temporary escape from their life. While acknowledging the heterogeneity of patients within these two groups, studies were excluded that described their samples' actions as deliberate self harm and included clearly non-suicidal acts (e.g., "cries for help") as a significant proportion (>50%) of the study population and were without separate analysis/reporting of suicide attemptees. However,

given the uncertainty about suicidal intention, studies reporting on samples who had performed "suicide attempts" were included here, even though it is acknowledged that these which may have included suicidal acts where there was not a clear and unambiguous intention to end life.

This review has been limited by the restriction to English language studies. Restriction by language may result in study bias, but the direction of this bias cannot be determined. In addition, the review has been limited to the published academic literature, and has not appraised unpublished work. Restriction to the published literature is likely to lead to bias since the unpublished literature tends to consist of studies not identifying a significant result.

Papers published pre-1990 were not considered. The NZGG will need to assess whether the new evidence presented in this review is sufficient to alter any recommendations included in previous evidence-based guidelines.

The studies were initially selected by examining the abstracts of these articles. Therefore, it is possible that some studies were inappropriately excluded prior to examination of the full text article. The possibility of this is enhanced by the fact that most studies considered did not consider the review topic as their primary aim.

All studies included in this review were conducted outside New Zealand, and therefore, their generalisability to the New Zealand population and context may be limited, and needs to be considered.

Data extraction, critical appraisal and report preparation was performed by a single reviewer.

The review scope was developed with the assistance of NZGG staff.

This review was conducted over a limited timeframe (February – April 2002).

Individual study limitations are described in the comments column in **Table 1 (pages 8-14)**. For a detailed description of interventions and evaluation methods, and results used in the studies appraised, the reader is referred to the original papers cited.

Results

There were 628 studies identified by the search strategy. Thirty-five full-text articles were obtained (or requested but not available) after excluding studies from the search titles and abstracts. Of these, 24 full text articles did not fulfil the inclusion criteria and are presented in **Appendix 3**, with a brief description of their reason for exclusion. Papers were excluded for several reasons: providing Level 4 (expert opinion, narrative review) evidence only (n=7), sample involving deliberate self harm (data on suicidal attempts to end life not identified separately (n=4), sample involving mortality data only (n=2), not relevant to the research question (n=5), presenting method was suicide intent itself (n=2), abstract only (n=1), suicide attempt only suspected (n=1). A further one paper was not available in time to be included due to delays with interloan.

Overall, 11 articles were fully appraised and are included in this report (see **Appendix 2**). **Table 1 (pages 8-14)** contains all included, critically appraised papers. Within each assigned quality grade (all Grade 3), papers are presented in alphabetical order according to first author surname.

Table 1. Evidence from appraised articles regarding what are the presenting complaints that should alert clinicians in emergency departments and tertiary mental health settings to the possibility of suicidal ideation/threat/attempt?

Source Country	Study design Evidence Grading	Setting Sample	Measures	Results	Comments, methodological issues, study limitations
(Dennis et al. 1997) Leicester ,UK	Retrospective case series Grade 3	Emergency department at the Leicester General Hospital. N=854 patients with 934 episodes aged 16 to 90, mean age 30.5 years, 48% male. Inclusion criteria: All attendance at A&E with a discharge diagnosis of "self-inflicted injury" from April 1994 to March 1995 retrospectively identified from PAS (patient activity analysis) system. Exclusion criteria: None specified.	Audit assessment forms based on standards of service provision from the Royal College of Psychiatrists. DSH defined as "an intentional self-injury (non-fatal), or deliberate ingestion of more than a prescribed amount of medical substances, or the deliberate ingestion of substances never intended for human consumption".	Method of DSH in decreasing order N relates to number of episodes by method. N % Overdose 1081 86% Wrist cutting 95 8% Other DSH 56 4% Non-ingestibles 15 1% Carbon monoxide poisoning 7 0.5% Hanging 6 0.5% Other 1 - There were 934 episodes of DSH, 26% (241 episodes) involved more than one method, mostly overdoses involving more than one substance.	▪ study's main aim is an audit of the management of DSH at the emergency department ▪ the A&E doctor's psychosocial assessment of DSH identified suicidal intent in only 70% of 931 DSH episodes assessed. This should be borne in mind regarding the results ▪ overdose was the most common method, and involved 855 case episodes (91.5%), recent alcohol consumption was recorded in 378 episodes (40%) ▪ reliability and validity of audit assessment tools not reported, case notes retrospectively analysed in a standardized fashion.
(Grossman et al. 1999) Washington, USA	Retrospective case series Grade 3	Emergency department (Level 1 trauma centre) (and mortality data excluded here). N=69 nonfatal injuries, aged 11-19 years. Inclusion criteria: Youths aged 0-19 years presenting for medical treatment with self-inflicted/intentional or unintentional firearm injuries between 1993 and 1995. Exclusion criteria: Assaultive or homicidal injuries.	International Classification of Diseases (ICD) 9th revision, codes to include self-inflicted/intentional, unintentional, or undetermined intent firearm injuries.	Suicide related injuries = 13 (19%) Unintentional injuries = 55 (80%) Undetermined intent injuries = 1 (1%) Over half of suicide related deaths were caused by handguns.	▪ sample relatively small ▪ males only, limited age range ▪ study's main aim was to investigate gun ownership and relation to suicide and unintentional injury ▪ demographic information not available for nonfatal injuries group ▪ hospital's comprehensive catchment area and use of ICD coding means that likely to have comprehensively identified gun related injuries in the region ▪ reliability and validity of ICD-coding not reported although study not restricted to self-report and attendant biases ▪ as gun ownership is less common in NZ, use of guns as a means of suicide attempt is likely to be much higher for this study than would be evident for a NZ population.

