Evidence for strategies that improve recruitment and retention of adults aged 65 years and over in randomised trials and observational studies: a systematic review

Key Points:

- Participation of adults aged ≥65 years in research needs to be improved in order to improve the evidence base for their treatments
- Advance notification (contacting participants prior to sending follow-up questionnaires) can increase study retention
- An opt-out approach (assumes a person is willing to participate unless they actively opt out) can increase study recruitment
- Evidence for other successful strategies came from single studies, some of which may depend on study context
- Future research studies on strategies to improve participation in older adults should stratify results by age ≥65 years

Keywords: Older adults; Randomised trials; Recruitment; Retention; Systematic review

Abstract

Background: Adults aged ≥65 years are often excluded from health research studies. Lack of representation reduces generalisability of treatments for this age group.

Objective: To evaluate the effectiveness of strategies that improve recruitment and retention of adults aged ≥65 in observational studies and randomised controlled trials (RCTs).

Methods: Searches conducted in ten databases for RCTs of recruitment and retention strategies in RCTs or observational studies. Two reviewers screened abstracts and full-text articles for eligibility and extracted data. Studies without separate data for adults aged ≥65 were discarded. Risk of bias assessed using the Cochrane Risk of Bias tool. Results were synthesised narratively.

Results: Thirty-two studies were included in the review (n=75,444). Twelve studies had low risk of bias, of which ten had successful strategies including: Opt-out vs opt-in increased recruitment (13.6%(n=261)-18.7%(n=36) difference; two studies); Advance notification increased retention (1.6% difference, OR 1.45; 95% CI 1.01,2.10, one study(n=2,686); 9.1% difference at 4 months, 1.44;1.08,1.92, one study(n=753)); Hand-delivered vs postal surveys increased response (25.1% difference; X^2=11.40, p<0.01; one study(n=139)); Open randomised design vs blinded RCT increased recruitment (1.56;1.05,2.33) and retention (13.9% difference;3.1%,24.6%) in one study(n=538). Risk of bias was high/unclear for studies in which incentives or shorter length questionnaires increased response.

Discussion: In low risk of bias studies, few of the strategies that improved participation in older adults had been tested in ≥1 study. Opt-out and advance notification strategies improved recruitment and retention, respectively, although an opt-out approach may have ethical limitations. Evidence from single studies limits the generalisability of other strategies.

INTRODUCTION

Rationale

With increasing life expectancy, the challenge for health care is the management of the growing number of older adults (aged ≥65 years) with comorbidities and related polypharmacy[**1**]. Older adults need to be considered as different from younger adults in terms of whether interventions can be useful in improving health and quality of life[**2-4**]. However, this age group is consistently under-represented in clinical trials because (i) they are often excluded from trials[**5-8**] and (ii) participation of this age group in epidemiological studies is declining[**9**]. It is therefore important to improve recruitment and retention of those aged ≥65 years in research studies[**10**] by (i) encouraging researchers to avoid using arbitrary upper age cut-offs[**11**], and (ii) finding new ways to engage prospective participants[**9**] using evidence-based recruitment and retention strategies.

One review of recruitment of adults focused on age ≥50 years but did not assess study quality or risk of bias[**12**]. Three Cochrane reviews examined the evidence for strategies that increase recruitment to trials[**13**], retention in trials[**14**] and postal and electronic questionnaire response[**15**], reporting several successful strategies including telephone reminders[**13**], opt-out strategies[**13**], open design[**13**,**14**], monetary incentives[**14**,**15**], recorded delivery[**14**,**15**], teaser on envelope[**15**], shorter e-questionnaires[**15**]. However, there was no age restriction for these reviews and results were not reported by age[**13-15**]. Older adults can have problems with cognition, vision, hearing, and use of technology[**16**,**17**] which could affect these results. Therefore, it is uncertain if the results from previous reviews are applicable to the ≥65 year age group.To our knowledge, no previous systematic reviews have assessed the evidence for recruitment and retention strategies specifically in adults aged ≥65 years.

Objectives

This systematic review aims to evaluate the effectiveness of strategies that improve recruitment and retention of adults aged ≥65 years to observational studies and RCTs, which will (i) inform evidence-based strategies to improve the representativeness of older adults in RCTs, and (ii) have the potential to impact on the appropriateness of the health care delivered to this age group.

METHODS

This review is reported in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidance[**18**]. A protocol was developed before starting this systematic review giving details of the methods and is available on request from the authors. The International Prospective Register of Systematic Reviews (https://www.crd.york.ac.uk/PROSPERO/) does not accept methodological reviews with no direct patient or clinically relevant outcomes, so we were unable to register the protocol prospectively.

Search strategy and selection criteria

Electronic bibliographic databases (MEDLINE, EMBASE, PsycINFO, HMIC, Web of Science, CINAHL, Cochrane CENTRAL, Cochrane Methods Database, Ageline, and AgeInfo) were searched, with no language restrictions, from the earliest available date to January 2016. XX (an information specialist) assisted with the search strategy, which included terms relating to recruitment and retention of study participants, combined with the Cochrane highly sensitive search strategy for identifying RCTs[**19**] (full Medline search strategy in Appendix 1). Although terms for older adults were included, search filters that limit to older adults were not used to keep the search sensitive. Search terms were adapted for each bibliographic database in combination with database-specific filters for controlled trials, where these were available.

Eligibility criteria

Eligibility criteria were based on the PICOS framework. The population included was adults aged ≥18. At the title and abstract screening stages, articles were included if they had some participants aged <65 years, or if there appeared to be no upper age limit. At the full article screening stage, studies that did not give results separately for people aged ≥65 years or studies that had an upper age limit <65 years were excluded. Interventions were strategies to improve response/recruitment and/or retention (e.g. incentives, telephone call, reminders). Strategies could be tested against ≥1 other strategies or a control only (no strategy). Outcomes were the number and proportion of participants who responded or who were recruited/retained. RCTs and quasi-randomised trials of recruitment and/or retention strategies conducted in randomised or quasi-randomised controlled trials or observational studies, in any setting, were included. Articles for which full text was not available, with no data, or those not testing strategies to improve response/recruitment/retention of participants to research studies (e.g. where people were asked reasons for participating/remaining or not participating/not remaining in a study; recruitment/retention to screening programmes; incentives/disincentives for clinicians to recruit/retain participants; studies reporting factors (e.g. participant characteristics) that predicted or were associated with recruitment/retention) were excluded.

Study selection and data extraction

Titles of all records identified from the searches were screened by one reviewer (XXX) based on the eligibility criteria. Pairs of the reviewing team (XXX, XX, XXX and XX) screened each abstract independently and assessed the full text of all potentially eligible articles independently to determine if they met the inclusion criteria. Data were extracted independently by pairs of reviewers using a piloted proforma: authors, country; design; setting; population; demographics; recruitment and/or retention strategies; number aged ≥65 years contacted; outcome measures (number and proportion of participants aged ≥65 years responded/recruited/retained). Disagreements were discussed and a third reviewer consulted if necessary. All references of included articles were screened for potential citations. We did not conduct a forward citation search or contact authors.

Risk of bias

Risk of bias for each of five domains of the Cochrane Risk of Bias tool[**19**] was assessed for each study, and studies were not excluded based on their risk of bias assessment. Due to practical difficulties in blinding participants and personnel to recruitment/retention

interventions, adequacy of random sequence generation and allocation concealment, completeness of outcome data and selective reporting were designated as the 'key' domains for this review. The overall risk of bias for each study was assessed as Low (low risk of bias for all key domains), Unclear (unclear risk of bias for ≥1 key domains) or High (high risk of bias for ≥1 key domains)[**19**].

Synthesis of results

It was anticipated that results from the included studies would not be combined for meta-analysis due to the many differences in the populations, strategies and settings of the studies. Therefore, a narrative synthesis of the data was conducted, grouping the results by types of strategy to assess differences between successful strategies and the overall risk of bias in these studies.

RESULTS

Study selection

The flow diagram (Figure 1) describes the process of selection of studies for the systematic review. After removing duplicates, and screening 21,924 titles and 1,087 abstracts, 424 full-text articles were assessed for eligibility. Data was extracted from 32 full-text articles, which met all the eligibility criteria and were included in the review[20-51].

Study characteristics

Table 1 presents a summary of the characteristics of the 32 included studies (full version in Appendix 2; references in Appendix 3). 8 studies were quasi-randomised[22,23,30,31,38,39,42,43]. The majority of studies were trials of strategies to improve recruitment[20,28,32,34,38,39,43,48] or response[22,25-27,29,31,33,35,40-42,44-47,49-51]. Five studies were trials of strategies aimed at retention: increasing response to cohort follow-up questionnaires[24,30], increasing response to trial follow-up questionnaires[36,37], and improving retention in a trial[23]. One study investigated both recruitment and retention in a trial[21].

The minimum age of the populations was 65 years in 8 studies and 70 years in 8 studies. One study had a population aged ≥72 years, and one had a population aged ≥75 years. 7 studies included populations with minimum age <65 years. Population age was not restricted in 7 studies, but authors stratified their results by ages ≥65 years or gave the mean age of participants. Almost half of the studies recruited participants from primary care settings.

Risk of bias

The overall risk of bias from the included studies was variable (Appendix 4). 12 studies had low overall risk of bias for all key domains[20,21,25,27-29,32,36,37,46-48], 12 studies had unclear overall risk of bias for ≥1 key domains[24,26,33-35,40,41,44,45,49-51], and 8 studies had high overall risk of bias for ≥1 key domains[22,23,30,31,38,39,42,43]. The majority of studies had low risk of reporting bias.

