SELF-HARM IN OLDER ADULTS: A SYSTEMATIC REVIEW

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ABSTRACT

Background

Self-harm is a major public health concern. Increasing ageing populations and high risk of suicide in later life highlight the importance of identification of the particular characteristics of self-harm in older adults.

Aim

To systematically review characteristics of self-harm in older adults.

Methods

A comprehensive search for primary studies on self-harm in older adults was conducted in e-databases (Medline, AgeLine, CINAHL, PsycINFO, Web of Science) from their inception to February 2018. Using predefined criteria, articles were independently screened and assessed for methodological quality. Data were synthesised following a narrative approach. A Patient Advisory group advised on the design, conduct, and interpretation of findings.

Results

40 articles (*n*= 62,755 older adults) were included. Yearly self-harm rates were 19 to 65 per 100,000 people. Self-poisoning was the most commonly reported method. Comorbid physical problems were common. Increased risk repetition was reported amongst older adults with self-harm history, previous and current psychiatric treatment. Loss of control, increased loneliness and perceived burdensome ageing were reported self-harm motivations.

Conclusions

Self-harm in older adults has distinct characteristics that should be explored to improve management and care. Whilst risk of further self-harm and suicide is high in all age cohorts, risk of suicide is higher in older adults. Given the frequent contact with health services, an opportunity exists for detection and prevention of self-harm and suicide in this population. These results are limited to research in hospital-based settings and community-based studies are needed to fully understand self-harm amongst older adults.

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DECLARATION OF INTEREST: None

INTRODUCTION

Self-harm is a major public health concern worldwide, affecting not only those who self-harm but also family members and broader society through increased resource costs and productivity losses[1-3]. In this review, self-harm is defined by NICE guideline (CG16 and 133), as "any act of self-poisoning or self-injury carried out by a person, irrespective of motivation"[4]. This review does not include indirect self-harm (e.g. refusal to eat/drink, self-neglect), but rather focuses on direct self-harm as defined by NICE guideline (CG16 and 133)[4]. Self-harm and suicide are often linked to mental health problems; although self-harm and suicide can be seen as two distinct behaviours, self-harm is the major risk factor for suicide[5-6]. The world's population is ageing, and it is projected that 20% of the United Kingdom's (UK) population will be 65 years and older by 2020[7]. Rates of mental health conditions in later life are high (approximately 15% for adults aged 60 and over), and suicide rates are amongst the highest in older adults[8-9]. An understanding of the nature of self-harm in later life is essential in order to offer more effective and adequate healthcare provision to this population. Previous reviews in the area were conducted over a decade ago, had no clear eligibility criteria for included studies, and lacked quality appraisal of included studies[10-11]. Consequently, this systematic review aimed to provide an up-to-date and robust synthesis of the evidence by describing the characteristics (rates and risk factors) of older adults who self-harm, including clinical characteristics and lived experiences of self-harm.

METHODS

This review was conducted and reported in accordance with established systematic review guidance (Preferred Reporting Items for Systematic Reviews and Meta-Analyses, PRISMA). An a priori protocol was established and registered on PROSPERO, an international prospective register of systematic reviews (CRD42017057505).

Patient and Public Involvement and Engagement (PPIE)

The review was conducted in consultation with a PPIE group, including members of a local self-harm group. A previous PPIE group had been convened for a former study on self-harm in primary care[12] and some members of the group had noted the importance of considering self-harm in older adults, resulting in the present study being conducted. Members of the original group expressing an interest in and experience of self-harm in older adults were reconvened. With over a decade of experience involving patients and the public in health research[13], this study was supported by the PPIE team at the Research Institute for Primary Care and Health Sciences at Keele University. All PPIE members were aged 60 or older, and included older adults with self-harm history, carers, and support workers. The PPIE group was

consulted four times at different stages of the review, including refining the review question, specification of study eligibility criteria, outcomes, interpretation, and dissemination of findings. The group also contributed to developing the diagrammatic representation of the relationship between the various risk factors for self-harm amongst older people (see Results section: Influencing factors for self-harm, Figure 3). Findings based on lived experiences and current literature were discussed to reach consensus during PPIE meetings. These discussions were then considered when interpreting results from the review. Inclusion of the PPIE group was considered essential to ensure the study outcomes were mapped pragmatically to patient-centred outcomes.

Information sources, Study Selection & Review Process

A comprehensive search strategy was developed and used to search electronic databases (AgeLine, CINAHL, PsycINFO, MedLine, and Web of Science) for published studies on self-harm in older adults. Databases were searched from their inception until February 28, 2018 (see Appendix 1 for full search strategy). Additionally, hand-searching of reference lists of included studies was carried out to identify other potentially relevant grey literature. No language restrictions were applied.

Each identified study was evaluated against the following predetermined selection criteria:

1. Population: Studies examining older adult populations (aged 60 years or older) with presence of at least one self-harm episode as defined by NICE[4].
2. Exposure: Self-harm determined by clinical presentation, self-report, or reports from family, carers, or health practitioners regardless of suicidal or non-suicidal intent.
3. Outcomes: Studies reporting at least one clinical characteristic (e.g. self-harm rates, methods, and repetitions) and/or lived experiences (defined as an individual's representation and understanding of a particular experience[14]) with self-harm were included. Secondary outcomes such as specific diagnoses, mental illness and comorbidities, personal demographics such as marital status and living conditions were highlighted but were not required for inclusion in the review.
4. Study Designs & Settings: Observational studies with or without comparison groups from both clinical and community populations were included in the review.

Exclusion criteria were narrative reviews, letters, editorials, commentaries, and conference abstracts for which there is no data and data requests were not successful. Case reports/case series and non-English language studies for which interpretation could not be obtained were also excluded.

The study selection process was tested and piloted a priori by members of the review team (IT, KP, BB, OB, CCG). Subsequently, two reviewers (IT, KP) independently evaluated

the eligibility of all identified citations. At each stage of titles, abstracts and full-texts selection, disagreement regarding eligibility were resolved through discussion between reviewers (IT, KP) or by the independent vote of a third reviewer (BB, OB, or CCG).

Data were extracted by one reviewer (IT) using a pre-tested customised data extraction form, and independently checked for completion, accuracy and consistency by a second reviewer (KP or EM). Data were extracted on the clinical characteristics of self-harm and lived experiences of the study participants. More specifically, data were extracted regarding population characteristics (e.g. age, gender, marital status, living situation, and ethnicity), characteristics of self-harm including methods and rates, and outcomes (e.g. risk factors, clinical characteristics, contact with health services, motivations and stressors for self-harm). In instances of missing or incomplete quantitative data (i.e. lack of crude estimates or measures of variability for estimates of self-harm), additional information was requested through contacting primary study authors. A random effects meta-analysis of quantitative self-harm data was planned but could not be performed due to inherent heterogeneity, incomplete reporting of data from primary studies, and non-response to provision of required information from study authors. A descriptive analysis of quantitative data alongside a thematic analysis of qualitative data was performed and narratively synthesised together[15]. Thematic analysis[16] involved line by line coding, organisation of codes into descriptive themes, and generation of analytical themes. Thematic analysis was conducted by one reviewer (IT), and then checked for completion, accuracy and consistency of identified themes by a second reviewer (EM).

Summary of evidence per risk factors for self-harm repetition were completed. A modified version of the GRADE rating system (http://www.gradeworkinggroup.org/) was used to assess the overall quality of evidence considering: the strength of association for each risk factor, methodological quality/design of the studies, consistency, directedness, precision, size, and (where possible) dose-response gradient of the estimates of effects across the evidence base. Evidence was graded as very low, low, moderate, and high, similar to a GRADE rating system.

The methodological quality of included studies was independently appraised by pairs of reviewers (IT and KP or OB), using the National Institute of Health (NIH) quality assessment toolkits for quantitative studies[17] and the Critical Appraisal Skills Programme (CASP) checklist for qualitative studies[18]. Ratings of high, moderate, or poor were given to studies according to the criteria stated in the toolkits. Disagreements regarding methodological quality of the included studies was resolved through discussion until consensus was reached.