Table 1. Evidence from appraised articles regarding what are the presenting complaints that should alert clinicians in emergency departments and tertiary mental health settings to the possibility of suicidal ideation/threat/attempt? *(continued)*

Source Country	Study design Evidence Grading	Setting Sample	Measures	Results	Comments, methodological issues, study limitations
(Li et al. 1997) USA	Retrospective case series Grade 3	Emergency department (trauma centres) from 74 hospitals in the USA, 1 in Puerto Rico, 1 in Canada. N=99 nonfatal injuries, aged 5-14 years. Inclusion criteria: Youths aged 5-14 years presenting for medical treatment with self-inflicted injuries with suicidal intent between Oct 1988 and April 1996. Exclusion criteria: Children with primary diagnosis of poisoning, burns, or near drowning.	Medically identified suicide acts measured by External cause of injury (E-coding) data recorded by medical staff as routine discharge data.	Method (in decreasing order) Hanging = 38 (38%), 82% male, 79% <14 yrs Gunshot = 28 (28%), 75% male, 39% <14 yrs Jumping = 21 (21%), 29% male, 48% <14 yrs Cutting/piercing = 6 (6%) Other unspecified = 6 (6%)	▪ though the sample is small, given rarity of paediatric suicide attempts the rates are likely to be reasonably accurate given comprehensive nature of data collection over many hospitals and states ▪ reliability and validity of E-coding not reported although study not restricted to self-report and attendant biases ▪ as gun ownership is less common in NZ, use of guns as a means of suicide attempt is likely to be higher for this study than would be evident for a NZ population ▪ major limitation in this study is the exclusion criteria of poisoning (a prime method of suicide attempt) ▪ 59% of the sample were aged 13 years and under and so it is possible that 50% or more of the sample were aged 12 years of under which would deem the study ineligible. Regardless of this is should be made clear that this study focuses on paediatric suicide and is not generaliseable to youth or adult populations.
(Neale 2000) Glasgow, Scotland	Cross-sectional study Grade 3	Emergency departments in 6 hospitals in 2 Scottish cities. N=77 drug-users; 69% male, mean age 27 years, all reporting history of drug use, 63% reported previous drug overdose. Inclusion criteria: Drug users experiencing non-fatal overdose identified by hospital staff who informed researcher by mobile phone. Exclusion criteria: Not specified.	Semi-structured, qualitative interviews measuring suicide intent of current overdose, analysed by Grounded theory (Glaser and Strauss, 1967).	38 (49%) of respondents reported suicidal thoughts or feelings before overdosing (had suicidal intent). Reasons for intentional overdosing derived inductively revealed that "motivations were not always driven by a clear and unambiguous desire to die".	▪ sample very small, exploratory study ▪ sample was a "convenience sample" as acknowledged that some eligible patients would not be referred to the study by busy ED staff. Likely that bias introduced, perhaps toward those more likely to be relevant to the study question, and therefore over-estimating suicide intent ▪ interviews generally conducted within few hours of presentation at hospital. However, drug use and treatment itself may have reduced accurate recall of pre-injury motivations ▪ qualitative, sensitive approach may have increased veracity of responding and reliability of results ▪ not clear that suicidal intent is distinct from deliberate self harm (DSH).

Table 1. Evidence from appraised articles regarding what are the presenting complaints that should alert clinicians in emergency departments and tertiary mental health settings to the possibility of suicidal ideation/threat/attempt? *(continued)*