Results of individual studies

The 32 studies included 34 strategies which were stratified by 12 types of strategy (Appendix 5). The most frequently evaluated strategies were method of approach or administration[22,25,28,32,39,42,46,48,49], incentive[24,26,27,30,43,51], questionnaire length or content[30,31,41,44,45], and advance notification[36,37,40]. The ranges of absolute rates of recruitment, retention and response were: recruitment 3.2% to 68.2% (median 41.4%), retention 18.9% to 95.4% (median 49.0%), and response 29.4% to 82.5% (median 62.3%).

Synthesis of results

Successful strategies with overall low or unclear risk of bias (Appendix 6):

(i) Methods of approach

An opt-out compared to an opt-in approach increased recruitment in two studies with an overall low risk of bias[32,48]. An opt-out approach advises potential participants that they will be included in a study unless they contact the researcher to decline participation, e.g. by reply card, telephone ("opt-out"), whereas an opt-in approach requires participants to contact the researcher only if they are willing to particpate. The difference in recruitment was 13.6% and 18.7% in the two studies, respectively[32,48], although statistical testing was unavailable for the former result[32] and the latter was not statistically significant likely due to small numbers[48]. However, when compared to a control, a refusal postcard (an opt-out type approach) increased refusal rates to complete a telephone survey (X^2=31.6, p=0.001)[49] with a difference in refusal of 18%, although this study had an overall unclear risk of bias. In a study with an overall low risk of bias, the odds of recruitment increased by 1.5 (95% confidence interval 1.0,2.3; p=0.046) using telephone contact by study nurse (stated in study information) after sending study information compared to no telephone contact[28].

(ii) Methods of administration

Two studies with an overall low risk of bias comparing postal administration of questionnaires with different interventions found differing results. Postal administration increased questionnaire response compared to nurse or lay interviewer administration with a difference in response of 8.5% (4.4%,12.7%; p<0.001) between the mean of the interview methods and the postal method[46]. However, when compared to postal delivery, hand delivery of questionnaires by a person known to the participant increased survey response (X^2=11.40, p<0.01)[25] with a 25.1% difference in response.

(iii) Incentive (monetary)

A cash incentive of $2 in a US study of radiologic technologists increased response to cohort follow-up questionnaires (retention)[24]. The difference in response was 34.9% (p<0.05) between incentive and no incentive; however, this study had an overall unclear risk of bias.

(iv) Questionnaire length

One study with an overall unclear risk of bias found that shorter length questionnaires increased response compared to longer questionnaires (5% difference)[41]. However, response was less dependent on questionnaire length than financial incentive since, although a short questionnaire increased response compared to a full questionnaire,

response was increased further by a longer questionnaire and recorded delivery (13% difference) and further still by a longer questionnaire and cash voucher (20% difference) (X^2=27.79, p<0.0005)[41].

(v) Advance notification

Two studies with an overall low risk of bias found that pre-notification by telephone[36] and newsletter[37] before sending trial follow-up questionnaires (retention) resulted in small increases in response (5.4% difference; OR 1.27 (0.94,1.72) p=0.12[36] and 1.6% difference, p=0.05; OR 1.45 (1.01,2.10)[37]). MacLennan et al found a greater increase in response to the next questionnaire 4 months later (9.1% difference; OR 1.44 (1.08,1.92) p=0.013)[36]. A third study found an advance letter increased survey response with a difference of 14%[40], although this study had an overall unclear risk of bias.

(vi) Colour of questionnaire ink / envelope

One study with an overall low risk of bias found that questionnaires printed in green ink compared to black ink increased response (OR 1.20;1.02,1.41)[47] with a difference of 4.3%.

(vii) Consent process

An informal, combined capacity and consent process increased recruitment compared to a formal, separate capacity and consent process (X^2=12.1, p<0.001)[20] with a difference of 30.1% in recruitment. This study had an overall low risk of bias.

(viii) Study design

One study with an overall low risk of bias found that both recruitment and retention in a trial were increased by using an open randomised design compared to a blinded, placebo-controlled randomised design[21]. The odds of recruitment were increased by 1.56 (1.05, 2.33) by using the open design (9.4% difference in recruitment). There was a 13.9% difference (3.1%,24.6%) in retention in the trial between the designs[21].

DISCUSSION

This systematic review found 10 studies with successful strategies for improving recruitment and retention of adults aged ≥65 years in randomised trials and observational studies, with an overall low risk of bias. There was some consensus of evidence for an opt-out approach increasing recruitment to an observational study[32] and to a trial[48] and for advance notification increasing retention in trials[36,37]. Evidence for other successful strategies came from single studies[20,21,25,28,46,47]. Recruitment in trials was improved by an open study design[21] and opt-out[48] strategies, whereas trial retention was improved by an open study design[21] and advance notification[36,37]. Recruitment to observational studies was increased by telephone contact after sending study information[28], modified consent[20] and opt-out[32] strategies.

Our review has shown for the first time that there are fewer studies and fewer successful strategies for improving participation of older adults in research studies than in the wider population. We found similarities in some strategies from previous reviews with no age

restrictions (opt-out for recruitment, one study[**13**]; open design for recruitment and retention, one study[**13,14**]), and an additional study supporting opt-out for recruitment[32]. However, some results differed for older adults. A previous review found pre-notification increased questionnaire response[**15**]; however, we identified advance notification as a successful retention strategy in two studies[36,37]. We found two different strategies (an informal consent process[20] and surveys delivered by hand[25]) not idenfitified by previous reviews, although the evidence was from single studies. The effects of incentives[**14,15,52**] and shorter length postal questionnaires[**15**], reported as successful strategies in the wider population, were unclear in older adults, due to the studies having an overall unclear or high risk of bias. The one study of incentives we assessed as having an overall low risk of bias, reported no effect of a cash incentive in older adults[27]. There was no evidence for shorter e-questionnaires, in contrast to results from the wider population[**15**], and a notable lack of studies testing strategies using technology in older adults in our review overall.

This review provides evidence that opt-out compared to opt-in may be a successful recruitment approach in older adults[32,48] although the Trevena et al study had small numbers[48]. The evidence for opt-out strategies is strengthened by the Harris et al study, which included an opt-out option with the successful telephone contact strategy[28]. However, an opt-out strategy can pose ethical challenges such as the potential risk of coercion if participants feel pressured to participate. Likewise, although telephone contact is a simple, successful recruitment strategy[28], its use may be limited if ethical approval is not given to obtain patient telephone numbers. Overall, our review suggests that an opt-out approach (perhaps combined with telephone contact) may be a successful recruitment strategy in older adults, but requires further testing.

Our review has shown for the first time that advance notification by telephone[36] or newsletter[37] compared to no advance notification can increase retention of older adults, although the effect maybe larger for subsequent questionnaires[36]. A previous review showed pre-notification increased questionnaire response[**15**], although the method of randomisation was not specified and/or allocation concealment was assessed as inadequate or unclear in 44 of the studies[**15**]. The remaining three had populations aged <65 years[**53,54**] or were aimed at primary care physicians[**55**]. In summary, we suggest that advance notification is a simple, effective strategy that can be employed to increase retention in older adults.

Two strategies, not identified by previous reviews, increased recruitment[20] and response[25], although the feasibility of each strategy was linked to its study context. An informal, combined capacity and consent process could be applied when recruiting dementia populations[20], but its use in other study populatons is unclear. Surveys delivered by hand[25] would not be practical or cost-effective in many study settings, limiting its widespread use. The success of this strategy maybe due to the home-delivered meals driver being known to the participant[25], providing evidence that communication and trust in the study personnel in contact with older adults is an important factor[**56-59**]. As found in previous reviews[**13**,**14**], use of an open randomised design[21] maybe limited depending on the study context, because participants are not blinded to the intervention.

Limitations

There are some limitations to this review. The protocol was not registered prospectively. Titles were screened by one person (XXX). However, we retrieved many articles found in other reviews, checks of which show that they did not fulfil our inclusion criteria, most commonly because results were not presented separately for age ≥65 years. The variety of interventions, populations and settings meant that the results could not be pooled for meta-analysis. The majority of studies were nested within larger host studies. Design of these methodological studies was therefore not always planned, and so not necessarily powered to compare the interventions under investigation. The results from some studies maybe limited by the absence of statistical significance. We did not include unpublished material, conduct a forward citation search or contact authors. However, we did include studies in other languages.

Conclusions

This review identified fewer studies, and fewer strategies, for improving participation of adults aged ≥65 years in research than previous reviews with no age restrictions, suggesting that evidence-based strategies in the wider population may not all be successful in older adults, or have not been tested/reported in this age group. Advance notification is a simple strategy that can be used to improve study retention,of older adults, and ultimately help to facilitate evidence-based health care interventions appropriate for this age group. An opt-out approach can improve recruitment but may have ethical implications and requires additional studies. Few of the successful strategies with low risk of bias have been tested in more than one study, and some may be limited by study context. Therefore, future research should confirm and expand the evidence-base found in this review, particularly testing strategies using technology.

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REFERENCES

PLEASE NOTE: The very long list of references supporting this review has meant that only the most important are listed here and are represented by bold type throughout the text. The full list of references is available on the journal website http://www.ageing.oxfordjournals.org/ as Appendix 3.