RESULTS

A total of 15,647 unique citations were identified, with eight additional studies included through reference checking. Four hundred and five abstracts were screened and a total of 56 full-text articles were assessed for inclusion. Forty studies (21 cross-sectional designs, 14 cohort studies, three qualitative studies and two case-control studies) met full eligibility criteria and were included. The flow of studies through the review process and reasons for exclusion are presented in Figure 1. The main characteristics of the included studies are summarised in Table 1.

INSERT FIGURE 1 HERE

Description of studies

Study Setting

Country of origin of the included studies were mainly English-speaking countries (*n*=21)[19-39]. However, 17 studies[40-56] were from non-English speaking countries, with a total of 16 different countries being represented. Two were multi-site studies across Europe, including both English and non-English speaking countries[57-58]. The majority of included studies were conducted in hospital-based settings (*n*=34), mostly situated in Emergency or Psychiatry Departments, with the exception of a plastic surgery department[19] and a poisons unit [34]. The remaining studies were conducted in other healthcare facilities (e.g. general hospitals, general practice, private clinics) (*n*=2)[57-58], community mental health services (*n*=2)[32, 50], a national surveillance system which includes both presentations from hospitals and primary care[47], and a national household survey[56]. Study length varied from eight months to 26 years. Follow-up was reported in all 14 cohort studies and varied from one to 23 years. All but one study[56] were based on self-harm presentations as determined by clinical presentation. The remaining study[56] was based on self-reported self-harm.

INSERT TABLE 1

Methodological Quality Assessment

Included studies were mostly of moderate (*n*=28) to high (*n*=10) methodological quality. Two studies were assessed as having poor quality. Figure 2a provides an overview of the quality assessment of studies, while Figure 2b highlights areas with higher or lower risk assessment. Risk assessment of studies was determined by grouping and rating the different methodological quality assessments of studies (e.g. confounding, loss to follow-up). High-risk ratings were given to studies where the quality assessment element was not reported at par

with standards, while low-risk when this was reported according to standards. Overall, participation rate, study population and research question, repeated exposure, timeframe, defined outcomes, and inclusion criteria were consistently assessed as having lower risk assessment across studies (≥80%), while loss to follow-up and measurement and adjustment of confounding variables were rated as having higher risk across studies (≥60%). Blinding of assessors and estimate of sample size were rated as having an unclear risk assessment across studies (≥60%).

INSERT FIGURE 2

Self-harm outcomes

Socio-demographic characteristics

All but three studies[30, 38, 55] (*n*=17,377) reported participants' gender. Of the studies that did, over half (57%; *n*=9,903) were women, and 43% (*n*=7,474) were men. Age of participants ranged from 60 to 112 years. Nine studies[24, 29, 35-36, 40, 47-48, 56-57] made a classification of individuals according to age range (*n*=51,174). Of those that did, 60% (*n*=31,072) of participants were aged 60 to 74 years old. Eleven studies [22, 28-29, 31-32, 40, 47, 53-56] classified participants according to ethnicity (*n*=6,573), with the majority of participants being White: 68.1% (*n*=4,479) and 13.3% (*n*=875) of other ethnicities (Black, Asian, Hispanic, or Maori). The remaining 18.6% (*n*=1,219) participants' ethnicity was unknown. 27 studies[20-22, 24-25, 27-28, 31-33, 35, 37, 40, 42-46, 48-51, 53-55, 57-58], reported the marital status of their participants (*n*=4,161). Of these, half were not married (51%, *n*=2,121); 38% (*n*=1,582) were married, and the marital status of the remaining 11% (*n*=461) was unknown. Over half of the studies[19-20, 23-28, 31, 35, 41, 44-46, 48, 50-51, 53, 55-58] (*n*=3,103) reported participants' living situation either living with family or in care (53.5%; *n*=1,658), followed by 40% (*n*=1,241) living alone at the time of the self-harm event. The remaining of participants' living situation was unknown (6.5%; *n*=203).

Self-harm rates

Overall, there were 63,266 self-harm presentations involving a total of 62,755 older adult participants. Of the 40 included studies, seven[23, 25, 27-29, 36, 57], presented overall estimates of self-harm rates per population (*n*=13,776). Yearly rates per 100,000 habitants varied from 19.3[29] to 65[23] as shown in Table 2.

INSERT TABLE 2

Self-harm methods

Of the 40 included studies, 34 (*n*=61,395*)* reported self-harm methods used by older adults*.* Table 1 includes a summary of the reported methods, with the majority of self-harm presentations being self-poisoning (86.1%; *n*=52,866) which included overdose of medication or ingestion of toxic substances. Self-injury through lacerations or burning of skin was 8.1% (*n*=5,002). Other methods included hanging, gunshots, car fumes, jumping in front of cars and immolation (5.6%; *n*=3,417). The remaining 0.2% (*n*=110) of the total participants used multiple methods to self-harm. Settings of the majority of studies reporting self-harm methods were hospital-based, with the exception of 4 studies[32, 47, 57-58] that also reported community-based data. However, similar trends regarding self-harm methods used were reported across the different study settings as reported in Table 1.

Associated clinical characteristics

Previous history of self-harm

Thirty studies[19-28, 31-32, 34-35, 37, 39-40, 42-46, 48-50, 53-55, 57-58] reported previous history of self-harm (*n*=6,033). Nearly one third of participants (29.4%; *n*=1,774) had a previous history of self-harm.

Previous psychiatric history

Thirty studies[19-29, 31-32, 35, 37, 39-46, 48, 51, 54-58] reported participants' previous psychiatric history (*n*=10,976), including alcohol and substance misuse, schizophrenia, and personality disorder, with 30% of participants having previous psychiatric history (*n*=3,279). Depression was the most commonly reported psychiatric diagnosis (*n*=7,893) across the 29 studies reporting depression. Specifically, 68.5% (*n*=5,414) of older adults who self-harmed had a diagnosis of depression.

Physical illness

Twenty-five studies [20-28, 31, 34-35, 37, 39-42, 45, 48-49, 51, 53-55, 58] reported comorbid physical illness among older adults who self-harm (*n*=4,211). Chronic physical illness (including cardiovascular disease, diabetes, musculoskeletal disorders, neurological problems) was common among participants, with 40% having a comorbid condition (*n*=1,666).

Medication

Seven studies[20, 22, 27-28, 31, 43, 49] reported medication use of participants (*n*=689). Nearly half of the participants from these studies (42.4%; *n*=292) were prescribed antidepressants at the moment of the self-harm episode.

Alcohol use

Eleven studies[20-21,23-24, 27, 29, 31, 33-34, 36, 47] reported alcohol use at the time of the self-harm episode (*n*=13,326). Of those studies that did, 16% (*n*=2,131) of participants presenting with self-harm had consumed alcohol at the time of the episode.

Self-harm repetition and completed suicide

Fourteen studies[21-28, 31, 37, 40, 49, 52, 58] reported self-harm repetition (*n*=3,065). The time measurement period varied vastly from one to 23 years and 17% (*n*=518) of the older adult population that self-harmed repeated this behaviour during the study period.

Those 16 studies[21, 23-28, 31, 33, 37, 39-41, 49, 52, 58] that reported death of participants following self-harm (*n*=3,883) reflected this variation in follow-up time: up to 17% (*n*=653) had died during the time of the studies. Not all of these studies specified causes of death, but in those which did (*n*=2,939), 3.3% (*n*=98) died by suicide[21, 23-26, 31, 37, 40-41, 49, 52, 58]. As summarised in Table 1, the studies reporting self-harm repetition and completed suicide were all based in hospital settings.

Contact with health services

Contact with different health services ranging from primary care to specialised care such as psychiatric services were reported among participants in some of the studies.

Primary Care

Three studies[20, 22, 45] (*n*=208) reported participants previous contact with primary care services prior to self-harm episodes with 28.9% (*n*=42) having seen their GP one week prior to self-harming, while 62% (*n*=98) had been in contact with primary care at least one month prior to the self-harm episode.