Source Country	Study design Evidence Grading	Setting Sample	Measures	Results	Comments, methodological issues, study limitations
(Read 1997) Cape Province, South Africa	Retrospective case series Grade 3	Emergency department (psychiatric emergencies ward) from one hospital. N=294 patients met criteria but only N=100 included, aged 13 to 25, males 25%, ethnicity 10% white, 78% mixed race, 12% African. Inclusion criteria: Patient consent, patients aged between 13 and 25 having made suicide attempt serious enough to have contact with the psychiatric emergency unit over 5 month period. Exclusion criteria: Not specified.	Patient interview by one diagnostician usually on day after attempt using comprehensive psychosocial and history assessment form, Beck Depression Inventory (BDI), Hamilton and the Montgomery-Asberg depression scales, Beck Suicide Intent Scale, 28-factor General Health Questionnaire.	Method Attempt 1st 2nd 3rd Overdose 72% 52% 83% Slit wrists 22% 17% 3% Jumping 6% 10% 1% Hanging - 7% 3% Shooting - - 1% Self-poison - 7% 5% Reckless driving - 2% 1% Stabbing - 5% 1% Other - - 2%	▪ assessed level of suicidal intent was moderate to severe in 58% of patients and 64% of patients had no predetermined plan of suicide action. The level of impulsivity was 71% and level of disclosure before the event 22%. Only 8% of patients were intoxicated at time of attempt ▪ overdose most common method across all three attempts, with most common types being analgesics, hypnotics, antidepressants and benzodiazepines. Suicide self-poison methods included bleach, sunstroke pills, window cleaner, paraffin, snailbait, vitamin/iron tablets, nails/pins/needles ▪ reliability and validity of assessment tools not reported, only one interviewer carried out assessments, therefore, potential interviewer bias ▪ sample group consisted of individuals whose suicide attempt was serious enough to warrant referral to hospital, these individuals are likely to present with more serious psychiatric conditions.
(Simmons et al. 1999) Washington, USA	Retrospective chart review Grade 3	Emergency department N=145 charts reviewed, males 31%, and females 69%, aged 10-80 years. Inclusion criteria: Charts for patients presenting with suicidal behaviour between Jan – July 1996 inclusive. Exclusion criteria: None specified.	Adapted a 10 item questionnaire previously piloted over 18 months which included nature of injury/suicide method, and nature of intent items. Questionnaire appears to have been used by researchers in reviewing charts retrospectively, though no details as to how intent was determined.	Method (in decreasing order) Overdosing with pills = 103 (71%) Self laceration = 23 (16%). Method not specified for 19 cases (13%) which may have been other causes or missing data.	▪ sample relatively small ▪ suicidal behaviour not clearly defined and may have included deliberate self harm/self-mutilation attempts. DSH methods frequently include overdose and self-laceration methods ▪ suicidal patients were not directly questioned ▪ authors state "because of inconsistent documentation by various providers, not all information sought was available for all subjects". However, no details of how reliably information of method and particularly of suicidal intent was collected or what level of missing data was evident ▪ not clear whether possibility of some charts being missed, or excluded inappropriately (exclusion criteria not described).

Table 1. Evidence from appraised articles regarding what are the presenting complaints that should alert clinicians in emergency departments and tertiary mental health settings to the possibility of suicidal ideation/threat/attempt? *(continued)*

Source Country	Study design Evidence Grading	Setting Sample	Measures	Results	Comments, methodological issues, study limitations
(Spicer and Miller 2000) South Carolina, and Missouri, USA	Cross-sectional study Grade 3	Emergency departments from 2 states (plus data on hospitals from 6 states). N=6219 patients. Inclusion criteria: Non-fatal suicide attempts. Exclusion criteria: Thoughts of suicide, suicide attempts that do not result in injury requiring treatment or hospitalization. Excluded patients transferring from another hospital or in-patient dept to eliminate double counting.	Medically identified suicide acts measured by external cause of injury (E-coding) data recorded by medical staff as routine discharge data. Estimated number of attempts, not number of attempters. Average annual number of suicide attempts at EDs for whole sample (of 8 states) derived by applying ratio of ED-only cases per admission (from the 2 ED States) to 6 states without EDs. Results here of use of method as proportions of average annual number of suicide attempts.	Estimated proportion of average annual numbers of suicide attempts (n=40,900) using each attempt method (in decreasing order) ▪ drug/poison ingestion (68%) ▪ cut/pierce (23%) ▪ other* (5%) ▪ suffocation/hanging (2%) ▪ firearm (1%) ▪ poison by gas (1%) ▪ jump (1%) ▪ drowning/submersion (<1%) ** includes jumping/lying moving object, fire/scald, electrocution, motor vehicle crash, caustic substance, explosive device, unspecified means.*	▪ eight states do not represent USA (poorer and more Hispanics) demographically or geographically ▪ data may not generalise to New Zealand ▪ likely to be under-classification of injuries as suicidal/intentional due to under-reporting because of social stigma, guilt, possible loss of insurance cover. Some methods may be more open to being hidden as suicide acts than others, introducing bias ▪ reliability and validity of E-coding not determined or reported. Classification may vary between states though use of same categories would enhance reliability ▪ study strength was that it attempted to minimise bias by not relying solely on self report, and by using medically standardised methods of identification of cases ▪ "other" category is disparate and unhelpful ▪ study likely to be biased toward suicide attempts that are repeated (and non-fatal) as considered attempts rather than attemptees ▪ study lacked sufficient cases to derive age-specific rates crossed X method, sex, and ethnicity.