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Figure 1. Flowchart of selection of studies

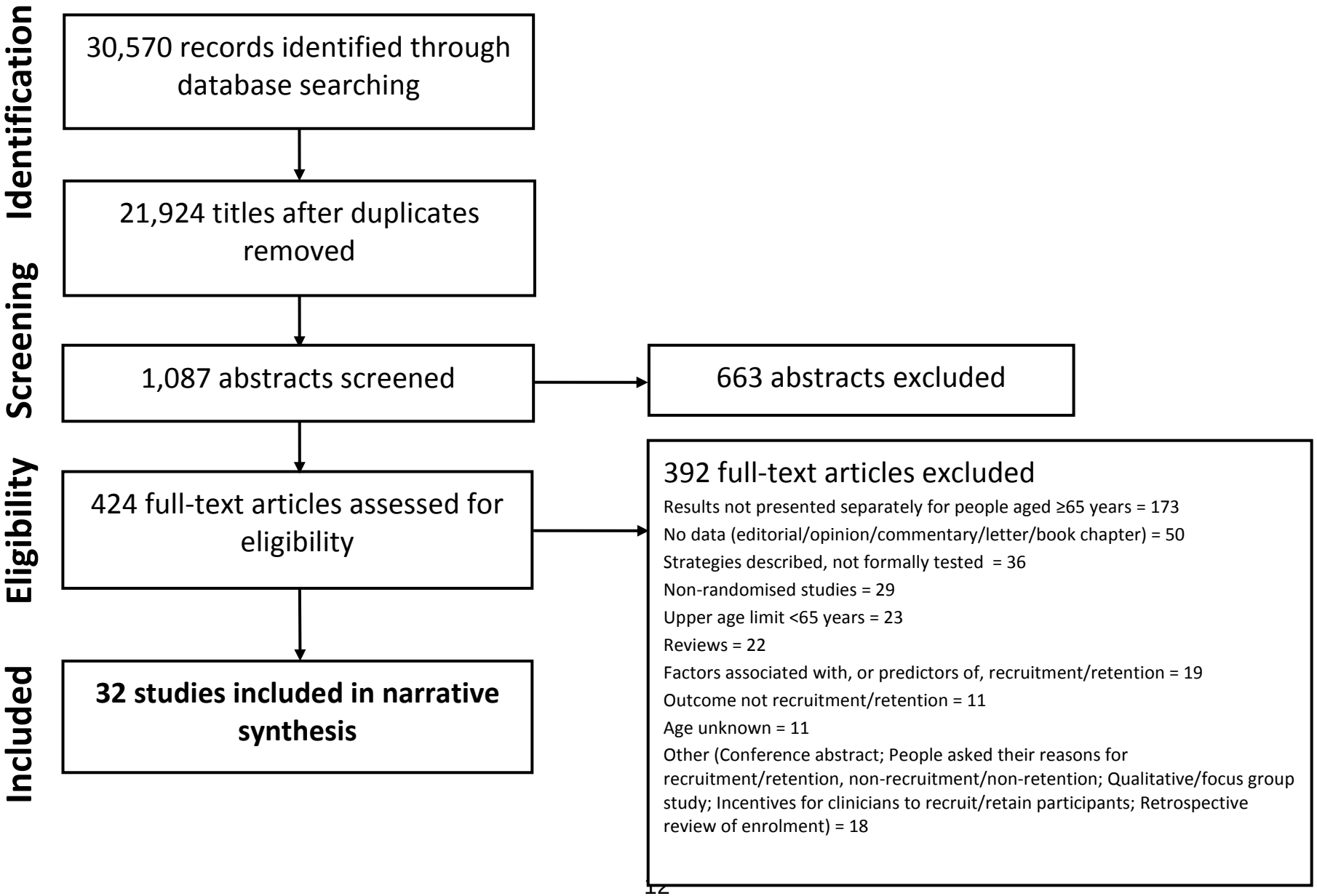
Identification
Screening
Eligibility
Included
30,570 records identified through database searching
21,924 titles after duplicates removed
1,087 abstracts screened
663 abstracts excluded
424 full-text articles assessed for eligibility
392 full-text articles excluded
Results not presented separately for people aged ≥65 years = 173
No data (editorial/opinion/commentary/letter/book chapter) = 50
Strategies described, not formally tested = 36
Non-randomised studies = 29
Upper age limit <65 years = 23
Reviews = 22
Factors associated with, or predictors of, recruitment/retention = 19
Outcome not recruitment/retention = 11
Age unknown = 11
Other (Conference abstract; People asked their reasons for recruitment/retention, non-recruitment/non-retention; Qualitative/focus group study; Incentives for clinicians to recruit/retain participants; Retrospective review of enrolment) = 18
32 studies included in narrative synthesis

Table 1. Characteristics of included studies (for full version, see Appendix 2)

Reference, Country & Study design*	Population, Age (years) & Number of participants (n)	Intervention vs Comparison strategy/strategies	Outcome
Adamis 2005, UK [20] ORS	Patients aged 70+ admitted to an elderly care assessment unit, n=130	Separate, formal test of capacity before consent vs Combined informal capacity/consent process	Consent to participate (Recruitment)
Avenell 2004, UK [21] RCT	Patients aged 70+ with osteoporotic fracture from hospital notes, n=538	Open randomised trial vs Blinded, placebo-controlled randomised trial	Recruitment & Retention in trial at 1 year
Colt 2005, USA [22] QRS	Cases aged 20-79 with kidney cancer, and matched controls; n=411 (age 65+)	Contact letter with: Full disclosure of biospecimen collection vs Partial disclosure of biospecimen collection	Consent to interview (Response)
Cyarto 2006, Australia [23] QRT	Residents of 6 retirement villages; n=119 (age 65-96)	Individual training program at home vs Supervised group training program	Retention rates
Doody 2003, USA [24] RT	Non-responders in follow-up survey of radiologic technologists; n=105 (age 70+)**	Questionnaire and: $1 cash vs $2 cash vs $2 cheque vs $5 cheque vs No incentive	Questionnaire response (Retention in cohort)
Edelman 2013, USA [25] RS	Adults aged 65+ in home-delivered meals program, n=139	Survey delivery by hand from home-delivered meals drivers vs Survey delivery by first class post	Response rates
Evans 2004, USA [26] RS	Males with prostate cancer (1997-2002) in a cancer registry; n=691 (age >65)	Unconditional, immediate incentive sent with survey vs Conditional, delayed incentive (sent after receipt of completed survey)	Response rates
Griffin 2011, USA [27] RT	Non-responders in survey of primary care patients at 4 medical centres; n=456 (age >75)	One page survey and: $5 cash vs $2 cash	Response rates
Harris 2008, UK [28] RCT	Adults aged 65+, registered with a general practice, n=560	No telephone call, no questionnaire vs No telephone call, questionnaire vs Telephone call, no questionnaire vs Telephone call, questionnaire	Recruitment to study
Harrison 2002, UK [29] RCT	Adults aged 18+ from a health authority register; n=80 (age 65+)	Survey with first class stamped addressed reply envelope vs Pre-paid addressed reply envelope	Response rates
Hoffman 1998, USA [30] QRTs	Adults in blood specimen bank cohort; Pilot 1 n=502, Pilot 2 n=679, Pilot 3 n=222 (age 65+)***	Pilot 1: Long vs Short questionnaire; Pilot 2: Article vs Pencil vs Article & pencil vs No incentive; Pilot 3: 2nd questionnaire vs Postcard reminder	Response (Retention in cohort)
Iglesias 2000, UK [31] QRT	Female patients aged 70+, from a general practice, n=847	Short length questionnaire vs Medium length questionnaire vs Long length questionnaire	Response rates & Willingness to enter trial
Junghans 2005, UK [32] RCT	Patients with angina from two general practices; n=261 (age 70+)	Invitation letter and: Opt-in (patients asked to return reply card/telephone if willing to participate) vs Opt-out (patients informed they would be contacted unless they decline participation by reply card/telephone)	Recruitment rate (clinic attendance)
Kelly 2010, USA [33] RT	Breast, prostate & colon cancer patients from a cancer registry (2005); n=680 (age 65+)**	Short survey & $3 vs Short survey & $5 vs Long survey & $3 vs Long survey & $5	Response rates
Kimmick 2005, USA [34] RT	Institutions of a national cancer cooperative group, recruiting patients aged 18+, n=125 institutions	Educational intervention & standard information vs Standard information	Percentage accrual of age 65+ (Recruitment)
Lavelle 2008, UK [35] RT	Non-responders in a survey of female patients aged 65+ attending breast clinics, n=477	Reminder survey with: First class stamped addressed reply envelope vs Pre-paid addressed reply envelope	Response rates