Psychiatric services

Twenty-nine studies[19-29, 31-32, 35, 37, 39-46, 48-49, 51, 54, 57-58] reported previous use of psychiatric services (*n*=5,054). Of these studies, 41.3% (*n*=2,086) of participants had previously attended services and/or received treatment prior to the self-harm episode. In contrast, only seven studies[20-23, 28, 31, 41] (*n*=2,493) reported participants receiving psychiatric treatment at the moment of the episode (28.2%; *n*=703).

Follow-up

Twenty-three studies[19-23, 25-28, 31, 33-36, 40-41, 44-45, 49, 51, 53-55] (*n*=8,398) reported 52.4% (*n*=4,403) of participants having received a psychiatric assessment immediately after the self-

harm episode. Across the studies, there was no further follow-up or indication whether this assessment led to any treatment or prevention of repeated self-harm.

Risk factors for self-harm repetition

Of the 40 included studies, nine[21, 23, 31, 35, 37, 49, 53, 55-56] calculated risk factors for self-harm repetition (*n*=2,646). Risk factors for self-harm repetition, summarised below are grouped according to socio-demographic, clinical, or other factors. Table 3 provides a summary of findings per group for the identified risk factors for self-harm repetition.

INSERT TABLE 3

Socio-demographic factors

Three studies estimated female gender to be a risk factor for self-harm repetition[21, 35, 49]. Not being married or partnered, living alone, and younger age (being 60-74 years old) were also found to be risk factors[23]. Additionally, not having a caregiver was also found to be a risk factor for self-harm repetition[56].

Clinical factors

Previous episode of self-harm was found to be a risk factor for self-harm repetition amongst older adults[23, 53]. Three studies[35, 37, 53] found that those with previous psychiatric history were also more likely to repeat self-harm. Four studies[37, 53, 55-56] estimated that people with a depression diagnosis were more likely to repeat self-harm. In this review, both previous and current psychiatric treatment was found to be a risk factor for self-harm repetition in three studies[23, 31, 37]. Finally, Tsoh and collaborators[53] also identified a diagnosis of arthritis as a risk factor for self-harm.

Other

Time was also found to be a determinant of self-harm repetition. Hawton and Harriss[21] found that older adults were most likely to repeat self-harm within 12 months of the first episode. Two studies found alcohol and drug use as a risk factor for self-harm repetition[23, 31]. Poorer function of self-care was also found to be a risk factor for self-harm repetition[53, 56].

Suicidal intention

Nine studies[20-22, 24, 28, 31-32, 35, 37] (*n*=972) reported suicidal intention with a total of 73.5% (*n*=714) of participants declaring suicidal intent. A variety of tools to assess suicidal intention were used, including interviewer's assessment, questionnaires such as the Beck suicidal intent score and C-CASA (Colombia Classification Algorithm of Suicide Assessment).

Motivations for self-harm

Eleven studies[20, 32, 34, 42, 49-51, 52, 54-55, 58] (*n*=551; less than 1% of the total participants) presented motivations for self-harm with broader explanations besides suicidal intent. The identified motivations emerged from both qualitative and quantitative studies and were based on self-reported motivations. Table 1 provides further detail of the identified motivations for self-harm which included relationship problems, physical and psychiatric illness, financial worries, regaining control, bereavement, isolation, helplessness, amongst others.

Qualitative Findings

Three qualitative studies[32, 50-51] (*n*=58) explored lived experiences of self-harm in older adults. Participants were similar with regards to socio-demographic characteristics. Country of origin and study settings were diverse, including psychiatric departments[51], local mental health services[32, 50], and older adults' community groups[50]. The focus of the qualitative studies was self-harm with suicidal intention exclusively, as all studies classified the act of self-harm as a suicide attempt. Three major themes were identified consequent to data analysis: loss of control contributing to the suicide attempt, increased loneliness and isolation, and ageing perceived as "burdensome" and affecting daily living. Table 1b illustrates the three major themes with direct quotes of participants from the included articles.

Loss of control contributing to the suicide attempt was a major theme mentioned in two studies[32, 51]. Loss of control due to both physical and mental health problems was described by participants as feeling overwhelmed, exhausted, and unable to continue living[51]. Loss of control was also perceived to be caused by mobility, social status and social support losses[32]. Once again, these losses led to feelings of helplessness where participants felt they no longer could continue living[32, 51]. The third qualitative study[50] identified deteriorating physical health and additional financial hardship as contributing to the suicidal attempt, worsened health, and wellbeing after self-harm episode or suicidal attempt. Despair and feelings of helplessness were also reported among participants that had attempted to end their lives[50].

Older adults mentioned increased feelings of loneliness and isolation, and these were major themes reported in the three qualitative studies[32, 50-51]. Feelings of loss described previously often resulted in participants feeling lonely and isolated [32, 51]. Participants also described having increased feelings of loneliness and isolation after the self-harm event where family members regarded the episode as shameful[50].

Participants described and perceived ageing as "burdensome", affecting all areas of daily living[32, 50]. Growing older was deemed to be a struggle and described with negative stereotypes of age and overall ageist views by older adults[32]. Regret and opportunities missed were also voiced by participants as intensifying the felt internal struggle which contributed to

the suicidal attempt[32]. Finally, participants also described feeling “too old”, leading them to their suicidal attempt in order to end the perceived “pain of old age”[50].

Influencing factors for self-harm in older adults

A thematic analysis of the influencing factors for self-harm in older adults is summarised in Figure 3, from the data presented in Table 1 from both quantitative and qualitative studies. Influencing factors range from internal (e.g. age, gender) to external factors (e.g. financial worries, low education), showing the complex relationship between these factors throughout the presented layers. Figure 3 highlights the potential risk for self-harm and shows that not one single factor independently influences self-harm in older adults. The themes are interconnected and layered across different individual, societal and healthcare settings and are represented diagrammatically in Figure 3.

INSERT FIGURE 3

Summary of findings

Overall, based on moderate quality evidence, previous history of self-harm, previous and current psychiatric treatment, and socio-demographic factors (single, living alone, and younger older adults aged 60-74 years old) were found to be significant risk factors for self-harm repetition (Table 3). Others, such as alcohol/drug use, female gender, psychiatric history and a diagnosis of musculoskeletal conditions such as arthritis were also associated with self-harm repetition but the overall quality of evidence for these factors ranged from low to very low.

DISCUSSION

This review presents current evidence regarding the characteristics of self-harm in older adults. Findings from this systematic review highlight self-harm in later life as having distinct characteristics to younger populations that should be explored to improve management and care for this age group. Despite sharing some characteristics of self-harm with younger populations[12, 59] (e.g. higher percentage in women, those with psychiatric history, and those with a previous episode(s) of self-harm), there is an increased risk of repetition and suicide in older adults. Previous history of self-harm, previous and current psychiatric treatment, and socio-demographic factors including being single, living alone, and being a younger older adult (60-74 years old) were more strongly associated with self-harm repetition.

Ranging from 19[29] to 65[23] yearly self-harm episodes per 100,000 people, findings from this review suggest prevalence rates to be lower compared to those reported in the literature

of younger populations[60-61]. However, the identified prevalence rates are to be taken with caution given that they are based on only seven studies which reported such findings, representing less than 5% of the total population of the systematic review. Furthermore, three of these studies[25, 27-28] have sample sizes of less than 200 participants, meaning their estimated rates must be taken with caution when calculating yearly self-harm rates per 100,000 people. There were also variant rates amongst the studies with only one study[29] identifying yearly rates of less than 20 per 100,000 people, with the rest of studies having nearly double the number of rates. We believe the variance in rates could be attributed to the study design setting[29] and different healthcare system which reported non-suicidal self-injury as opposed to other presentations of self-harm (e.g. attempted suicide) as reported in the other studies. Furthermore, even with variant and lower prevalence rates compared to younger populations, the impact these presentations have on individuals and health services are significant. Hospitalisation is longer in older adults who self-harm, and medical complications more likely, resulting in increased resource expenditure[29, 62]. Additionally, accuracy of self-harm estimates may not be completely representative given that the majority of the studies were based in hospital settings, and do not consider other presentations of self-harm which may not result in hospital attendance. With an increasingly ageing population, it is important to acknowledge this possible under-representation of self-harm presentations in older adults. Older adults who self-harm are at 67 times higher risk of suicide compared to younger populations[23]. This is congruent with worldwide epidemiological literature[63-64] which states suicide rates in later life are one of the highest globally.