Table 1. Evidence from appraised articles regarding what are the presenting complaints that should alert clinicians in emergency departments and tertiary mental health settings to the possibility of suicidal ideation/threat/attempt? *(continued)*

Source Country	Study design Evidence Grading	Setting Sample	Measures	Results	Comments, methodological issues, study limitations
(Stern et al. 1991) Boston, USA	Prospective case series Grade 3	Emergency department or acute psychiatric service at one urban teaching hospital. N=177 patients presenting after overdose in the period October 1984 to January 1985; mean age 28 years and 47% male, 23% were 19 years or less, 85% Caucasian, 24% no insurance cover. Inclusion criteria: Patients presenting following accidental or intentional drug overdose. Exclusion criteria: Digitalis excess, accidental insulin reaction, inebriation with alcohol with no suicidal intent or ideation or concurrent drug overdose.	Review of medical records on day of admission, during and after hospital admission, review of toxicologic screening studies and follow-up telephone interview 4 weeks after ED visit.	Mental status of patients at presentation 53% alert 22% lethargic 15% agitated 7% stuporous 3% comatose Most commonly detected primary drugs 23% benzodiazepines 21% alcohol 20% non-narcotic analgesics 10% antidepressants 7% barbiturates	▪ limited generalisabilty of study results as only 66% of the 162 patients where intent was identified, expressed the desire to kill or harm themselves. Results not separately identified for these patients ▪ reliability and validity of case records for measuring suicidal intent unclear and not discussed ▪ of 165 patients having toxic screen analysis, 83% had positive results. Polydrug ingestions where identified in 46%, alcohol being most common agent, seen in 25% ▪ the toxicological screening tests may have reliability problems, also patient misinformation and patient intent issues with 33% of those with negative results requiring psychiatric admission.
(Tuzun et al. 2000) Istanbul, Turkey	Cross-sectional study Grade 3	Emergency departments at one urban teaching hospital. N=116 patients presenting after suicide attempts between Dec 1998 and May 1999; 39% male, aged between 15 and 65+, 54% between 15 and 24 years. Inclusion criteria: Patients presenting following non-fatal suicide attempts at ED. Exclusion criteria: Not specified.	Data on methods gathered from personal files and medical charts. (Additional data collected on a sub-sample interviewed not relevant to this topic).	Method (in decreasing order) Poisoning = 96 (83%), 32% male Jumping = 9 (8%), 100% male Gunshot = 7 (6%), 71% male Cutting = 4 (3%) , 0% male	▪ relatively small sample ▪ in Turkey, drugs are sold without prescriptions which makes poisoning a particularly accessible method, though rates are consistent with Australasian data (see below). A high rise urban setting and gun availability may also have contributed to high rates of those methods in this study compared to other research elsewhere ▪ reliability and validity of chart records for measuring suicidal intent unclear and not discussed ▪ possibility of missing data not discussed, and exclusion criteria not described ▪ study's main aim was to explore risk factors in a qualitative study of a sub-sample, hence small sample.

Table 1. Evidence from appraised articles regarding what are the presenting complaints that should alert clinicians in emergency departments and tertiary mental health settings to the possibility of suicidal ideation/threat/attempt? *(continued)*

Source Country	Study design Evidence Grading	Setting Sample	Measures	Results	Comments, methodological issues, study limitations
(Vajda and Steinbeck 2000) Melbourne, Australia	Retrospective chart review Grade 3	Emergency department at inner city tertiary hospital. N=112 patients presenting after attempted suicide between 1994 and 1996, mean age 18 years, male (32%). Inclusion criteria: Non-fatal suicide attempts, aged between 23 and 20 years. Exclusion criteria: Death soon after admission (n=1), missing file (n=1), patient refusing psychiatric assessment (n=1).	ICD codes routinely applied during "comprehensive psychosocial and psychiatric assessment" by the on-call psychiatric registrar. Classification of suicide attempt may be deemed even if patient may have been ambivalent about, or denied their intention of suicide.	Method (in decreasing order) ▪ drug overdose/poisoning (87%) ▪ cut/pierce (9%) ▪ jump (2%) ▪ combination poisoning/cutting (1%) ▪ firearm (1%)	▪ relatively small sample ▪ data from Australia may be more relevant to NZ than other countries ▪ reliability and validity of ICD-coding not reported although study not restricted to self-report and attendant biases ▪ study's main aim was to predict repeat suicide, hence small sample size.