MacLennan 2014, UK [36] RT	Non-responders to annual questionnaire aged 70+, n=753	Advance telephone call followed by usual reminder schedule vs Usual reminder schedule	Response at 3 weeks & 4 months (Retention)
Mitchell 2012 UK, [37] RT	Female trial participants aged 70-84, recruited from GP practices, n=2686	Pre-notification: newsletter sent before questionnaire vs No pre-notification: newsletter sent after questionnaire returned	Response rate (Retention)
Mitchell 2011, UK [38] QRT	Females aged 70-85 from GP practices, n=2803	Invitation pack sent with: Brown mailing & reply envelopes vs White mailing & reply envelopes	Response rates (Recruitment)
Mudano 2013, USA [39] QRT	Females aged 65+ from community-based physician offices, n=160	Recruitment in physician office using: Web-based tablet computer vs Interactive Voice Response System (via cell phone)	Completion of screening questions & Recruitment to hypothetical trial
Nápoles-Springer 2004, USA [40] RT	African-American and White primary care patients aged 50+; n=300 (age 65+)[#]	Advance notice letter sent 2 weeks prior to survey vs No advance letter/other contact prior to survey	Survey response rates
O'Connor 2011, Denmark [41] RT	Married persons aged 65-80 from Danish Central Person Register n=1200	Short questionnaire vs Full questionnaire & recorded response vs Full questionnaire & 50DKr/$10 voucher vs Full questionnaire	Response rates
Perkins 1998, Australia [42] QRT	Residents of households in region of state, aged 16+; n=236 (age 65+)**	Invitation to complete SF-36 by: Telephone vs Post	Consent to complete (Response)
Pighills 2009, UK [43] QRTs	Persons aged 70+ registered at one general practice, n=7233	Trial 1: Original newspaper article vs No article; Trial 2: More favorably written newspaper article vs Original newspaper article	Recruitment rates
Puffer 2004, UK [44] RT	Female responders to a questionnaire aged 72+ from five general practices, n=3836	Single-sided booklet vs Double-sided booklet vs Single-sided multiple booklet vs Double-sided multiple booklet	Response rates
Shah 2001, UK [45] RCT	Patients aged 65-74 in a general practice, n=390	Consent form and income questions vs Consent form only vs Income only questions vs No income questions or consent form	Response rates
Smeeth 2001, UK [46] RCM	Patients aged 75+ registered with 106 general practices, n=42278	Questionnaire administered by: Post vs Lay interviewer vs Nurse	Response rates
Taylor 2006, UK [47] RS	Adults aged 65+ in 5 general practices, n=2449	Black ink questionnaire & brown envelope vs Black ink questionnaire & white envelope vs Green ink questionnaire & brown envelope vs Green ink questionnaire & White envelope	Response rate
Trevena 2006, Australia [48] RCT	Patients aged 50–74 from one general practice; n=36 (age 65-74)	Letter and: Opt-in (patients contacted only if they respond by reply card/telephone/email) vs Opt-out (patients contacted unless they ask practice to withhold their contact details)	Recruitment to trial
Verboncoeur 2000, USA [49] RS	Adults aged 65+ enrolled in two Health Maintenance Organisations, n=1102	Invitation letter and refusal postcard vs Invitation letter and no refusal postcard	Refusal rates (Response)
Wensing 2005, Netherlands [50] RCT	Non-responders to questionnaire aged 70+, registered with 26 general practitioners, n=955	Reminder & questionnaire vs Reminder & request to explain non-response vs Simple reminder card	Response rates
Ziegenfuss 2011, USA [51] RS	Individuals aged 18+ in the Mayo Health System diabetes registry; n=2227 (age 65+)[#]	Survey with option to receive study results vs Survey with no option to receive study results	Survey response rate

*RCT=Randomised Controlled Trial; QRT/S=Quasi-randomised Trial/Study; ORS=Open Randomised Study; RT/S=Randomised Trial/Study; RCM=Randomised Comparison of Methods. **Number calculated by reviewers (XXX, XX, XX, XXX) from data in the article. ***Unclear if Pilots 1 & 2 were mutually exclusive; Pilot 3 was non-respondents to Pilot 2. [#]Number obtained from author.

Appendix 1. Search strategy

EMBASE

1. crossover procedure/
2. double-blind procedure/
3. randomized controlled trial/
4. single-blind procedure/
5. random$.ti,ab.
6. factorial$.ti,ab.
7. crossover$.ti,ab.
8. cross over$.ti,ab.
9. (doubl$ adj blind$).ti,ab.
10. (singl$ adj blind$).ti,ab.
11. assign$.ti,ab.
12. allocat$.ti,ab.
13. or/1-12
14. exp aged/
15. (elder or elders or elderly).ti,ab.
16. ((old or older) adj (age or aged or people or person or adult or adults)).ti,ab,kw.
17. exp Aging/
18. ag?ing.ti,ab,kw.
19. (senior or seniors).ti,ab,kw.
20. ((late or later) adj1 (life or lives)).ti,ab,kw.
21. pensioner$.ti,ab,kw.
22. (retired or retirement).ti,ab,kw.
23. gerontolog$.ti,ab,kw.
24. (veteran or veterans).ti,ab,kw.
25. age-related.ti,ab,kw.
26. (age adj3 (factor$ or adjust$)).ti,ab,kw.
27. or/14-26
28. ((willing$ or inten$) adj5 part$).ti,ab,kw.
29. research subjects/
30. informed consent/
31. "refusal to participate"/
32. ((participate or participation) adj7 (trial$ or RCT$ or stud$ or research)).ti,ab,kw.
33. ((enrol?ment or enrol$1) adj7 (patient$ or participant$ or subject$ or trial$ or RCT$ or stud$)).ti,ab,kw.
34. ((enrol?ment or enrol$1 or enrolling) adj7 (method$ or strateg$ or approach$)).ti,ab,kw.
35. (enrol?ment adj7 (increas$ or improv$)).ti,ab,kw.
36. ((recruit or recruitment) adj7 (patient$ or participant$ or subject$ or trial$ or RCT$ or stud$)).ti,ab,kw.
37. ((recruit or recruitment or recruiting) adj7 (method$ or strateg$ or approach$)).ti,ab,kw.
38. (recruitment adj7 (increas$ or improv$)).ti,ab,kw.
39. (accrual adj7 (increas$ or improv$ or trial$ or stud$ or RCT$ or research)).ti,ab,kw.
40. or/28-39
41. ((minimi$ or prevent$ or lessen$ or decreas$ or reduc$) adj2 attrition).ti,ab,kw.
42. ((minimi$ or prevent$ or lessen$ or decreas$ or reduc$) adj2 drop$-out$).ti,ab,kw.
43. ((minimi$ or prevent$ or lessen$ or decreas$ or reduc$) adj2 dropout$).ti,ab,kw.
44. ((loss or lost) adj2 (follow-up or followup)).ti,ab,kw.
45. ((minimi$ or prevent$ or lessen$ or decreas$ or reduc$) adj2 withdrawal$).ti,ab,kw.
46. ((method$ or approach$ or strateg$) adj3 (drop$-out$ or dropout$ or withdrawal$ or attrition)).ti,ab,kw.
47. ((affect$ or influence$ or impact$ or effect$) adj7 ((drop$-out$ or dropout$ or withdrawal$ or attrition) adj2 (rate$ or questionnaire$ or survey$))).ti,ab,kw.
48. ((method$ or approach$ or strateg$) adj3 (follow-up or followup or response$ or retention)).ti,ab,kw.
49. ((affect$ or influence$ or impact$ or effect$) adj7 ((follow-up or followup or response$ or retention) adj2 (rate$ or questionnaire$ or survey$))).ti,ab,kw.
50. retention rate$.ti,ab,kw.
51. attrition rate$.ti,ab,kw.
52. Patient Dropouts/
53. ((high$ or increas$ or encourag$ or maximi$ or promot$ or improv$) adj2 retention).ti,ab,kw.
54. ((high$ or increas$ or encourag$ or maximi$ or promot$ or improv$) adj2 (response$ or responder$)).ti,ab,kw.
55. or/41-54
56. 13 and 27 and 40
57. limit 56 to Embase
58. 13 and 27 and 55
59. limit 58 to Embase

MEDLINE

1. exp aged/
2. (elder or elders or elderly).ti,ab.
3. ((old or older) adj (age or aged or people or person or adult or adults)).ti,ab,kw.
4. exp Aging/
5. ag?ing.ti,ab,kw.
6. (senior or seniors).ti,ab,kw.
7. ((late or later) adj1 (life or lives)).ti,ab,kw.
8. pensioner$.ti,ab,kw.
9. (retired or retirement).ti,ab,kw.
10. gerontolog$.ti,ab,kw.
11. (veteran or veterans).ti,ab,kw.
12. age-related.ti,ab,kw.
13. (age adj3 (factor$ or adjust$)).ti,ab,kw.
14. or/1-13
15. randomized controlled trial.pt.
16. controlled clinical trial.pt.
17. clinical trials as topic.sh.
18. randomly.ab.
19. trial.ti.
20. randomi#ed.ab.
21. or/15-20
22. exp animals/ not humans.sh.
23. 21 not 22
24. ((willing$ or inten$) adj5 part$).ti,ab,kw.
25. research subjects/
26. informed consent/
27. "refusal to participate"/
28. ((participate or participation) adj7 (trial$ or RCT$ or stud$ or research)).ti,ab,kw.
29. ((enrol?ment or enrol$1) adj7 (patient$ or participant$ or subject$ or trial$ or RCT$ or stud$)).ti,ab,kw.
30. ((enrol?ment or enrol$1 or enrolling) adj7 (method$ or strateg$ or approach$)).ti,ab,kw.
31. (enrol?ment adj7 (increas$ or improv$)).ti,ab,kw.
32. ((recruit or recruitment) adj7 (patient$ or participant$ or subject$ or trial$ or RCT$ or stud$)).ti,ab,kw.
33. ((recruit or recruitment or recruiting) adj7 (method$ or strateg$ or approach$)).ti,ab,kw.
34. (recruitment adj7 (increas$ or improv$)).ti,ab,kw.
35. (accrual adj7 (increas$ or improv$ or trial$ or stud$ or RCT$ or research)).ti,ab,kw.
36. or/24-35
37. ((minimi$ or prevent$ or lessen$ or decreas$ or reduc$) adj2 attrition).ti,ab,kw.
38. ((minimi$ or prevent$ or lessen$ or decreas$ or reduc$) adj2 drop$-out$).ti,ab,kw.
39. ((minimi$ or prevent$ or lessen$ or decreas$ or reduc$) adj2 dropout$).ti,ab,kw.
40. ((loss or lost) adj2 (follow-up or followup)).ti,ab,kw.
41. ((minimi$ or prevent$ or lessen$ or decreas$ or reduc$) adj2 withdrawal$).ti,ab,kw.
42. ((method$ or approach$ or strateg$) adj3 (drop$-out$ or dropout$ or withdrawal$ or attrition)).ti,ab,kw.
43. ((affect$ or influence$ or impact$ or effect$) adj7 ((drop$-out$ or dropout$ or withdrawal$ or attrition) adj2 (rate$ or questionnaire$ or survey$))).ti,ab,kw.
44. ((method$ or approach$ or strateg$) adj3 (follow-up or followup or response$ or retention)).ti,ab,kw.
45. ((affect$ or influence$ or impact$ or effect$) adj7 ((follow-up or followup or response$ or retention) adj2 (rate$ or questionnaire$ or survey$))).ti,ab,kw.
46. retention rate$.ti,ab,kw.
47. attrition rate$.ti,ab,kw.
48. Patient Dropouts/
49. ((high$ or increas$ or encourag$ or maximi$ or promot$ or improv$) adj2 retention).ti,ab,kw.
50. ((high$ or increas$ or encourag$ or maximi$ or promot$ or improv$) adj2 (response$ or responder$)).ti,ab,kw.
51. or/37-50