The use of self-poisoning as a method is distinctive compared to other populations. One reason for this may be increased access to medication due to comorbid conditions that require prescribed medications. Nearly one third of the older adults were being prescribed antidepressants, giving them increased access to tablets for use in overdose. Data from the UK's Office for National Statistics highlights that over one third of self-poisoning deaths were due to antidepressant overdose in 2014[65-66].

Findings suggest that older adults who self-harm report feelings of isolation, loneliness and loss of control. Ageing and reaching later life were perceived as "burdensome" by older adults, which contributed to their self-harm episode. However, these experiences were limited to the context of self-harm with exclusive suicidal intent.

Considerations for interpretion of findings

There are three main factors to consider when interpreting findings from this review. First, different terminologies were used across studies to refer to acts of self-harm, reflecting the on-going heterogeneity of meanings inherent in the concept. For instance, definitions of self-harm in the literature included non-suicidal self-injury, deliberate self-harm, and attempted

suicide. Most of the included studies (*n*=29) classified self-harm as attempted suicide, i.e. as holding an exclusive suicidal intent, which is not always the case.

Second, the design and reporting of many of the included studies did not allow for a comprehensive capture and statistical synthesis of all predefined outcomes (e.g. risk factors for repeated self-harm) as set out by the review. For instance, over half of the included studies were descriptive observational studies (e.g. cross-sectional) which mainly report disease distribution among populations, to see whether a disease or condition is present or not[67]. This means that factors such as potential confounders and direction of causality between exposure and outcome could not always be determined for all the older adults population. However, the availability of analytic study designs (*n*=14 cohort studies) allowed more detailed exploration of the factors that influence self-harm in older adults. This is a strength for the evidence presented in this review as the inclusion of varied study designs ensured no evidence was lost and all available evidence is used to inform future research and practice.

Lastly, findings from this review are limited to data presented from included studies, which were predominantly based on self-harm presentations to hospital settings (*n*=34). For instance, the yearly self-harm rates presented in this review were mostly based on studies conducted in hospital settings, as opposed to population or community-based data. Not all self-harm episodes result in hospital presentations, therefore other self-harm episodes (e.g. in the community) may not have been comprehensively captured in this review. Therefore, appropriate consideration must be taken when interpreting results from this review to ensure not generalising to the wider population of older adults who self-harm.

Strengths and limitations of this review

This is the first review to systematically synthesise and appraise information regarding self-harm in older adults from both quantitative and qualitative studies. We believe reporting qualitative findings is of great importance to researchers and clinicians in the field, offering further explanation of self-harm in older adults. A further strength of this review is its emphasis on the inclusion of PPIE perspectives at all stages. An example of PPIE's collaboration in the review is the contribution to the development of Figure 3, which was achieved by discussing the identified stressors with the PPIE group. As the National Institute of Health Research (NIHR) national advisory group INVOLVE[68] states, this makes reviews more relevant and likely to be addressing the needs of patients.

The conclusions of this review should be viewed with caution due to two factors. The majority of included studies were similar with regard to study setting, reporting self-harm in hospital settings rather than in the community. In addition to study selection by two independent pair of reviewers, our search strategy was both sensitive and comprehensive, minimising the chances that any study might have been missed. Easier access to hospital

patient records in the older adults' population compared to conducting community-based research may explain the limited number of community-based studies. Another reason for the majority of evidence being predominantly from hospital settings may be the high level of stigma attached to self-harm[69], resulting in resistance to help-seeking and/or accessing primary care services. Given the different settings and other factors influencing recording of self-harm, findings from the review may not be generalisable to the whole population of older adults that self-harm, but mostly limited to a population of older adults attending hospital settings. Secondly, evidence presented in systematic reviews is dependent on the inherent methodological quality of included studies. Despite quality assessment of the studies across domains being mostly moderate and low risk of bias, the assessments highlighted certain areas of high-risk of bias, including confounding, blinding of assessors, and loss to follow-up. The low-quality rating of these areas is important to take into consideration when analysing the overall literature on self-harm in older adults.

Comparison with previous literature

Our review offers an update from previous reviews[10-11], and explores factors not covered in previous work, such as self-harm repetition and motivations for self-harm. In contrast to other studies[10-11], we examined findings specifically around older populations and included additional study designs, i.e. both quantitative and qualitative studies. Other conducted reviews[70] assessing qualitative evidence may not be directly comparable to the present review given their inclusion of both direct and indirect self-harm. We adhere to NICE guidelines definition of self-harm and view direct self-harm as distinct to indirect self-harm. This review therefore focused on direct self-harm only.

Furthermore, in younger populations, there is empirical evidence which provides an explanation for under-estimation of self-harm presentations[71]. According to the Iceberg Model[71], there are three layers of self-harm presentations, with only two of them being overt and on the tip and surface of the iceberg: fatal self-harm (i.e. suicides) and hospital or clinical presentations of self-harm. However, the last and largest layer of the Iceberg Model[71] is self-harm presentations in the community, which are mostly hidden given the lack of visibility. Considering the Iceberg Model of self-harm reported in younger populations, it is likely that findings from this review can be translated to the Iceberg Model in older populations, once again highlighting the hidden element of self-harm and most likely underestimation of self-harm as found in this review.

Implications for clinical practice

Our findings are in line with NICE guideline CG16[72] suggesting that identifying and managing older adults, whose self-harm is different to that in younger populations, is vital due

to the increased risk of repetition and suicide in this population. Clinicians have the potential to intervene and prevent self-harm in older adults as frequent contact with health services is reported. This includes potential opportunities to reduce self-harm repetition (with resource implications not least for post-episode treatment), suicide and premature death[73]. In particular, it is important that clinicians prescribing antidepressants (amongst other medication) are aware of the increased risk of self-harm in this population and ensure adequate follow-up is in place. The model developed through this review offers the potential to inform clinicians about the possible influencing factors for self-harm in older adults (Figure 3). However, it should not be used alone as other existing factors may have not been captured in the model given the limited hospital-based context of the majority of studies included in this review.

Future research

Further work is needed to identify appropriate resources and clear referral pathways to enable clinicians to support older people who self-harm. Future research may wish to focus on populations of older adults engaging in self-harm within community settings so there is a more comprehensive capture and understanding of self-harm in older adults. Given that most people who self-harm will be managed in primary care, there is a need for further research in primary care and community settings. Research exploring the different motivations for self-harm (suicidal or non-suicidal) would aid in clarifying the heterogeneous terminology used to refer to self-harm and further understand experiences of self-harm in later life. Lastly, data reporting standards within the psychiatric literature will benefit from careful consideration. Due to inadequate reporting/incomplete data provision across included studies, this review was unable to pool together findings in a meta-analysis. The agreement and compliance to high-reporting standards should be a priority for researchers and journals within the mental health field.

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IT conceptualised the idea for the review with guidance received from CCG, LD, BB, and OB. IT developed and carried out the searches. IT and KP screened titles, abstracts, full-texts. IT, OB, and KP assessed study quality. IT, KP, and EM extracted data from studies. IT carried out narrative synthesis with input from CCG, BB, LD, OB. IT drafted the manuscript and CCG, BB, EM, LD, OB, and KP provided feedback. All authors have read and approved the final manuscript.