Table 1. Evidence from appraised articles regarding what are the presenting complaints that should alert clinicians in emergency departments and tertiary mental health settings to the possibility of suicidal ideation/threat/attempt? *(continued)*

Source Country	Study design Evidence Grading	Setting Sample	Measures	Results	Comments, methodological issues, study limitations
(Wislar et al. 1998) Illinois, USA	Retrospective chart review Grade 3	Emergency department from one hospital servicing five rural counties. N=122 youth presenting after suicide related events during 1994 (139 visits), mean age 15 years, range 6 to 19 years, 40% male, 86% Caucasian, 14% black. Inclusion criteria: All ED visits by children and adolescents during calendar year 1994 that included an emergency mental health assessment (N=266). Exclusion criteria: None specified.	Retrieval of chart information from ED medical records and outpatient unit assessments based on previous ED surveillance studies and a follow-up study of adolescent overdose attempts.	Suicide-related visits were 34 self-injury and 105 suicidal ideation/threat without injury visits. Aggressive behaviour in suicidal youth (22%) compared with non-suicidal (32%), ssd $p < 0.05$. Reasons for suicide-related visit (in decreasing order): (N=139 visits)* Poisoning by ingestion of drugs 15.8% Cutting 9.4% Other method 2.9% Hanging, strangulation, suffocation 1.4% Poisoning by ingestion of drugs 0.7% Crashing a vehicle 0.7% No injury: attempt with no injury 5% suicidal ideation 57.6% suicidal threats 20.9% ** Percents do not sum to 100 as it possible to have more than one injury or reason for visit.*	▪ suicide-related events were defined as "behaviour involving self-directed injuries (e.g., cutting, jumping, falling from height, single car accidents, drug overdose etc) or thoughts about self-injury or death (e.g., suicidal ideation or threats) ▪ degree of intent and data on actual attempts unknown ▪ data may not generalise to New Zealand, relatively small sample ▪ possible selection bias as no information on youth who did not receive a mental health assessment (95% of ED visits by youth in 1994) ▪ although previous studies are referenced for assessment tools, the actual reliability and validity of these is not discussed ▪ information from medical records deficient in previous suicidal history.

Appendix 1: Search strategies

Note: The Medline search was undertaken in two sections as the scope of the topic was further refined. Medline search 2 excluded abstracts identified by search 1.

MEDLINE (SEARCH 1)

1 risk factors/ (189633)
2 risk/ (65949)
3 risk assessment/ (16426)
4 or/1-3 (268103)
5 exp suicide/ (26647)
6 ((suicid$ adj3 threat) or (suicid$ adj3 risk) or suicidal ideation or suicidality).mp. (3837)
7 5 or 6 (27332)
8 emergency service hospital/ (18319)
9 emergency medical services/ (16589)
10 emergency services, psychiatric/ (1306)
11 or/8-10 (35026)
12 4 and 5 and 11 (69)
13 6 and 11 (89)
14 12 or 13 (111)
15 1 and 5 (2622)
16 limit 15 to review (403)
17 comorbidity/ (11439)
18 exp mental disorders/ (477961)
19 mental health services/ (12263)
20 violence/ (12127)
21 7 and 11 and 17 (11)
22 4 and 18 and 7 (1787)
23 7 and 19 (290)
24 20 and 7 and 4 (161)
25 (suicid$ and (co-morbid$ or comorbid$)).mp. (754)
26 limit 25 to review (153)
27 limit 22 to review (263)
28 21 or 23 or 24 or 26 or 27 (819)
29 14 or 16 (506)
30 28 or 29 (1082)
31 limit 30 to english (930)
32 limit 31 to yr=1990-2002 (706)
33 (letter or news).pt. (529082)
34 32 not 33 (679)

MEDLINE (SEARCH 2)

1 SUICIDE/ (17290)
2 suicide, attempted/ (7532)
3 (suicidal$ or suicidal ideation or (suicid$ adj3 threat$)).mp. (6451)
4 suicide.ti. (10455)
5 or/1-4 (26378)
6 emergency service, hospital/ (16362)
7 (emergency department or emergency room).mp. (15076)
8 emergency services, psychiatric/ (1187)
9 emergency medical services/ (14030)
10 or/6-9 (38284)
11 5 and 10 (645)
12 limit 11 to yr=1990-2002 (352)

13 limit 12 to english (302)
14 ((method or means) and suicid$).mp. (2378)
15 (accident$ and suicid$).mp. (2393)
16 (firearm$ and suicid$).mp. (564)
17 or/14-16 (4946)
18 emergenc$.mp. (105896)
19 17 and 18 (298)
20 limit 19 to yr=1990-2002 (210)
21 (recogni$ adj5 suicid$).mp. (196)
22 limit 21 to yr=1990-2002 (129)
23 20 or 22 (337)
24 limit 23 to english (270)
25 13 or 24 (485)
26 (letter or news).pt. (512914)
27 from 22 keep (selected references)