52. 14 and 23 and 36
53. 14 and 23 and 51

WEB OF SCIENCE

28 #27 AND #26 AND #22
27 TS=(randomised or randomized or randomly) OR TI=(randomised or randomized or randomly)
26 #25 OR #24 OR #23
25 TS=(((old or older) NEAR/1 (age or aged or people or person or adult or adults))) OR TI=(((old or older) NEAR/1 (age or aged or people or person or adult or adults)))
24 TS=(elder or elders or elderly) OR TI=(elder or elders or elderly)
23 TS=(aging or ageing) OR TI=(aging or ageing)
22 #21 OR #20 OR #19 OR #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1
21 TS=(((increas* or encourag* or maximi* or promot* or improv*) NEAR/2 respon*)) OR TI=(((increas* or encourag* or maximi* or promot* or improv*) NEAR/2 respon*))
20 TS=(((increas* or encourag* or maximi* or promot* or improv*) NEAR/2 retention)) OR TI=(((increas* or encourag* or maximi* or promot* or improv*) NEAR/2 retention))
19 TS=("attrition rate*") OR TI=("attrition rate*")
18 TS=("retention rate*") OR TI=("retention rate*")
17 TS=(((affect* or influence* or impact* or effect*) NEAR/3 ((follow-up or followup or response* or retention) NEAR/2 (rate* or questionnaire* or survey*)))) OR TI=(((affect* or influence* or impact* or effect*) NEAR/3 ((follow-up or followup or response* or retention) NEAR/2 (rate* or questionnaire* or survey*))))
16 TS=(((method* or approach* or strateg*) NEAR/2 (follow-up or followup or response* or retention))) OR TI=(((method* or approach* or strateg*) NEAR/2 (follow-up or followup or response* or retention)))
15 TS=(((affect* or influence* or impact* or effect*) NEAR/3 (("drop* out*" or dropout* or withdrawal* or attrition) NEAR/2 (rate* or questionnaire* or survey*)))) OR TI=(((affect* or influence* or impact* or effect*) NEAR/3 (("drop* out*" or dropout* or withdrawal* or attrition) NEAR/2 (rate* or questionnaire* or survey*))))
14 TS=(((method* or approach* or strateg*) NEAR/2 ("drop* out*" or dropout* or withdrawal* or attrition))) OR TI=(((method* or approach* or strateg*) NEAR/2 ("drop* out*" or dropout* or withdrawal* or attrition)))
13 TS=(((minimi* or prevent* or lessen* or decreas* or reduc*) NEAR/2 withdrawal*)) OR TI=(((minimi* or prevent* or lessen* or decreas* or reduc*) NEAR/2 withdrawal*))
12 TS=(((minimi* or prevent* or lessen* or decreas* or reduc*) NEAR/2 dropout*)) OR TI=(((minimi* or prevent* or lessen* or decreas* or reduc*) NEAR/2 dropout*))
11 TS=(((minimi* or prevent* or lessen* or decreas* or reduc*) NEAR/2 "drop* out*")) OR TI=(((minimi* or prevent* or lessen* or decreas* or reduc*) NEAR/2 "drop* out*"))
10 TS=(((minimi* or prevent* or lessen* or decreas* or reduc*) NEAR/2 attrition)) OR TI=(((minimi* or prevent* or lessen* or decreas* or reduc*) NEAR/2 attrition))
9 TS=((accrual NEAR/2 (increas* or improv* or trial* or stud* or RCT* or research))) OR TI=((accrual NEAR/2 (increas* or improv* or trial* or stud* or RCT* or research)))
8 TS=((recruitment NEAR/2 (increas* or improv*))) OR TI=((recruitment NEAR/2 (increas* or improv*)))
7 TS=((recruitment NEAR/2 (method* or strateg* or approach*))) OR TI=((recruitment NEAR/2 (method* or strateg* or approach*)))
6 TS=((recruitment NEAR/2 (patient* or participant* or subject* or trial* or RCT* or stud*))) OR TI=((recruitment NEAR/2 (patient* or participant* or subject* or trial* or RCT* or stud*)))
5 TS=((enrollment NEAR/2 (increas* or improv*))) OR TI=((enrollment NEAR/2 (increas* or improv*)))
4 TS=((enrollment NEAR/2 (method* or strateg* or approach*))) OR TI=((enrollment NEAR/2 (method* or strateg* or approach*)))
3 TS=((enrollment NEAR/2 (patient* or participant* or subject* or trial* or RCT* or stud*))) OR TI=((enrollment NEAR/2 (patient* or participant* or subject* or trial* or RCT* or stud*)))
2 TS=((participation NEAR/2 (trial* or RCT* or stud* or research))) OR TI=((participation NEAR/2 (trial* or RCT* or stud* or research)))
1 TS=(((willing* or inten*) NEAR/2 part*)) OR TI=(((willing* or inten*) NEAR/2 part*))
.

Appendix 2. Characteristics of included studies (full version)

Author, Year & Country	Study design	Population & age (years) Number of participants (n)	Intervention strategy/strategies	Comparison strategy/strategies*	Outcomes (recruitment, response, retention)
Adamis et al, 2005, UK [20]	Open randomised study	Patients aged 70+ admitted to an elderly care assessment unit n=130	Separate, formal test of capacity preceding consent	Combined informal capacity/consent process	Proportion consenting to participate
Avenell et al, 2004, UK [21]	Randomised controlled trial	Patients aged 70+ with osteoporotic fracture identified from hospital notes (eligible for RECORD trial) n=538	Open randomised trial (participants knew their tablet/no tablet allocation)	Blinded, placebo-controlled randomised trial	Proportions recruited Proportions remaining in study at 1 year
Colt et al, 2005, USA [22]	Quasi-randomised study	Cases aged 20-79 with kidney cancer, and matched controls n=411 (age 65+)	Contact letter with full disclosure of optional biospecimen collection	Contact letter with partial disclosure of optional biospecimen collection (described after interview)	Interview particpation rates Willingness to provide samples
Cyarto et al, 2006, Australia [23]	Quasi-randomised trial	Residents of six independent-living retirement villages Age not restricted n=119 (age 65-96)	Individual training program delivered at home (Have A Try (HAT))	Supervised group training program (Come Have A Try (CHAT))	Retention rates
Doody et al, 2003, USA [24]	Randomised trial	Non-responders in a follow-up survey of radiologic technologists Age not restricted n=105 (age 70+)**	Questionnaire delivery by US first-class mail: $1 cash $2 cash $2 cheque $5 cheque) Questionnaire delivery by Federal Express: $1 cash $2 cash $2 cheque	No incentive No incentive	Questionnaire response

Edelman et al, 2013, USA [25]	Randomised study	Adults aged 65+ in a rural county home-delivered meals program n=139	Survey delivery by hand from home-delivered meals drivers	Survey delivery by first class post	Response rates
Evans et al, 2004, USA [26]	Randomised study	Males diagnosed with prostate cancer (1997-2002) in a cancer registry Age not restricted n=691 (age >65)	Unconditional, immediate incentive sent with survey	Conditional, delayed incentive (sent after receipt of completed survey)	Response rates
Griffin et al, 2011, USA [27]	Randomised trial	Non-responders in a survey of primary care patients at four Veterans Health Administration medical centres Age not restricted n=456 (age >75)	$5 cash sent with one page survey	$2 cash sent with one page survey	Overall response rates Response rates by incentive
Harris et al, 2008, UK [28]	Randomised controlled trial	Adults aged 65+, registered with a general practice n=560	No telephone call, no questionnaire No telephone call, questionnaire Telephone call, no questionnaire Telephone call, questionnaire		Recruitment to study
Harrison et al, 2002, UK [29]	Randomised controlled trial	Adults aged 18+ from a health authority register n=80 (age 65+)	Survey with first class post office stamped addressed reply envelope	Survey with pre-paid business franked addressed reply envelope	Response rates
Hoffman et al, 1998, USA [30]	Quasi-randomised trials: 3 pilot studies	Adults in a blood specimen bank cohort Age not restricted 1st pilot: n=502 (age 65+) 2nd pilot: n=679 (age 65+)*** 3rd pilot: n=222 (non-respondents to 2nd pilot; age 65+)	1st pilot: Long questionnaire 2nd pilot: Newspaper article Pencil Newspaper article & pencil 3rd pilot: Letter & second questionnaire	Short questionnaire No incentive Postcard reminder	Response

Iglesias & Torgerson, 2000, UK [31]	Quasi-randomised trial	Female patients aged 70+, from a general practice n=847	Short length questionnaire Medium length questionnaire Long length questionnaire		Response rates Willingness to enter randomised trial
Junghans et al, 2005, UK [32]	Randomised controlled trial	Patients with angina from two general practices Age not restricted n=261 (age 70+)	Opt-in: Invitation letter asking patients to return reply card or telephone if willing to participate	Opt-out: Invitation letter stating that patients would be contacted by researcher unless patient declined participation by reply card or telephone	Recruitment rate (clinic attendance)
Kelly et al, 2010, USA [33]	Randomised trial	Breast, prostate and colon cancer patients from a cancer registry in 2005 Age not restricted n=680 (age 65+)[#]	Short survey & $3 Short survey & $5 Long survey & $3 Long survey & $5		Response rates to interventions
Kimmick et al, 2005, USA [34]	Randomised trial	Member institutions of a national cancer institute–funded cooperative group, recruiting patients aged 18+ n=125 institutions	Educational intervention & standard information	Standard information	Percentage of accrual of persons aged 65+ compared with baseline
Lavelle et al, 2008, UK [35]	Randomised trial	Non-responders in a survey of female patients aged 65+ attending breast clinics n=477	Reminder survey with first class stamped addressed reply envelope	Reminder survey with pre-paid addressed reply envelope	Response rates to reminder survey
MacLennan et al, 2014, UK [36]	Randomised trial	Non-responders to annual questionnaire aged 70+ in RECORD trial n=753	Advance telephone call followed by usual study reminder schedule for annual questionnaire	No advance telephone call: usual study reminder schedule for annual questionnaire	Proportion of questionnaires returned within 3 weeks of reminder Proportion of questionnaires returned at 4 months