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Figures and Tables

Figure 1 Study flow diagram

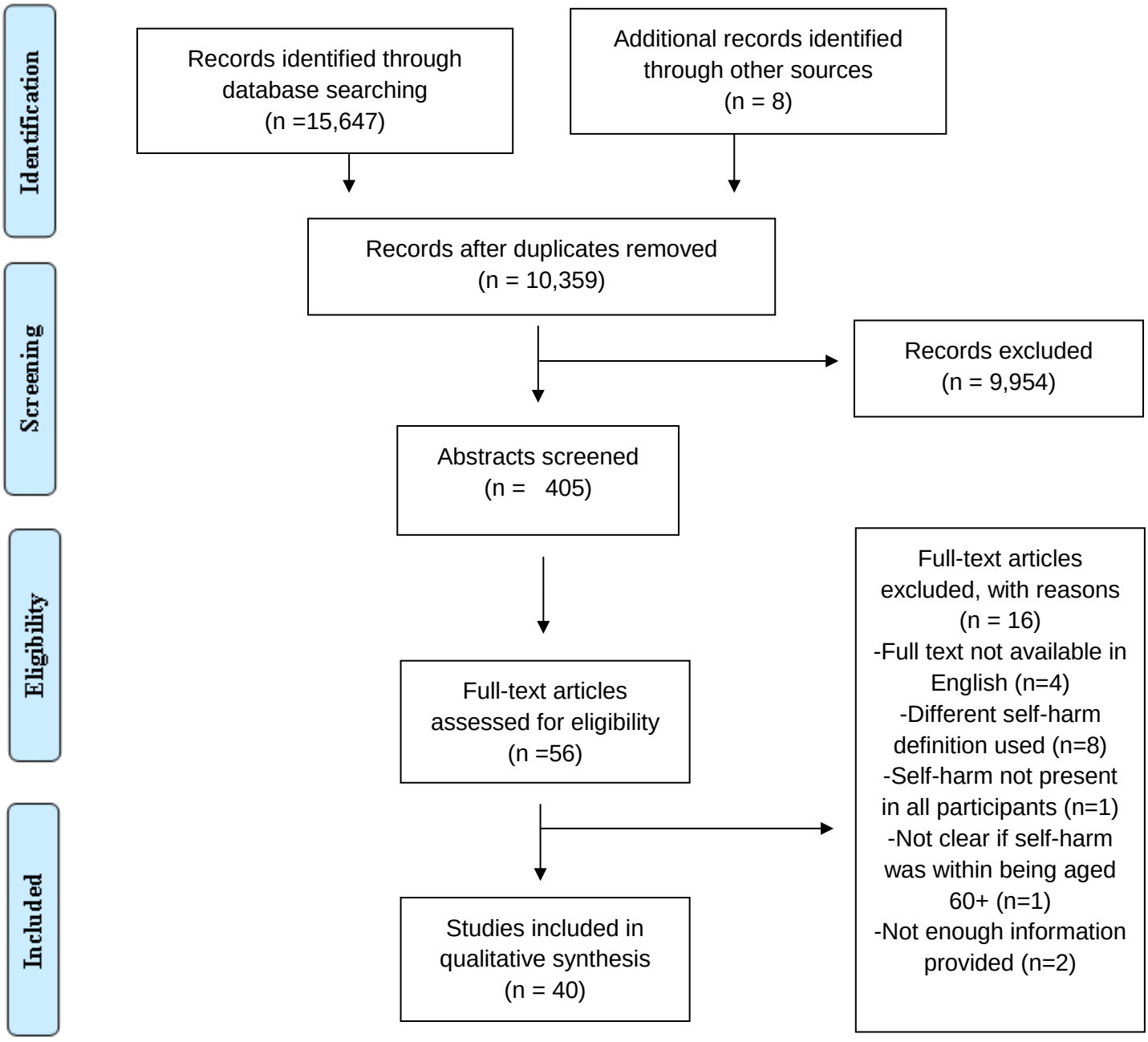


Figure 2

Figure 2a Methodological Quality Assessment within studies

	Study question	Population	Participation rate	Inclusion criteria	Sample size	Timeframe	Blinded assessors	Repeated exposure	Defined outcomes	Loss to follow-up	Confounding
Armond et al 2017	✓	✓	-	✓	-	-	?	-	✓	-	x
Briskman et al 2017	✓	✓	-	✓	-	-	x	-	✓	-	x
Carter et al 2014	✓	✓	-	✓	-	-	?	-	✓	-	x
Cheung et al 2017	✓	✓	?	✓	?	✓	?	✓	✓	✓	✓
Chiu et al 1996	✓	✓	✓	x	?	✓	x	✓	?	x	x
De Beer et al 2015	✓	✓	✓	✓	✓	✓	?	✓	✓	x	x
De Leo et al 2001	✓	✓	-	?	-	-	x	-	✓	-	x
De Leo et al 2002	✓	✓	✓	?	x	✓	x	✓	✓	x	x
Dennis et al 2007	✓	x	-	✓	-	-	?	-	✓	-	✓
Draper 1994	✓	✓	-	✓	-	-	x	-	x	-	x
Gavrielatos et al 2006	✓	✓	-	✓	-	-	x	-	✓	-	x
Gheshlaghi et al 2012	✓	✓	-	✓	-	-	?	-	✓	-	x
Hawton et al 2006	✓	✓	✓	✓	?	✓	✓	?	x	✓	✓
Hepple et al 1997	✓	✓	✓	✓	?	✓	x	✓	✓	x	x
Gokcelli et al 2017	✓	✓	-	✓	-	-	x	-	x	-	x
Kim et al 2011	✓	✓	-	✓	-	-	?	-	✓	-	x
Lawrence et al 2000	✓	✓	-	✓	-	-	?	-	✓	-	✓
Lamprecht et al 2005	✓	✓	✓	✓	?	✓	?	✓	✓	✓	✓
Lebret et al 2006	✓	✓	✓	✓	?	✓	x	✓	✓	✓	✓
Liu et al 2009	✓	✓	✓	✓	x	-	?	-	✓	-	✓
Logan et al 2007	✓	✓	-	✓	-	-	?	-	✓	-	x
Murphy et al 2012	✓	✓	✓	✓	?	✓	?	✓	✓	✓	✓
Nowers 1993	✓	✓	✓	✓	?	✓	?	✓	✓	✓	✓
Packer et al 2012	✓	✓	-	✓	-	-	?	-	✓	-	x
Pierce 1987	✓	✓	✓	✓	?	✓	x	✓	✓	x	x
Pierce 1996	✓	✓	✓	✓	?	✓	?	✓	✓	x	x
Pillans et al 2017	✓	✓	-	✓	-	-	?	-	✓	-	✓
Ruths et al 2005	✓	✓	✓	✓	?	✓	?	✓	✓	x	x
Shah 2009	✓	✓	-	✓	-	-	?	-	✓	-	x
Takahashi et al 1995	✓	✓	-	✓	-	-	x	-	x	-	x
Ticehurst et al 2002	✓	✓	-	✓	-	-	?	-	x	-	✓
Tsoh et al 2005	✓	✓	x	✓	x	-	?	-	✓	-	✓
Van Orden et al 2015	✓	✓	✓	✓	-	✓	?	✓	✓	✓	✓
Wiktorsson et al 2010	✓	✓	-	✓	-	-	?	-	x	-	✓
Wynne et al 1987	✓	✓	-	✓	-	-	?	-	✓	-	x
Yang et al 2001	✓	✓	?	✓	-	-	x	-	✓	-	x
Zhang et al 2016	✓	✓	✓	✓	-	-	✓	-	✓	-	✓

	Study question	Methodology	Research design	Recruitment	Data collection	Relationship researcher	Ethical considerations	Data analysis	Findings	Research value
Bonnewyn et al 2014	✓	✓	✓	✓	✓	?	✓	✓	✓	?
Crocker et al 2006	✓	✓	✓	✓	✓	?	✓	✓	✓	✓
Kim 2014	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓ **Reported**: element reported appropriately in study
x Not reported: element not mentioned in study
? Cannot determine: lack of clarity to assess if element was reported
- Not applicable: due to study design, element not applicable to report