EMBASE

1 risk/ or risk factors/ or risk assessment/ (143438)
2 high risk patient/ or high risk population/ (25495)
3 1 or 2 (162668)
4 suicide/ or attempted suicide/ (10877)
5 ((suicid$ adj3 threat) or (suicid$ adj3 risk) or suicidal ideation or suicidality).mp. (2858)
6 4 or 5 (11804)
7 emergency health service/ (4126)
8 emergency medicine/ (6446)
9 emergency treatment/ (3892)
10 emergency/ (2619)
11 or/7-10 (16394)
12 3 and 6 and 11 (37)
13 3 and 6 (2051)
14 limit 13 to review (279)
15 5 and 11 (55)
16 12 or 14 or 15 (344)
17 COMORBIDITY/ (10046)
18 exp Mental Disease/ (316162)
19 FAMILY VIOLENCE/ or VIOLENCE/ (7620)
20 Mental Health Service/ (4662)
21 17 and 6 and 11 (5)
22 3 and 6 and 18 (2039)
23 limit 22 to review (278)
24 6 and 20 (191)
25 19 and 6 and 3 (150)
26 (suicid$ and (co-morbid$ or comorbid$)).mp. (644)
27 limit 26 to review (99)
28 21 or 23 or 24 or 25 or 27 (663)
29 16 or 28 (716)
30 limit 29 to english (655)
31 limit 30 to yr=1990-2002 (652)
32 letter.pt. (218008)
33 31 not 32 (631)
34 from 33 keep (selected references)
35 from 34 keep 1-63 (63)
36 from 33 keep 301-626 (326)
37 (suicid$ adj3 covert$).mp. (5)
38 (suicid$ adj3 hidden).mp. (9)
39 (recogni$ adj3 suicid$).mp. (92)
40 (identif$ and (suicid$ adj3 attempt$)).mp. (426)
41 traffic accident/ (7501)

42 attempted suicide/ (3528)
43 41 and 42 (19)
44 37 or 38 or 39 or 43 (125)
45 11 and 40 (14)
46 44 or 45 (138)
47 limit 46 to english (121)
48 limit 47 to yr=1990-2002 (112)
49 from 48 keep (selected references)

CINAHL

1 risk factors/ (14474)
2 risk assessment/ (2292)
3 1 or 2 (16364)
4 exp SUICIDE/ (2674)
5 ((suicid$ adj3 threat) or (suicid$ adj3 risk) or suicidal ideation or suicidality).mp. (493)
6 4 or 5 (2741)
7 Emergency Service/ (3595)
8 emergency nursing/ (3450)
9 Emergency Medical Services/ (4165)
10 emergency care/ (4581)
11 psychiatric emergencies/ (207)
12 or/7-11 (14441)
13 3 and 6 and 12 (15)
14 3 and 6 (308)
15 limit 14 to review (26)
16 13 or 15 (39)
17 limit 16 to yr=1990-2002 (39)
18 from 17 keep (selected references)
19 from 17 keep (further selected references)
20 comorbidity/ (1304)
21 exp mental disorders/ (35986)
22 Mental Health Services/ (2051)
23 DOMESTIC VIOLENCE/ or VIOLENCE/ (3306)
24 6 and 12 and 20 (1)
25 3 and 6 and 21 (122)
26 6 and 22 (40)
27 23 and 3 and 6 (15)
28 (suicid$ and (comorbid$ or co-morbid$)).mp. (37)
29 or/24-28 (202)
30 from 29 keep (selected references)
31 (suicid$ adj3 hidden).mp. (1)
32 (suicid$ adj3 covert).mp. (2)
33 (recogni$ adj3 suicid$).mp. (28)
34 (identif$ and (suicid$ adj3 attempt$)).mp. (57)
35 Accidents, Traffic/ (1750)
36 exp accidents/ (7974)
37 35 or 36 (7974)
38 6 and 37 (43)
39 31 or 32 or 33 or 34 or 38 (129)
40 39 not 29 (119)
41 limit 40 to yr=1990-2002 (105)
42 from 41 keep (selected references)

CURRENT CONTENTS

1 ((suicid$ adj3 threat) or (suicid$ adj3 risk) or suicidal ideation or suicidality).mp. (2392)
2 suicid$.ti. (6380)
3 1 or 2 (7259)
4 ((risk adj3 factor$) or (risk adj3 assess$)).mp. or risk.ti. (120523)
5 3 and 4 (1115)
6 limit 5 to review articles (60)
7 (emergency or emergencies).mp. (26513)
8 5 and 7 (67)
9 (inpatient or (psychiatric adj3 service$) or mental health service or outpatient).mp. (22411)
10 5 and 9 (111)
11 (suicid$ and (co-morbid$ or cormorbid$)).mp. (50)
12 6 or 8 or 10 or 11 (267)
13 limit 12 to english (257)
14 (suicid$ adj3 (covert or hidden)).mp. (13)
15 (suicid$ adj3 (recogni$ or identif$)).mp. (302)
16 (accident$ and suicid$).mp. (628)
17 (15 or 16) and emergenc$.mp. (94)
18 14 or 17 (107)
19 limit 18 to english (93)
20 13 or 19
21 from 20 keep (selected references)