Mitchell et al, 2012 UK, [37]	Randomised trial	Female SCOOP trial participants aged 70-84, recruited from GP practices n=2686	Pre-notification: newsletter sent before questionnaire	No pre-notification: newsletter sent after questionnaire returned	Questionnaire response rate
Mitchell et al, 2011, UK [38]	Quasi-randomised trial	Females aged 70-85 from GP practices taking part in first phase of SCOOP trial n=2803	Invitation pack sent with brown mailing & reply envelopes	Invitation pack sent with white mailing & reply envelopes	Response rates for invitation process Response rates for consenting process Response rates for return of first questionnaire
Mudano et al, 2013, USA [39]	Quasi-randomised trial	Females aged 65+ from community-based physician offices n=160	Recruitment using web-based tablet computer in physician office	Recruitment using Interactive Voice Response System (via cell phone) in physician office	Completion of screening questions Willingness to participate in hypothetical trial
Nápoles-Springer, et al, 2004, USA [40]	Randomised trial	African-American or White primary care patients aged 50+ n=300 (age 65+)[#]	Advance notice letter sent 2 weeks prior to survey	No advance letter/other contact prior to survey	Survey response rates
O'Connor 2011, Denmark [41]	Randomised trial	Married persons aged 65-80 from Danish Central Person Register n=1200	Short, non-sensitive questionnaire Full questionnaire & recorded response Full questionnaire & financial incentive (50DKr/$10 voucher)	Full questionnaire	Response rate, overall and by age

Perkins & Sanson-Fisher, 1998, Australia [42]	Quasi-randomised trial	Residents of households in region of state, aged 16+ n=236 (age 65+)**	Invitation to complete SF-36 by telephone	Invitation to complete SF-36 by post	Consent to complete telephone interview or return of questionnaire
Pighills et al, 2009, UK [43]	Two quasi-randomised trials	Persons aged 70+ registered at one general practice n=7233	1st trial: Original newspaper article 2nd trial: More favorably written newspaper article	No article Original newspaper article	Response & recruitment rates
Puffer et al, 2004, UK [44]	Randomised trial	Female responders to a questionnaire aged 72+ from five general practices n=3836	Single-sided booklet Double-sided booklet Single-sided multiple booklet Double-sided multiple booklet		Overall response rates
Shah et al, 2001, UK [45]	Randomised controlled trial	Patients aged 65-74 in a general practice n=390	Consent form and income questions Consent form only Income only questions No income questions or consent form		Response rates
Smeeth et al, 2001, UK [46]	Randomised comparison of methods	Patients aged 75+ registered with 106 general practices n=42278	Questionnaire delivered by post Questionnaire administered by lay interviewer Questionnaire administered by nurse		Response rates

Taylor et al, 2006, UK [47]	Randomised study	Adults aged 65+ in 5 general practices n=2449	Black ink questionnaire & brown envelope Black ink questionnaire & white envelope Green ink questionnaire & brown envelope Green ink questionnaire & White envelope		Response rate
Trevena et al, 2006, Australia [48]	Randomised controlled trial	Patients aged 50–74 from one general practice n=36 (age 65-74)	Opt-in: Letter sent advising patients that researchers would contact patients only if patients responded by reply card, telephone or email	Opt-out: Letter sent advising patients that researchers would contact patients unless patients contacted practice to withhold their contact details	Proportion recruited
Verboncoeur et al, 2000, USA [49]	Randomised study	Adults aged 65+ enrolled in two Health Maintenance Organisations n=1102	Invitation letter and refusal postcard	Invitation letter and no refusal postcard	Refusal rates to complete telephone survey
Wensing & Schattenberg, 2005, Netherlands [50]	Randomised controlled trial	Non-responders to a questionnaire aged 70+, registered with 26 general practitioners n=955	Reminder & questionnaire Reminder & request to explain non-response	Simple reminder card	Response rates
Ziegenfuss et al, 2011, USA [51]	Randomised study	Individuals aged 18+ in the Mayo Health System diabetes registry n=2227 (age 65+)[#]	Survey with option to receive study results	Survey with no option to receive study results	Survey response rate

*No comparison group listed for factorial studies.

**Number calculated by reviewers from data in the article.

***Unclear if 1st and 2nd pilot studies were mutually exclusive.

[#]Number obtained from author.

Appendix 3. Full reference list

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Appendix 4. Risk of bias within included studies

First author & Year	Random sequence generation described	Allocation to interventions concealed	Blinding of participants &/or personnel	Incomplete outcome data	Selective reporting	Overall risk of bias, using key domains*
Adamis 2005	L	L	U	L	L	**L**
Avenell 2004	L	L	L	L	L	**L**
Colt 2005	H	U	U	L	L	**H**
Cyarto 2006	H	U	U	L	L	**H**
Doody 2003	U	U	U	L	L	**U**
Edelman 2013	L	L	U	L	L	**L**
Evans 2004	U	U	U	L	L	**U**
Griffin 2011	L	L	U	L	L	**L**
Harris 2008	L	L	L	L	L	**L**
Harrison 2002	L	L	U	L	L	**L**
Hoffman 1998	H	U	U	U	L	**H**
Iglesias 2000	H	L	U	L	L	**H**
Junghans 2005	L	L	L	L	L	**L**
Kelly 2010	L	U	L	L	L	**U**
Kimmick 2005	U	U	U	L	L	**U**
Lavelle 2008	L	L	L	U	L	**U**
MacLennan 2014	L	L	U	L	L	**L**
Mitchell 2012	L	L	U	L	L	**L**
Mitchell 2011	H	L	L	L	L	**H**
Mudano 2013	H	U	U	U	L	**H**
Nápoles-Springer 2004	L	U	U	U	L	**U**
O'Connor 2011	U	U	U	U	U	**U**
Perkins 1998	H	U	L	U	L	**H**
Pighills 2009	H	U	L	U	U	**H**
Puffer 2004	U	U	L	U	L	**U**
Shah 2001	U	U	U	L	U	**U**
Smeeth 2001	L	L	U	L	L	**L**
Taylor 2006	L	L	U	L	L	**L**
Trevena 2006	L	L	L	L	L	**L**
Verboncoeur 2000	U	U	U	L	L	**U**
Wensing 2005	L	L	U	U	L	**U**
Ziegenfuss 2011	U	U	L	U	L	**U**

L = Low risk of bias; H = High risk of bias; U = Unclear risk of bias

*Overall risk of bias was assessed using four key domains (adequacy of random sequence generation, allocation concealment, completeness of outcome data and selective reporting): **L**=low risk of bias for all key domains; **U**=unclear risk of bias for ≥1 key domains; **H**=high risk of bias for ≥1 key domains[19].

Appendix 5. Results from included studies, grouped by strategy

First author & year	Strategies compared	Age (years) n	Results		Absolute rates of recruitment, retention, or response	Conclusion
Consent process						
Adamis et al, 2005 [20]	Formal test of capacity Informal capacity/consent process	70+	**Entered study**: 25/57 (43.9%) 54/73 (74%)	X^2=12.1, df=1, p<0.001	Recruitment: 79/130 = 60.8%	Informal capacity/consent process increased recruitment
Study design						
Avenell et al, 2004 [21]	Open randomised trial Blinded, placebo-controlled randomised trial	70+	**Recruitment**: 134/180 (74.4%) 233/358 (65.1%)	9.4% difference (1.3%,17.4%) OR 1.56 (1.05, 2.33)	Recruitment: 367/538 = 68.2%	Open trial design increased recruitment
	Open randomised trial Blinded, placebo-controlled randomised trial	70+	**Retention at one year**: 105/134 (78.4%) 152/233 (65.2%)	13.9% difference (3.1%,24.6%)	Retention: 257/367 = 70.0%	Open trial design increased retention
Method of approach / administration						
Colt et al, 2005 [22]	Full disclosure of biospecimen collection	65+*	**Consent to interview**: Cases: 50/60 (83.3%) Controls: 81/145 (55.9%)		Response: 268/411 = 65.2%	No difference in consent to interview between full and partial disclosure***
	Partial disclosure of biospecimen collection		Cases: 56/70 (80%) Controls: 81/136 (59.6%)	3.3% difference (-10.0%,16.6%) -3.7% difference (-15.2%,7.9%)		
	Full disclosure of biospecimen collection		**Consent to blood sample**: Cases: 39/50 (78%) Controls: 62/81 (76.5%)			No difference in consent to blood sample between full and partial disclosure***
	Partial disclosure of biospecimen collection		Cases: 37/55 (67.3%) Controls: 59/81 (72.8%)	10.7% difference (-6.2%,27.6%) 3.7% difference (-9.7%,17.1%)		
Edelman et al, 2013 [25]	Survey delivery by hand Survey delivery by first class post	65+	**Response**: 39/69 (56.5%) 22/70 (31.4%)	X^2=11.40, df=1, p<0.01	Response: 61/139 = 43.9%	Hand delivered surveys increased response rates