Figure 2

Figure 2b Overall Quality assessment across studies

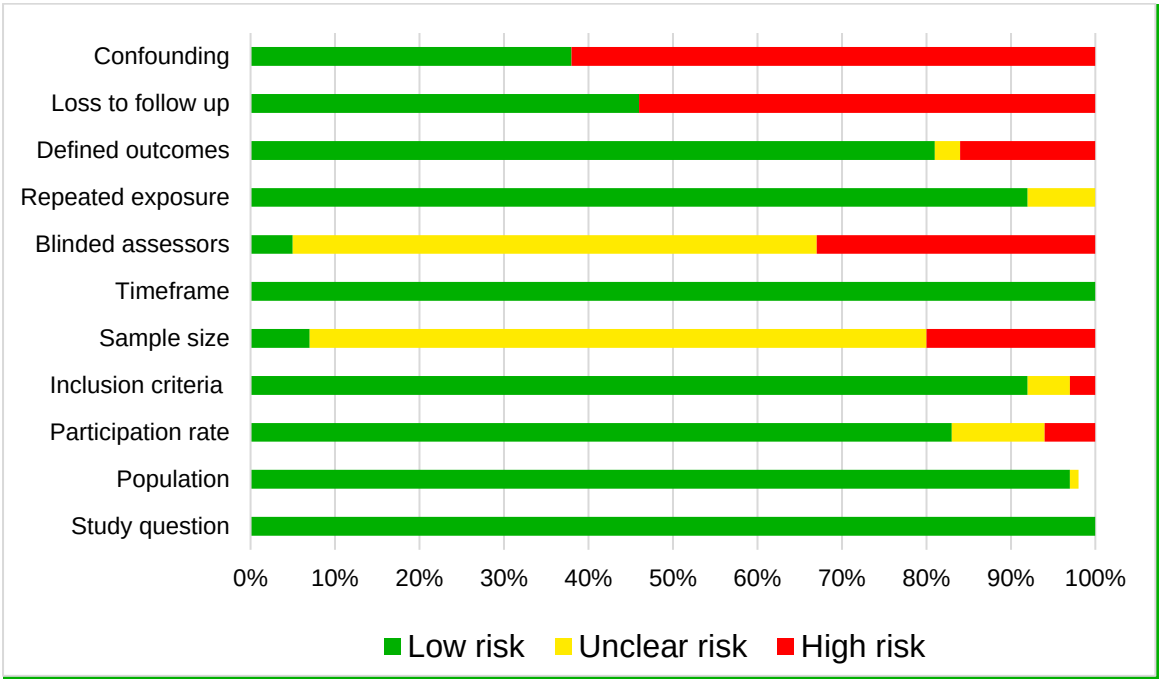
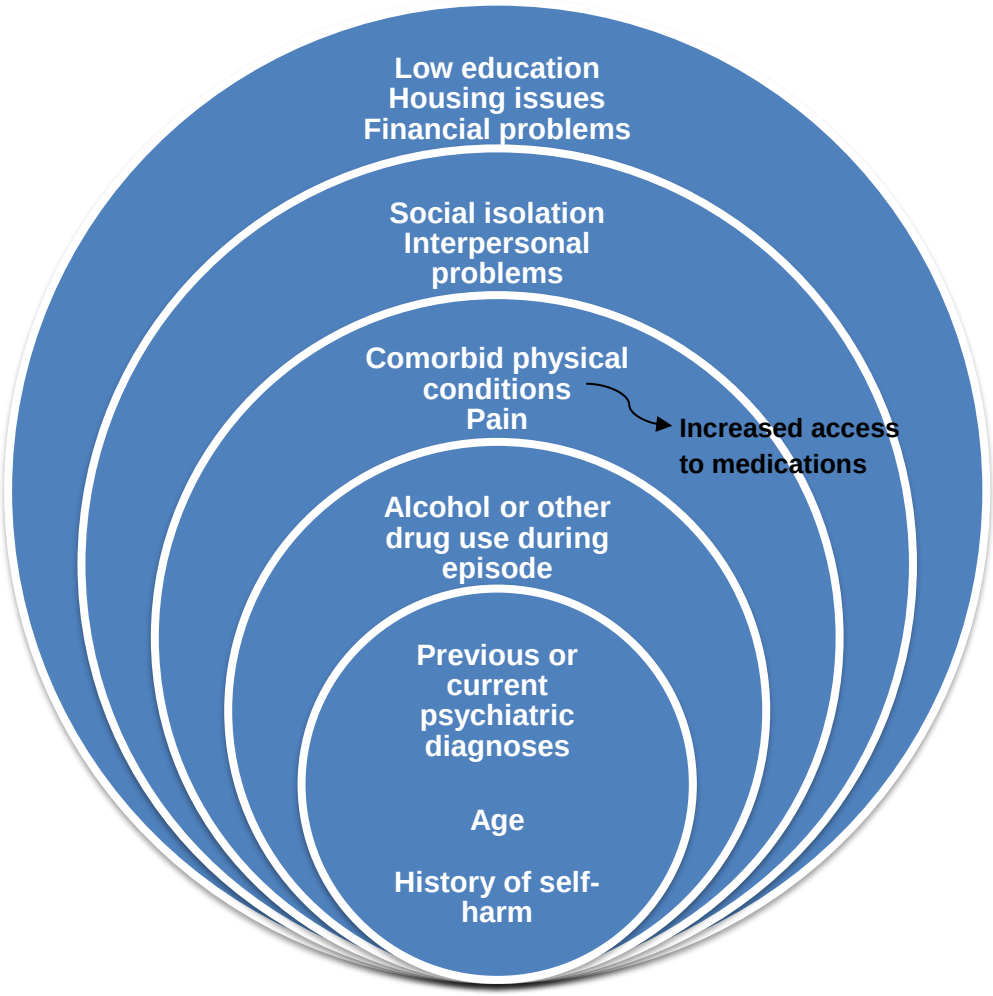


Figure 3 Influencing factors in self-harm in older adults



+ Diagram presented in layers according to internal and external factors. Different size layers do not refer to higher or lower association to self-harm but rather represent internal and external factors.

Table 1

Table 1a Characteristics of included studies

Characteristics of included studies											
Study ID	**Study design**	**Quality assessment**	**Study setting**	**Study length (follow-up)**	**Participants (presentations)**	**Age range**	**Self-harm method**	**Self-harm repetition (time)**	**Death (suicide)**	**Influencing Factors for self-harm**	**Motivations for self-harm**
Armond 2017 Brazil	Cross-sectional	Moderate	Hospital & community based	1 year	93 (93)	60-90+	Self-poison: 39 Self-injury: 0 Other: 54	NA	NA	Low education level and socio-economic status	NR
Bonnewyn 2014 Belgium	Qualitative	Moderate	Hospital-based (Psychiatry)	NR	8 (8)	66-85	NR	NA	NA	Loss, death of spouse or family member, conflict with family member, physical illness, physical disability, insomnia, loneliness, loss of control	Death of a spouse or family member, conflict with family member, physical illness/disability, loneliness, loss of control
Briskman 2017 Israel	Cross-sectional	Moderate	Hospital-based (A&E)	8 years	187 (187)	65-95	Self-poison: 177 Self-injury: 10 Other: 0	NA	NA	NR	NR
Carter 2014 USA	Cross-sectional	High	Hospital-based (A&E)	1 year	4,915 (4,915)	65-85+	Self-poison: 3,077 Self-injury: 595 Other: 1,243	NA	NA	Alcohol and drug use	NR
Cheung 2017 New Zealand	Cohort	High	Hospital-based (A&E)	3 years (1 year)	339 (339)	65-96	Self-poison: 233 Self-injury: 31 Other: 37 Multiple: 38	50/339 (1 year)	7 (7)	Perceived physical illness, family discord, bereavement, financial trouble, partner separation	NR
Chiu 1996 Hong Kong	Cohort	Poor	Hospital-based (Psychiatry)	2.5 years (1.5 years)	55 (55)	65-91	Self-poison: 15 Self-injury: 40	5/55 (1.5 years)	16 (3)	NR	NR
Crocker 2006 UK	Qualitative	High	Community-based	NR	15 (15)	65-91	Self-poison: 14 Self-injury: 0 Other: 1	NA	NA	Social isolation, loss of social status, physical illness and loss of mobility, loneliness, ageing perceived as burdensome	Become invisible to others, regaining control
De Beer 2015 New Zealand	Cohort	Moderate	Hospital-based (A&E)	3 years (1 year)	52 (52)	65-80+	Self-poison: 34 Self-injury:8 Other: 7 Multiple: 3	7/52 (1 year)	5/52 (0)	Physical illness, pain, family discord, changed relationship, bereavement, financial trouble, legal difficulties	NR
De Leo 2001 Europe	Cross-sectional	Moderate	Hospital & community based	5 years	1,518 (1,734)	65-82	Self-poison: 1,196 Self-injury: 191 Other: 347	NA	NA	NR	NR

