ANNALS OF FAMILY MEDICINE

Online Supplementary Material

Lau D, Hu J, Majumdar SR, Storie DA, Rees SE, Johnson JA. Interventions to improve influenza and pneumococcal vaccination rates among community-dwelling adults: A systematic review and meta-analysis. *Ann Fam Med*. 2012;10(6):538-546.

http://www.annfammed.org/content/10/6/538/suppl/DC1

Supplemental Appendix A. This appendix contains detailed methods (including the search strategy), and information on excluded and included studies. Exhibit A.1 summarizes recommendations for influenza and pneumococcal vaccination. The search strategy is reported in Exhibit A.2. Exhibits A.3 and A.4 are tables listing excluded studies and reasons for exclusion. Exhibit A.5 contains detailed descriptions of the design, interventions, and results of the included studies.

This appendix contains the detailed methods (including the search strategy), and information on excluded and included studies. Exhibit A.1 summarizes recommendations for influenza and pneumococcal vaccination. The search strategy is reported in Exhibit A.2. Exhibits A.3 and A.4 are tables listing excluded studies and reasons for exclusion. Exhibit A.5 contains detailed descriptions of design, interventions, results, and Downs and Black quality scores for 106 included studies, comprising 151 intervention-control comparisons. One-hundred and eleven comparisons from 77 studies entered meta-analysis. Studies that did not enter meta-analysis met inclusion criteria, but may not have reported vaccination outcomes in a manner conducive to meta-analysis. For example, some studies converted vaccination rates to continuous performance scores for each physician. Two studies were excluded from analyses as outliers (1)(2). Removal of these studies led to dramatic decreases in heterogeneity within the team change (nurses with responsibilities for administering vaccine) strata. Exhibit A.6 lists each included study and the meta-analyses to which they contributed.

Contents

Exhibit A.1. Recommendations of the US Advisory Committee on Immunization Practices (ACIP)

2010 Influenza vaccination recommendations (adults)

- All persons aged >= 6 months

ACIP, 2010

2009 Influenza vaccination recommendations (adults)

These recommendations have been succeeded by a policy of universal vaccination. However, ACIP considers the following groups "high risk", and therefore deserving of particular emphasis during periods of limited vaccine supply, or in the transition from targeted to universal vaccination.

- All persons aged >/= 50 years
- Women who will be pregnant during the influenza season
- Persons who have chronic pulmonary, cardiovascular, renal, hepatic, neurological/neuromuscular, hematologic, or metabolic disorders (including diabetes mellitus)
- Adults who have immunosuppression
- Residents of nursing homes and other long-term care facilities.

ACIP, 2009

Pneumococcal vaccination recommendations (adults)

- All persons aged >/= 65 years
- Persons with chronic cardiovascular disease, chronic pulmonary disease (including asthma), or diabetes mellitus
- Persons with alcoholism, chronic liver disease, or cerebrospinal fluid leaks
- Persons with cochlear implants
- Persons with functional or anatomic asplenia
- Persons living in special environments or social settings
- Immunocompromised persons
- Smokers

Revaccination

- A second dose is recommended 5 years after the first dose for persons with functional or anatomic asplenia and for immunocompromised persons.
- Those who received vaccination before age 65 years should receive another dose of vaccine at age 65 years or later if >= 5 years have passed since their previous dose.

ACIP updated recommendations
(Reported by Nuorti and Whitney, 2010)

Exhibit A.2(a). Detailed methods and search summary

Data sources and searches
A health sciences librarian (DAS) searched medical literature databases (Medline, EMBASE, Cochrane Library, Scopus, Web of Science, AARP Ageline, PsychInfo, Social Policy and Practice, and CINAHL) from inception to August 2010 for potentially relevant citations (Supplement A.2). We complemented the electronic search with references from previous reviews and included studies.

Study selection
The title and abstract of each citation retrieved was screened for relevance. Full papers of relevant citations were examined for inclusion. English language studies published in peer-reviewed journals were included if they involved elderly adults or adults with chronic diseases; involved a quality improvement intervention (see below); featured a parallel control group; and reported influenza or pneumococcal vaccination rates. We focused exclusively on the community setting to maximize relevance for primary care. Studies taking place in acute or long-term care were excluded. Studies reporting sufficient data to estimate log odds ratios (OR) and standard errors were eligible for meta-analysis. Two reviewers (DL and JH) selected studies independently.

Data extraction and quality assessment
Data concerning study design, setting, patient characteristics, intervention characteristics, study quality, patient numbers, and odds ratios (OR) were extracted from included studies. Study quality was measured using the Downs and Black instrument. Data was extracted using standard forms, in duplicate by two reviewers (DL and JH), with disagreements resolved by consensus.

Search strategy

MEDLINE
OVID (1950-present, including in-process citations)
August 13, 2010
1888 results total