Harris et al, 2008 [28]	Telephone contact No telephone contact	65+	**Recruitment**: 134/280 (47.9%) 106/280 (37.9%)	10% difference (0.2%,19.8%) OR 1.5 (1.0,2.3) p=0.046	Recruitment: 240/560 = 42.9%	Telephone contact increased recruitment
	No questionnaire inclusion Questionnaire inclusion		124/280 (44.3%) 116/280 (41.4%)	−2.9% difference (−12.7%,7.0%) OR 0.9 (0.6,1.3) p=0.570		Questionnaire inclusion did not reduce recruitment
Junghans et al, 2005 [32]	Opt-in invitation letter Opt-out invitation letter	70+*	**Recruitment****: 49/127 (38.6%) 70/134 (52.2%)	13.6% difference**	Recruitment: 119/261 = 45.6%**	Opt-in approach decreased response rates***
Trevena et al, 2006 [48]	Opt-in letter Opt-out letter	65-74*	**Recruitment**: 10/22 (45.6%) 9/14 (64.3%)	18.7% difference** p=0.27	Recruitment: 19/36 = 52.8%**	Opt-in decreased recruitment (not statistically significant)
Mudano et al, 2013 [39]	Web-based tablet computer Interactive Voice Response System	65+	**Completed screening questions**: 93/93 (100%) 46/67 (69%)			Tablet computer technology increased completion of screening questions
	Web-based tablet computer Interactive Voice Response System		**Interest in participating in hypothetical trial**: 32/91 (35.2%) 13/64 (20.3%)	p=0.045	Recruitment: 45/155 = 29.0%**	Tablet computer increased interest in participating in a hypothetical clinical trial
Perkins & Sanson-Fisher, 1998 [42]	Invitation to complete questionnaire by post Invitation to complete questionnaire by telephone	65-74*	**Consent to complete****: 75/89 (84.3%) 67/79 (84.8%)	0.5% difference**	Response: 184/236 = 78.0%** (age 65+)	No difference between invitation to complete questionnaire by telephone or by post***
	Invitation to complete questionnaire by post Invitation to complete questionnaire by telephone	75+*	17/25 (68.0%) 25/43 (58.1%)	-9.9% difference**		Invitation by post increased consent to complete questionnaire***

Smeeth et al, 2001 [46]	Questionnaire administered by post Questionnaire administered by lay interviewer Questionnaire administered by nurse interviewer	75+	**Response rate**: 12857/15407 (83.5%; 80.9%,85.7%) 9775/13229 (73.9%; 69.5%,77.8%) 10358/13642 (75.9%; 70.4%,80.7%)	8.5% difference (4.4%,12.7%) p<0.001 between mean of interview methods (74.9%) and postal method 2% difference between interview methods (-4.4%,8.5%) p=0.53	Response: 32990/42278 = 77.9%	Questionnaire administered by post increased response rate
Verboncoeur et al, 2000 [49]	Invitation letter and refusal postcard Invitation letter and no refusal postcard	65+	**Refusal rate** (response rate**): 53/166 (32%) (105/166 (63.3%)) 132/936 (14%) (718/936 (76.7%))	X^2=31.6, p=0.001	Response: 823/1102 = 74.7%**	Refusal postcard increased refusal rate
Incentive						
Doody et al, 2003 [24]	Questionnaire & no incentive Questionnaire & $1 cash Questionnaire & $2 cash Questionnaire & $2 check Questionnaire & $5 check	70+*	**Response****: 3/24 (12.5%) 4/23 (17.4%) 9/19 (47.4%) 6/26 (23.1%) 4/13 (30.8%)	p<0.05 between $2 cash and referent	Retention: 26/105 = 24.8%**	$2 cash increased response
Griffin et al, 2011 [27]	Survey & $2 cash Survey & $5 cash	>75*	**Response rate**: After 1st questionnaire & postcard 57.01% After 2nd questionnaire 76.17% After 1st questionnaire & postcard 66.94% After 2nd questionnaire 76.45%	Adjusted OR 1.53 (1.04-2.23) Adjusted OR 1.02 (0.66-1.57)	Response: 348/456 = 76.3%**	$5 cash increased response after first questionnaire mailing & reminder postcard $5 cash did not increase response after second questionnaire mailing
Evans et al, 2004 [26]	Survey & immediate financial incentive Survey & delayed financial incentive	>65*	**Response**: 221/355 (62%) 206/336 (61%)	1% difference**	Response: 427/691 = 61.8%	No difference in response between timing of incentives

Hoffman et al, 1998 (i) [30]	Questionnaire &		**Response** (2nd pilot):			
	No incentive	65-74*	58.5%			Inclusion of newspaper article, and article and pencil, increased response slightly***
	Newspaper article		63.9%	5.4% difference**	Retention: 387/679 = 57.0%** (age 65+)	
	Pencil		59.3%			
	Newspaper article & pencil		65.1%	6.6% difference**		
	Questionnaire &					
	No incentive	75+*	50.0%			Inclusion of newspaper article decreased response***
	Newspaper article		41.7%	-8.3% difference**		
	Pencil		54.4%			
	Newspaper article & pencil		50.8%			
Pighills et al, 2009 [43]	Recruitment pack &:		**Recruitment**:		Recruitment:	
	Original newspaper article	70+	73/2243 (3.25%)		144/4488 = 3.2%	Newspaper article very slightly increased recruitment (not statistically significant)
	No article		71/2245 (3.16%)	p=0.80 (-0.94,1.12)		
	Recruitment pack &:		**Recruitment**:		Recruitment:	Newspaper article very slightly increased recruitment (not statistically significant)
	More favourably written newspaper article	70+	57/1374 (4.15%)		111/2745 = 4.0%	
	Original newspaper article		54/1371 (3.94%)	p=0.75 (-1.00,2.00)		
Ziegenfuss et al, 2011 [51]			**Response rate**:			
	Survey with option to receive study results	65-79*	451/887 (50.8%)			No difference in response rate between offer and no offer of study results
	Survey with no option to receive study results		442/844 (52.4%)	Response rates did not differ by condition at p<0.05	Response: 1117/2227 = 50.2% (age 65+)[#]	
	Survey with option to receive study results	≥80*	108/247 (43.7%)			No difference in response rate between offer and no offer of study results
	Survey with no option to receive study results		116/249 (46.6%)	Response rates did not differ by condition at p<0.05		
Incentive & Questionnaire length						
Kelly et al, 2010 [33]			**Response rate**:		Response:	
	Long survey & $3 cash	65+*	85/162 (52.5%)		383/680 = 56.3%[#]	No difference in response rate[#]
	Long survey & $5 cash		90/167 (53.9%)			
	Short survey & $3 cash		105/176 (59.7%)			
	Short survey & $5 cash		103/175 (58.9%)	X^2=2.632, p=0.452[#]		
Mode of survey reply						

Harrison et al, 2002 [29]	1st class stamped addressed reply envelope	65+*	**Response rate**: 33 (84.6%)		Response: 66/80 = 82.5%**	No difference in response rates between first class stamp and pre-paid business franked reply envelopes
	Pre-paid business franked addressed reply envelope		33 (80.5%)	4.1% difference**		
Lavelle et al, 2008 [35]	First class stamped addressed reply envelope	65+	**Response rate**: 76/239 (31.8%)		Response: 140/477 = 29.4%	No difference in response rates between stamped and prepaid return envelopes
	Pre-paid addressed reply envelope		64/238 (26.9%)	4.9% difference (-3.3%,13.1%) X^2=1.39, df=1, p=0.239		
Questionnaire length / content						
Hoffman et al, 1998 (ii) [30]	Long questionnaire	65-74*	**Intial response (1st pilot)**: 45.2%			No difference in response between long and short questionnaire***
	Short questionnaire		46.7%	1.5% difference**	Retention: 206/502 = 41.0% (age 65+)**	
	Long questionnaire	75+*	31.2%			No difference in response between long and short questionnaire ***
	Short questionnaire		33.3%	2.1% difference**		
Iglesias & Torgerson, 2000 [31]	Short questionnaire	70+	**Response**: 135/276 (48.9%)		Response: 389/847 = 45.9%	Longer length questionnaire length reduced response rate
	Medium questionnaire		135/277 (48.7%)	9% difference (0.3%,16.6%) between short and long		
	Long questionnaire		119/294 (40.5%)			
	Short questionnaire		**Willingness to enter trial**: 20/276 (7.2%)			No effect of questionnaire length on numbers willing to enter trial
	Medium questionnaire		25/277 (9.0%)			
	Long questionnaire		26/294 (8.8%)			
O'Connor 2011 [41]	Full questionnaire	65-81	**Response**: 94/300 (31%)		Response: 486/1200 = 40.5%**	Highest response rate in group receiving financial incentive
	Short non-sensitive questionnaire		107/300 (36%)			
	Full questionnaire & recorded response		132/300 (44%)			Significant differences in response rate between all groups
	Full questionnaire & financial incentive		153/300 (51%)	X^2=27.79, n=1200, p<0.0005		