De Leo 2002 Europe	Cross-sectional	Moderate	Hospital & community based	3 years (1 year)	63 (63)	60 and over [1]	Self-poison: 50 Self-injury: 3 Other: 4 Multiple: 6	15/63 (1 year)	8 (8)	Bereavement of father, poor mental health, and poor social assistance. Financial problems	Relational difficulties, desire to manifest desperation to others, or mental illness
Dennis 2007 UK	Cross-sectional	Moderate	Hospital-based (Psychiatry)	NR	76 (76)	65-92	Self-poison: 43 Self-injury: 9 Other: 4 Multiple: 20	NA	NA	Isolated lifestyle, life events and difficulties, bereavement, health problems	Gain relief, escape, make others understand how desperate they were, influence others, seek help, make others feel sorry
Draper 1994 Australia	Cross-sectional	Moderate	Hospital-based (Psychiatry)	6.5 years	69 (69)	65-85+	Self-poison: 52 Self-injury: 13 Multiple: 4	NA	NA	Social isolation, family issues, marital issues, death, accommodation issues, financial problems	NR
Gavrielatos 2006 Greece	Cross-sectional	Moderate	Hospital-based (A&E)	3.5 years	44 (44)	65-91	Self-poison: 44 Self-injury: 0 Other: 0	NR	NR	Domestic stress (e.g. health or financial issues), stress of chronic illness	NR
Gheshlaghi 2012 Iran	Cross-sectional	Poor	Hospital-based (A&E)	1 year	43 (43)	65-83	Self-poison: 43 Self-injury: 0 Other: 0	NA	3 (3)	NR	NR
Gokcelli 2017 Turkey	Cross-sectional	Moderate	Hospital-based (A&E)	9 years	63 (63)	60-91	Self-poison: 56 Self-injury: 3 Other: 4	NA	NA	NR	NR
Hawton 2006 UK	Cohort	Moderate	Hospital-based (Psychiatry and A&E)	23 years (23 years)	730 (730)	60-85+	Self-poison: 647 Self-injury: 62 Multiple: 21	112/730 (23 years)	432 (30)	Physical illness, social isolation, relationship problems, bereavement, housing problems, alcohol misuse, financial worries	NR
Hepple 1997 UK	Cohort	Moderate	Hospital-based (Psychiatry)	3 years (2-5 years)	100 (100)	65-94	Self-poison: 87 Self-injury: 2 Other: 11	28/100 (2-5 years)	42 (7)	Isolation, friction with family, bereavement, physical and psychiatric problems	NR
Kim 2011 Korea	Cross-sectional	High	Hospital-based (A&E)	2 years	57 (57)	65-81	Self-poison: 57 Self-injury: 0 Other: 0	NA	NA	NR	Interpersonal conflict, economic problems, physical illness
Kim 2014 Korea	Qualitative	Moderate	Community-based	8 months	35 (35)	64-89	NR	NA	NA	Financial problems, domestic violence, illness, childhood events, violence, grief, mental illness	Feelings of helplessness, despair, dependence, and isolation
Lamprecht 2005 UK	Cohort	High	Hospital-based (Psychiatry)	3 years (1-2 years)	82 (99)	65-82	Self-poison: 90 Self-injury: 5 Other: 4	15/82 (1-2 years)	NR	Pain and debilitating illness	NR

Lawrence 2000 Australia	Cohort	Moderate	Hospital-based	15 years	1,368 (1,596)	60-80+	NR	NA	NA	NR	NR
Lebret 2006 France	Cohort	High	Hospital-based (Psychiatry)	7 years (3 years)	59 (59)	61-85	Self-poison: 31 Self-injury: 9 Other: 12 Multiple: 7	8/59 (3 years)	17 (3)	Physical illness, loneliness, relationship conflict	Physical illness, interpersonal problems, social isolation/loneliness
Liu 2009 Taiwan	Case-control	Moderate	Hospital-based (A&E)	20 months	43 (43)	61-90	Self-poison: 21 Self-injury: 12 Other: 10	NA	NA	Health conditions, finances, interpersonal relations, affinity relations, parent-child relations	Depression, family conflict, long-term physical illness, financial burden
Logan 2007 USA	Cross-sectional	Moderate	Hospital-based (A&E)	1 year	5,710 (5,710)	65 and over [1]	Self-poison: 3,425 Self-injury:1,062 Other: 1,223	NA	NA	NR	NR
Murphy 2012 UK	Cohort	High	Hospital-based (A&E)	8 years (1-8 years)	1,177 (1,177)	60-97	Self-poison: 1,031 Self-injury: 107 Other: 39	196/1,177 (1 year)	24 (24)	Relationship problems, bereavement, physical and/or mental health problems, alcohol problems	NR
Nowers 1993 UK	Cohort	High	Hospital-based (A&E)	7 years (5 years)	88 (88)	65-90	Self-poison: 85 Self-injury: 2 Other: 1	17/88 (1 year)	26 (5)	NR	NR
Packer 2012 UK	Cross-sectional	Moderate	Hospital-based (Plastic surgery)	5 years	10 (10)	60-80+	Self-poison: 0 Self-injury: 10 Other: 0	NA	NA	NR	NR
Pierce 1987 UK	Cohort	Moderate	Hospital-based (A&E)	13 years (1-12 years)	145 (145)	65-92	Self-poison: 138 Self-injury: 7 Other: 0	12/145 (1-12 years)	4 (4)	Physical illness, housing or financial stress, pain	NR
Pierce 1996 UK	Cohort	Moderate	Hospital-based (A&E)	20 years (1-19 years)	39 (89)	60-87	Self-poison: 78 Self-injury: 6 Other: 5	39/39 (50 months)	18 (2)	NR	NR
Pillans 2017 Australia	Cross-sectional	High	Hospital-based	26 years	626 (626)	65-97	Self-poison: 500 Self-injury: 126	NA	24 (NR)	NR	NR
Ruths 2005 UK	Cohort	Moderate	Hospital-based (A&E)	2 years (2 years)	43 (43)	65-95	Self-poison: 36 Self-injury: 7 Other: 0	8/43 (2 years)	18 (0)	Chronic pain, terminal illness	NR
Shah 2009 UK	Cross-sectional	Moderate	Hospital-based	9 years	44,310 (44,310)	60-75+	Self-poison:41,298 Self-injury: 2,635 Other: 377	NA	NA	NR	NR
Takahashi 1995 Japan	Cross-sectional	Moderate	Hospital-based (Psychiatry)	10 years	50 (50)	65-89	Self-poison: 21 Self-injury: 13 Other: 5 Multiple: 11	NA	NA	NR	NR
Ticehurst 2002 Australia	Cross-sectional	Moderate	Hospital-based	7.5 years	110 (110)	65 and over [1]	Self-poison: 110 Self-injury: 0 Other: 0	NA	6 (NR)	NR	NR

Tsoh 2005 Hong Kong	Case-control	Moderate	Hospital-based (Psychiatry)	15 months	66 (66)	65-82	NR	NA	NA	Psychiatric and physical morbidities, family discord	NR
Van Orden 2015 Sweden	Cohort	Moderate	Hospital-based (A&E)	3 years (12 months)	101 (101)	70-91	Self-poison: 73 Self-injury: 13 Other: 15	6 (12 months)	2 (2)	Social problems, perceived burdensomeness, psychological problems, physical problems	Escape, functioning and autonomy, psychological problems, somatic problems and pain, perceived burden, social problems, lack of meaning
Wiktorsson 2010 Sweden	Cross-sectional	Moderate	Hospital-based (A&E)	3 years	103 (103)	70-91	NR	NA	NA	Hopelessness, loneliness, low education	NR
Wynne 1987 UK	Cross-sectional	Moderate	Hospital-based (Poisons unit)	4.5 years	45 (45)	65 and over [1]	Self-poison: 45 Self-injury: 0 Other: 0	NA	NA	Physical: pain, severe illness, disability, terminal illness. Social: relationship problems, housing, financial problems. Psychiatric: depression, personality disorder, alcohol problems	Physical: pain, severe illness, disability, terminal illness. Social: relationship problems, housing, financial problems. Psychiatric: depression, personality disorder, alcohol problems
Yang 2001 Taiwan	Cross-sectional	Moderate	Hospital-based (Psychiatry)	6 years	55 (55)	65-84	Self-poison: 20 Self-injury: 21 Other: 14	NA	NA	Psychosocial problems, family problems, interpersonal problems, adjustment problems, and physical illness	Psychosocial problems, family problems, interpersonal problems, adjustment problems, physical illness
Zhang 2016 China	Cross-sectional	High	Community-based	6 months	63 (63)	60-112	NR	NA	NA	Having no caregivers, psychological problems	NR