PSYCHINFO

1 at risk populations/ or premorbidity/ or risk factors/ or risk perception/ or risk analysis/ (18273)
2 attempted suicide/ or suicidal ideation/ or suicide/ or suicide prevention/ (12968)
3 (risk adj assess$).mp. (1283)
4 ((suicid$ adj3 threat) or (suicid$ adj3 risk) or suicidality).mp. (3600)
5 1 or 3 (18916)
6 2 or 4 (13646)
7 5 and 6 (1434)
8 limit 7 to english (1331)
9 limit 8 to yr=1990-2002 (1015)
10 limit 9 to "1300 literature review/research review" (77)
11 limit 9 to "1400 meta-analysis" (7)
12 10 or 11 (83)
13 emergenc$.mp. (12362)
14 2 or 4 (13646)
15 13 and 14 (442)
16 limit 15 to english (363)
17 limit 16 to yr=1990-2002 (231)
18 17 not 12 (229)
19 (covert adj3 suicid$).mp. (14)
20 (hidden adj3 suicid$).mp. (12)
21 (recogni$ adj3 suicid$).mp. (179)
22 or/19-21 (203)
23 limit 22 to yr=1990-2002 (95)
24 limit 23 to english (93)
25 from 24 keep (selected references)
26 (presenting and suicid$).mp. (246)
27 motor traffic accidents/ (1530)
28 6 and 27 (50)
29 26 or 28
30 limit 29 to yr=1990-2002
31 from 30 keep (selected references)

An additional search for the word “autocide” was done in the Medline, Embase, Current Contents, Cinahl, and Psychinfo databases.

OTHER DATABASES

Other databases without formal indexing were searched using free text drawn from the vocabulary of the strategies given above.

Appendix 2: Bibliography of included studies

INCLUDED, CRITICALLY APPRAISED STUDIES

Dennis, M., Beach, M., Evans, P. A., Winston, A., & Friedman, T. (1997). An examination of the accident and emergency management of deliberate self harm. *Journal of Accident & Emergency Medicine*, 14, 311-315.

Grossman, D. C., Reay, D. T., & Baker, S. A. (1999). Self-inflicted and unintentional firearm injuries among children and adolescents: The source of the firearm. *Archives of Pediatrics & Adolescent Medicine*, 153, 875-878.

Li, G., Ling, J., DiScala, C., Nordenholz, K., Sterling, S., & Baker, S. P. (1997). Characteristics and outcomes of self inflicted pediatric injuries: the role of method of suicide attempt. *Injury Prevention*, 3, 115-119.

Neale, J. (2000). Suicidal intent in non-fatal illicit drug overdose. *Addiction*, 95, 85-93.

Read, G. F. H. (1997). Trends in an adolescent and young adult parasuicide population presenting at a psychiatric emergency unit: A descriptive study. *International Journal of Adolescent Medicine & Health*, 9, 249-269.

Simmons, N. A., Peterson, J. W., & Hale, C. (1999). Surveillance of suicidal behavior in Kitsap County, Washington: A retrospective study. *Public Health Nursing*, 16, 337-340.

Spicer, R. S., & Miller, T. R. (2000). Suicide acts in 8 states: incidence and case fatality rates by demographics and method. *American Journal of Public Health*, 90, 1885-1891.

Stern, T. A., Gross, P. L., Pollack, M. H., Browne, B. J., & et al. (1991). Drug overdoses seen in the emergency department: Assessment, disposition, and follow-up. *Annals of Clinical Psychiatry*, 3, 223-231.

Tuzun, B., Polat, O., Vatansever, S., & Elmas, I. (2000). Questioning the psycho-socio-cultural factors that contribute to the cases of suicide attempts: an investigation. *Forensic Science International*, 113, 297-301.

Vajda, J., & Steinbeck, K. (2000). Factors associated with repeat suicide attempts among adolescents. *Australian & New Zealand Journal of Psychiatry*, 34, 437-445.

Wislar, J. S., Grossman, J., Kruesi, J. P., Fendrich, M., Franke, C., & Ignatowicz, N. (1998). Youth suicide-related visits in an emergency department serving rural counties - implications for means restriction. *Archives of Suicide Research*, 4, 75-87.

Appendix 3: Bibliography of excluded studies

EXCLUDED, RETRIEVED STUDIES

The following papers were reviewed but rejected for inclusion in the analysis (reasons for exclusion follow):

Anonymous (1992). Suicide by accident. *Emergency Medicine*, 24, 223-224.

Expert opinion article.

Anonymous (1998). Recognizing the patient at risk for suicide. *Emergency Medicine*, 30, 105-106.

Expert opinion article.

Beautrais, A. L. (2000). *Restricting access to means of suicide in New Zealand: a report prepared for the Ministry of Health on methods of suicide in New Zealand 1977-1996*. Wellington: Ministry of Health.

Sample exclusion (mortality data).

Birkhead, G. S., Galvin, V. G., Meehan, P. J., O'Carroll, P. W., & Mercy, J. A. (1993). The emergency department in surveillance of attempted suicide: findings and methodologic considerations. *Public Health Reports*, 108, 323-331.

Multiple methodological shortcomings which were highly likely to give biased results, including data on suicidal intent missing on 40-50% of questionnaires; sample likely to include deliberate self harm without suicidal intent to end life; lack of detail in results presented.

Bland, R. C., Newman, S. C., & Dyck, R. J. (1994). The epidemiology of parasuicide in Edmonton. *Canadian Journal of Psychiatry - Revue Canadienne de Psychiatrie*, 39, 391-396.