Puffer et al, 2004 [44]	Single-sided booklet Double-sided booklet Single booklet Multiple booklet	72+	**Response**: 480/960 (50%) 469/948 (49.4%) 475/961 (49.5%) 446/967 (46.1%)	 OR 1.119 (0.738,1.696) p=0.597 OR 1.114 (0.735,1.688) p=0.611	Response: 1870/3836 = 48.7%	Single-sided paper did not increase response Multiple, separate booklets did not increase response
Shah et al, 2001 [45]	Consent form and income question Consent form only Income question only No income question or consent form	65-74	**Final response rate**: 72.2% 59.4% 56.9% 63.3%	 p=0.13	Response: 245/390 = 62.8%	Income question or consent form for access to medical records did not reduce response
Mode of survey reminder						
Hoffman et al, 1998 (iii) [30]	Second questionnaire reminder Postcard reminder Second questionnaire reminder Postcard reminder	65-74* 75+*	**Response (3rd pilot)**: 29.8% 10.8% 25.0% 9.1%	 p<0.05 p<0.05	Retention: 42/222 = 18.9% (age 65+)**	Second mailing of questionnaire increased response Second mailing of questionnaire increased response
Wensing & Schattenberg, 2005 [50]	Simple reminder card Reminder & questionnaire Reminder & request to explain non-response Simple reminder card Reminder & questionnaire Reminder & request to explain non-response	70+	**Initial response**: 216/379 (57%) 152/288 (53%) 162/288 (56%) **Final response**: 252/379 (66%) 200/288 (69%) 188/288 (65%)	 RR 1.60 (1.11,2.31) RR 0.93 (0.60,1.46) RR 1.04 (0.94,1.16) RR 0.98 (0.88,1.10)	 Final response 640/955 = 67.0%	Reminder & questionnaire increased initial response No effect of either intensive follow-up procedure on final response
Education						

Kimmick et al, 2005 [34]		65+	**Accrual of patients at baseline**:			
	Educational information		40%			Educational intervention did not increase accrual
	Standard intervention		36%	p=0.40		
			Accrual of patients during year 1:			
	Educational information		36%			
	Standard information		32%	p=0.35		
			Accrual of patients during year 2:		Recruitment at 2 years = 31%	
	Educational information		31%			
	Standard information		31%	p=0.83		
Advance notification						
MacLennan et al, 2014 [36]		70+	**Response to reminder questionnaire**:		Retention: 492/753 = 65.3%**	
	Advance telephone call & usual reminder schedule		265/390 (67.9%)	OR 1.27 (0.94,1.72) p=0.12 ITT (RD 5.4%; −1.4,12.2)		Advance telephone call increased response to reminder questionnaire slightly
	Usual reminder schedule		227/363 (62.5%)	ATT (RD 6.2%; −1.6,14.0)		
			Response to next questionnaire at 4 months:			
	Advance telephone call & usual reminder schedule		202/390 (51.8%)	OR 1.44 (1.08,1.92) p=0.013		Advance telephone call increased response to the next questionnaire sent at 4 months
	Usual reminder schedule		155/363 (42.7%)	ITT (RD 9.1%; 2.0,16.2) ATT (RD 10.4%; 2.2,18.5)		
Mitchell et al, 2012 [37]		70-84	**Response**:		Retention: 2562/2686 = 95.4%	
	Newsletter sent before questionnaire		1291/1342 (96.2%)			Small (statistically significant) increase in response using pre-notification newsletter
	Newsletter sent after questionnaire returned		1271/1344 (94.6%),	1.6% difference, p=0.05, OR 1.45 (1.01,2.10)		
Nápoles-Springer, et al, 2004 [40]		65+*	**Number of returned surveys**[#]:		Response: 103/300 = 34.3%[#]	Advance notice letter increased response compared to no advance letter***
	Advance notice letter sent prior to survey		62/150 (41.3%)			
	No advance notice letter		41/150 (27.3%)	14% difference**		
Ink / Envelope colour						

Mitchell et al, 2011 [38]			**Response to invitation**:			
	Brown mailing and reply envelopes	70-85	1096/1402 (78%)			No effect of envelope colour on response to participate in trial or response to questionnaire
	White mailing and reply envelopes		1086/1401 (78%)	OR 1.04 (0.87,1.24)		
			Consent to take part in trial:		Recruitment: 1119/2803 = 39.9%	
	Brown mailing and reply envelopes		535/1096 (49%)			White envelope colour increased consent to take part in trial (not statistically significant)
	White mailing and reply envelopes		584/1086 (54%)	OR 0.86 (0.74,1.00) p=0.06		
			Response to questionnaire:			
	Brown mailing and reply envelopes		502/534 (94%)			
	White mailing and reply envelopes		537/571 (94%)	OR 0.99 (0.60,1.63)		
Taylor et al, 2006 [47]			**Response rates**:		Response: 1556/2449 = 63.5%	Questionnaires printed in green ink increased response rate
	Black ink questionnaire	65+	757/1232 (61.4%)			
	Green ink questionnaire		799/1217 (65.7%)	OR 1.20 (1.02,1.41)		
	Brown envelope		773/1241 (62.3%)			No effect of envelope colour on response rate
	White envelope		783/1208 (64.8%)	OR 0.90 (0.76,1.06)		
Location						
Cyarto et al, 2006 [23]			**Retention**:		Retention: 49/119 = 41%**	Delivery of intervention in supervised group increased retention
	Individual, at home training program (HAT)	81.5 (6.1)[#]	8/38 (21%)			
	Supervised group training program (CHAT)	78.7 (6.1)[##]	41/81 (51%)	X^2=9.33, df=1, p=0.002		

For relative risk (RR), odds ratio (OR), risk difference (RD) and percentage difference, 95% confidence intervals are given in brackets following the value.
*Data reported in this systematic review is for this specific age. The authors also presented data for ages <65 years in the article.
**Results for this specific age group calculated by reviewers from data in the article.
***Conclusion by reviewers, not authors of articles, since no conclusion or statistical testing reported for this age.
[#]Number obtained from author.
[##]Baseline mean age (standard deviation).

Appendix 6. Summary of successful strategies

First author & year	Recruitment or Response or Retention	Strategies	Age (years)	Which intervention increased recruitment, response or retention?	Overall risk of bias
		Method of approach			
Harris 2008 [28]	Recruitment to Obs	No telephone call, no questionnaire vs No telephone call, questionnaire vs Telephone call, no questionnaire vs Telephone call, questionnaire	65+	Telephone contact	Low
Junghans 2005 [32]	Recruitment to Obs	Opt-in (by reply card / telephone) vs Opt-out (by reply card / telephone)	70+	Opt-out approach**	Low
Trevena 2006 [48]	Recruitment to Trial	Opt-in (by reply card / telephone / email) vs Opt-out (by telephone)	65-74	Opt-out approach (not sig)	Low
Verboncoeur 2000 [49]	Response	Refusal postcard vs No refusal postcard	65+	No refusal postcard	Unclear
		Method of administration			
Edelman 2013 [25]	Response	Survey delivery by hand from home-delivered meals drivers vs Delivery by first class post	65+	Hand delivered surveys	Low
Mudano 2013 [39]	Recruitment to hypothetical Trial	Web-based tablet computer vs Interactive Voice Response System (by telephone)	65+	Tablet administered screening questions	High
Perkins 1998 [42]	Response	Invitation to complete questionnaire by telephone vs By post	65-74 75+	No difference. Invitation to complete questionnaire by post**	High
Smeeth 2001 [46]	Response	Screening assessment questionnaire delivered by post vs Administered by lay interviewer vs Administered by nurse	75+	Postal approach	Low
		Incentive			

Doody 2003 [24]	Retention in Cohort	$1 cash vs $2 cash vs $2 cheque vs $5 cheque	70+	$2 cash	Unclear
Hoffman 1998 (i) [30]	Retention in Cohort	Newspaper article vs Pencil vs Article & pencil vs No incentive	65-74	Newspaper article Newspaper article & pencil	High
Hoffman 1998 (i) [30]	Retention in Cohort	Newspaper article vs Pencil vs Article & pencil vs No incentive	75+	Newspaper article decreased response	High
Questionnaire length / content					
Iglesias 2000 [31]	Response	Short questionnaire vs Medium vs Long	70+	Short questionnaire Medium questionnaire	High
Iglesias 2000 [31]	Willingness to participate in Trial	Short questionnaire vs Medium vs Long	70+	No effect	High
O'Connor 2011 [41]	Response	Full questionnaire vs Short questionnaire vs Full questionnaire & recorded response* vs Full questionnaire & incentive	65-81	Full questionnaire & financial incentive Full questionnaire & recorded response	Unclear
Advance notification					
MacLennan 2014 [36]	Retention in Trial	Advance telephone call & usual reminder schedule vs Usual reminder schedule	70+	Advance telephone call (slight increase; greater increase at 4 months)	Low
Mitchell 2012 [37]	Retention in Trial	Newsletter sent before questionnaire vs Newsletter sent after questionnaire returned	70-84	Pre-notification newsletter	Low
Nápoles-Springer 2004 [40]	Response	Advance notice letter sent prior to survey vs No advance notice letter	65+	Advance notice letter**	Unclear
Method of survey reminder					
Hoffman 1998 (iii) [30]	Retention in Cohort	Second questionnaire reminder vs Postcard reminder	65-74	Second questionnaire reminder	High
Hoffman 1998 (iii) [30]	Retention in Cohort	Second questionnaire reminder vs Postcard reminder	75+	Second questionnaire reminder	High
Ink / Envelope colour					
Taylor 2006 [47]	Response	Black ink questionnaire & brown envelope vs Black ink & white envelope vs Green ink & brown envelope vs Green ink & white envelope	65+	Green ink questionnaire No effect of envelope colour	Low

Consent process					
Adamis 2005 [20]	Recruitment to Obs	Formal vs Informal capacity & consent process	70+	Informal consent process	Low
Study design					
Avenell 2004 [21]	Recruitment to Trial	Open randomised trial vs Blinded, placebo-controlled randomised trial	70+	Open trial design	Low
Avenell 2004 [21]	Retention in Trial	Open randomised trial vs Blinded, placebo-controlled randomised trial	70+	Open trial design	Low
Location of intervention delivery					
Cyarto 2006 [23]	Retention in Trial	Intervention delivered Individually at home vs In supervised group	Means 81.5 (SD 6.1), 78.7 (6.1)	Delivery of intervention in supervised group	High

*Recipient had to sign to receive the letter.
**Statistical testing unavailable for this age group.