*NR= Not Reported

*NA= Not Applicable

[1] Paper did not report upper range limit

Table 1

Table 1b Major themes with quotes from qualitative studies

Major themes from qualitative studies			
Major themes	Bonnewyn et al., 2014	Crocker et al., 2006	Kim, 2014
Loss of control leading to suicide attempt	"I was very tired. Completely exhausted. I did not see a way out anymore. I was tired doing the dishes, I was tired making up my bed. Tired, tired, always tired. But then again, I had almost not slept for months and months on end. I never slept during night time. My eyes hurt so much, I could simply not close them anymore." (Female participant 1)	"Once I retired, I had no further aim, and had nothing to get up for. I didn't know what to do with my day. [...]. My partner said 'Just take that day as it comes, read the paper, go out and get the paper, do the chores ...' and I thought 'Oh god, all unconstructive things'." (Male participant 1)	"I've tried twice to kill myself. It is not as easy to commit suicide as people think. I know it is a sin to do it, but I can't change my mind about ending this painful life. It's always stuck in my mind. I eat a lot of sugary foods and I do not take insulin because I think I have lived long enough." (Female participant 5)
Increased loneliness and isolation	''Six months after my husband passed away, I really started to realize that ...I am on my own now. The children, they came in and I wanted ...I was troubled by something, I wanted to talk about it, but I could not.'' (Female participant 2)	"When it got to the second stage [prior to attempt] it felt like that again you know, vanishing, you know and I thought I can't go on, on my own. And it's funny that because I've always been a loner." (Female participant 3)	"I opened my eyes after three days. I was lying down in my room. No one knew what I had done. That was really sad and embarrassing. I felt terrible because no one cared about me." (Female participant 6)
Ageing perceived as burdensome and affecting daily living	"It felt as if I could no longer cope. My greatest fear and biggest problem was that I would no longer be able to do the things which I was able to do before: looking after the grandchildren, washing, ironing, everything related to housekeeping. I am no longer able to do that and that is my biggest fear: that I won't be able to do that in the future. I can't do anything anymore, nothing works out; I am no longer of use. I can no longer do the things which I used to do before anyway." (Female participant 1)	"Oh yes, I've been independent since I was born, let's put it that way. I never really depended on anybody or relied on anybody. I was very, very independent. I was a very feminine person, very sexy." (Female participant 4)	"They [doctors] have been telling me I need surgery since last year. But why should I? To live longer? I don't have the money anyway. It would have been great if I had just died. This is more painful." (Male participant 2)

Table 2 Yearly self-harm in older adults rates per 100,000 habitants

Study	Study setting	Population size	Yearly rates per 100,000 habitants	Confidence Intervals (CI)
Logan et al., 2007	Hospital-based (Accident & Emergency Department [A&E]) United States	n=5,710	19.3	95% CI: 13.9-24.8
De Beer et al., 2015	Hospital-based (A&E) New Zealand	n=52	32.7*	Not provided
Pierce, 1987	Hospital-based (A&E) United Kingdom	n=145	46*	Not provided
Ruths et al., 2005	Hospital-based (A&E) United Kingdom	n=43	47.3*	Not provided
De Leo et al., 2001	Hospital and community based Multi-site study conducted in 13 countries in Europe	n=1,734	61.43	Not provided
Carter et al., 2014	Hospital-based (A&E) United States	n=4,915	63	95% CI (61.2-64.8)
Murphy et al., 2012	Hospital-based (A&E) United Kingdom	n=1,177	65	Not provided
*Small population size (n<200)				

Table 3 Summary of Findings on Risk Factors for Self-harm Repetition in Older Adults

Risk Factors for self-harm repetition in older adults					
		Evidence base	**Strength association**	**Strength of evidence (GRADE) ***	**Comments**
Socio-demographic factors	**Female gender**	3 studies[21,35,49] n= 858	Significant value p<0.05 using x^2 estimates p=0.014[21], 0.01[49]	⊕⊕ Low	Uncertainty due to incomplete estimates presented in 2 of the studies
	Single, living alone and younger age (60-74 y/o)	1 study [23] n= 1,177	p<0.05 a) Single: HR= 1.5, CI 1.0-2.1 b) Living alone: HR= 1.5, 95% CI 1.0-2.3 c) Younger age (60-74 y/o): Multivariate HR= 1.8, 95% CI 1.2-2.8	⊕⊕⊕ Moderate	Evidence limited to one study, but strong association provided and large sample size
	No caregiver	1 study [56] n= 63	OR= 1.82, 95% CI 1.04-3.33	⊕⊕ Low	Strong association provided but limited evidence with one study and small sample size.
Clinical factors	**Self-harm history**	2 studies [23,53] n= 1,240	Significant value p<0.05 Multivariate HR[23]= 1.9, 95% CI 1.4-2.8 Adjusted OR[53]= 32.9, 95% CI 3.2-339.37	⊕⊕⊕ Moderate	Mixed evidence for strength of association amongst studies. Stronger association found in study with increased number of participants
	Psychiatric history	2 studies [35,37] n= 169	x^2= 5.61; p<0.05[37]	⊕ Very Low	Uncertainty due to incomplete estimates presented
	Depression diagnosis	4 studies[37,53,55-56] n= 272	Adjusted OR[53]= 59.2, 95% CI 6.4-546.6 OR[55]= 8.38, 95% CI 2.27-30.93 OR[56]= 5.19, 95% CI 2.92-9.22 x^2=4.98; p<0.05[37]	⊕⊕ Low	Despite multiple studies included, small sample size. Mixed evidence regarding strength of association, particularly imprecision of overall estimates.
	Previous and current psychiatric treatment	3 studies[23,31,37] n= 1,616	p<0.05 Multivariate HR[23]= 1.8, 95% CI 1.2-2.7 OR[31]= 2.73, 95% CI 1.20-6.25 x^2= 4.59[37]	⊕⊕⊕ Moderate	Strong association with estimates provided. Large sample size and multiple studies included
	Arthritis diagnosis	1 study [53] n= 66	Adjusted OR= 22.6, 95% CI 3.2-157.3	⊕ Very Low	Low association provided with large imprecision in estimates. Limited evidence from only 1 study.
Other factors	**Time (12 months)**	1 study [21] n= 730	p=0.042	⊕⊕ Low	Limited evidence from one study but large sample size
	Alcohol and drug use	2 studies [23,31] n= 1,516	p<0.05 HR[23]= 1,9, 95% CI 1.5-5.1 OR[31]= 3.87, 95% CI 1.35-11.12	⊕⊕ Low	Large sample size but inconsistency due to mixed results in strength of association among studies
	Poorer function of self-care+	2 studies [53, 56] n= 129	Adjusted OR[53]= 0.3, 95% CI 0.1-0.7 OR[56]= 0.83, 95% CI 0.76-0.92	⊕⊕ Low	Limited evidence with small sample size. Validity of tool used unknown

***x*²:** chi-square; **HR:** Hazards Ratio; **CI:** Confidence Interval; **OR:** Odds Ratio

*Modified GRADE system used to assess overall quality of risk factors. Elements used to assess evidence: risk of bias, inconsistency, indirectness, imprecision, large effect (strength of association), and dose-response gradient

Quality of evidence across studies:

⊕⊕⊕⊕ High= Further research is very unlikely to change our confidence in the estimate of effect

⊕⊕⊕ Moderate= Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate

⊕⊕ Low= Further research is likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate

⊕Very low= Any estimate of effect is very uncertain

+ Measured using the Lawton Instrumental Activities of Daily Living Scale (IADL)