Sample involving para-suicide/deliberate self harm (without intent to end life).

Buzan, R. D., & Weissberg, M. P. (1992). Suicide: risk factors and therapeutic considerations in the emergency department. *Journal of Emergency Medicine*, 10, 335-343.

Expert opinion, narrative review.

Harwitz, D., & Ravizza, L. (2000). Suicide and depression. *Emergency Medicine Clinics of North America*, 18, 263-271.

Narrative review.

Hawley, C. J., James, D. V., Birkett, P. L., Baldwin, D. S., de Ruiter, M. J., & Priest, R. G. (1991). Suicidal ideation as a presenting complaint. Associated diagnoses and characteristics in a casualty population. *British Journal of Psychiatry*, 159, 232-238.

Presenting complaints were suicidal ideation itself.

Kliger, D. M., & Sporty, L. D. (1993). The pedestrian trauma patient. Perspectives from a psychiatric consultation service. *Psychosomatics*, 34, 222-228.

Sample exclusion (only 9 cases of suspected suicide defined as having previous suicide attempt or suspicious circumstances around injury).

Meade, D. M., Lynch, T. G., & Fuller, R. (1995). Adolescent suicide. *Emergency Medical Services*, 24, 27-35.

Narrative review.

Nadkarni, A., Parkin, A., Dogra, N., Stretch, D. D., & Evans, P. A. (2000). Characteristics of children and adolescents presenting to accident and emergency departments with deliberate self harm. *Journal of Accident & Emergency Medicine*, 17, 98-102.

Sample involving deliberate self harm (data on intent and suicidal attempts to end life not identified separately).

Norton, R., & Langley, J. (1997). The epidemiology of firearm injuries in New Zealand. *New Zealand Public Health Report*, 4, 17-19.

Sample exclusion (mortality data).

Rancans, E., Alka, I., Renberg, E. S., & Jacobsson, L. (2001). Suicide attempts and serious suicide threats in the city of Riga and resulting contacts with medical services. *Nordic Journal of Psychiatry*, 55, 279-286.

Not relevant to topic, methodological problems with various definitions of suicide attempts and intent insufficient reported information.

Repper, J. (1999). A review of the literature on the prevention of suicide through interventions in accident and emergency departments. *Journal of Clinical Nursing*, 8, 3-12.

This systematic review did not consider material relevant to topic.

Rich, J. A., & Singer, D. E. (1991). Cocaine-related symptoms in patients presenting to an urban emergency department. *Annals of Emergency Medicine*, 20, 616-621.

Patients presenting with cocaine use, presenting complaints were suicidal intent itself.

Rives, W. (1999). Emergency department assessment of suicidal patients. *Psychiatric Clinics of North America*, 22, 779-787.

Narrative review.

Roberts, G. L., Lawrence, J. M., O'Toole, B. I., & Raphael, B. (1997). Domestic violence in the Emergency Department: I. Two case-control studies of victims. *General Hospital Psychiatry*, 19, 5-11.

Not relevant to topic, domestic violence explored as a risk factor for suicide.

Rockett, I. R. H., Spirito, A., Fritz, G. K., Riggs, S., & Bond, A. (1991). Adolescent risk-takers: A trauma center study of suicide attempters and drivers. *International Journal of Social Psychiatry*, 37, 285-292.

Sample: suicide attempts defined as any deliberate self injury (data on those with genuine suicidal attempts not identified separately). Compared with data on victims of motor vehicle accidents who were explicitly not suicide attempts.

Schnyder, U., & Valach, L. (1997). Suicide attempters in a psychiatric emergency room population. *General Hospital Psychiatry*, 19, 119-129.

Not relevant to topic, aim of study to describe socio-demographic and consultation characteristics, and disposition decisions.

Shenassa, E., Catlin, S., & Buka, S. (2000). Gun availability, psychopathology, and risk of death from suicide attempt by gun. *Annals of Epidemiology*, 10, 11.

Abstract only.

Thompson, M. P., Kaslow, N. J., Kingree, J. B., Puett, R., Thompson, N. J., & Meadows, L. (1999). Partner abuse and posttraumatic stress disorder as risk factors for suicide attempts in a sample of low-income, inner-city women. *Journal of Traumatic Stress*, 12, 59-72.

Not relevant to topic, domestic violence explored as a risk factor for suicide.

Tueth, M. J. (1996). Predicting suicide in the emergency department. *American Journal of Emergency Medicine*, 14, 434-435.

Expert opinion, narrative review.

Weir, E., & Wallington, T. (2001). Suicide: the hidden epidemic. *CMAJ: Canadian Medical Association Journal*, 165, 634-636.

Expert opinion, narrative review.

Requested from Interloan but not available in time for inclusion in review:

Buzan, R.D. & Weissburg, M. P. (1992). Suicide: risk factors and prevention in medical practise. *Annual Review of Medicine*, 43, 37-39.