1. exp Immunization/
2. (immuniz* or immunis*).ti,ab.
3. exp Immunization Programs/
4. vaccin*.ti,ab.
5. inoculat*.ti,ab.
6. Influenza Vaccines/ad [Administration & Dosage]
7. Pneumococcal Vaccines/ad [Administration & Dosage]
8. or/1-7
9. Influenza, Human/
10. pneumococcal infections/ or pneumonia, pneumococcal/
11. (influenza or pneumococcal or pneumonia).ti,ab.
12. or/9-11
13. 8 and 12
14. preventive health services/ or exp immunization programs/
15. (program* or intervention*).mp.
16. ((vaccinat* or immunis* or immuniz* or inoculat*) adj3 (rate or rates or uptake or delivery or distribution or coverage or status)).ti,ab.
17. quality assurance, health care/ or benchmarking/ or clinical audit/ or medical audit/ or nursing audit/ or total quality management/
18. (quality improvement or QI).mp.
19. patient care planning/ or case management/
20. Patient Care Team/
21. interdisciplinary communication/
22. Registries/
23. education, medical, continuing/ or education, nursing, continuing/ or education, pharmacy, continuing/
24. Reminder Systems/
25. Patient Education as Topic/
26. Self Care/
27. Medical Records Systems, Computerized/
28. (case management or patient registry or reminder* or patient education or self care or self management).ti,ab.
29. or/14-28
30. 13 and 29
31. limit 30 to (english language)
32. animals/
33. humans/
34. 32 not (32 and 33)
35. 31 not 34
36. randomized controlled trial.pt. or random*.tw. or control*.tw. or intervention*.tw. or evaluat*.tw. or compar*.tw. or impact.tw. or evaluat*.tw.
37. (time adj series).tw. or (pretest or pre test or posttest or post test).mp. or (before adj2 after).tw.

38. 36 or 37
39. 38 and 35
40. limit 39 to "all child (0 to 18 years)"
41. limit 39 to "all adult (19 plus years)"
42. 40 not (40 and 41)
43. 39 not 42

EMBASE
OVID (1980-Week 31, 2010)
August 13, 2010
2619 results total

1. immunization/ or mass immunization/ or vaccination/
2. (immuniz* or immunis*).ti,ab.
3. (vaccin* or inoculat*).ti,ab.
4. influenza/
5. Streptococcus pneumonia/
6. pneumococcal infection/
7. pneumonia/
8. Streptococcus infection/
9. (influenza or pneumocc* or pneumonia).ti,ab.
10. or/1-4
11. or/5-9
12. influenza vaccination/
13. 11 and 10
14. 13 or 12
15. vann jc.au.
16. ndiaye sm.au.
17. 16 or 15
18. preventive health service/
19. health program/
20. intervention.tw.
21. ((vaccinat* or immunis* or immuniz* or inoculat*) adj3 (rate or rates or uptake or delivery or distribution or coverage or status)).ti,ab.
22. quality control/ or medical audit/ or total quality management/
23. (quality improvement or QI).ti,ab.
24. patient care/ or case management/ or patient care planning/ or patient decision making/ or patient scheduling/
25. interdisciplinary communication/
26. exp information system/
27. continuing education/
28. patient education/
29. self care/
30. (case management or patient registry or reminder* or patient education or self care or self management).ti,ab.
31. or/18-30
32. 31 and 14
33. limit 32 to (english language)
34. (exp vertebrate/ or animal/ or exp experimental animal/ or nonhuman/ or animal.hw.) not exp human/
35. 33 not 34
36. randomized controlled trial/
37. controlled study/
38. (random* or experiment* or (time adj series) or (pre test or pretest or posttest or post test) or (before adj3 after)).tw.
39. (impact* or intervention* or effect* or chang* or evaluat* or compar* or control*).tw.
40. or/36-39
41. 35 and 40
42. limit 41 to (embryo or infant or child or preschool child <1 to 6 years> or school child <7 to 12 years> or adolescent <13 to 17 years>)
43. limit 41 to (adult <18 to 64 years> or aged <65+ years>)
44. 42 not (42 and 43)
45. 41 not 44

Cochrane Library
Wiley (to issue 3, 2010)
August 13, 2010
838 results

Cochrane SRs: 28
DARE: 6
CENTRAL: 722
Methods: 8
HTA: 2

Economic Evals: 72

#1 (immuniz* or immunis* or inoculat* or vaccin*):ti,ab,kw and (influenza or pneumococc* or streptococc* or pneumonia):ti,ab,kw

#2 (rate or rates or uptake or delivery or distribution or coverage or status):ti,ab,kw or "quality improvement" or qi or "quality management" or "case management" or "patient care" or interdisciplinary:ti,ab,kw or (registr* or audit or education or reminder* or "self care" or "self management" or "medical record" or program* or intervention*):ti,ab,kw

#3 (#1 and #2)

CINAHL
Ebsco
August 30, 2010
121 results

S8 ((S1 OR S2) AND (S3 OR S4 OR S5 OR S6)) OR S7

Limiters - Exclude MEDLINE records; Publication Type: Clinical Trial, Conference, Doctoral Dissertation, Masters Thesis, Nursing Interventions, Practice Guidelines, Proceedings, Protocol, Research
Search modes - Boolean/Phrase Interface

S7 (MH "Influenza Vaccine/AD/SD")

S6 TI ((influenza or pneumococc* or streptococc* or pneumonia)) and AB ((influenza or pneumococc* or streptococc* or pneumonia))

S5 (MH "Pneumonia")

S4 (MH "Pneumococcal Infections")

S3 (MH "Influenza")

S2 TI ((vaccin* or immunis* or immuniz* or inoculat*)) or AB ((vaccin* or immunis* or immuniz* or inoculat*))

S1 (MH "Immunization")

Scopus
Elsevier
August 13, 2010
1216 results

(((TITLE-ABS-KEY((pneumococcal W/3 immuniz*) OR (pneumococcal W/3 immunis*) OR (pneumococcal W/3 vaccinat*) OR (pneumonia W/3 immuniz*) OR (pneumonia W/3 immunis*) OR (pneumonia W/3 vaccinat*) OR (pneumonia W/3 inoculat*)) OR TITLE-ABS-KEY((influenza W/3 immuniz*) OR (influenza W/3 immunis*) OR (influenza W/3 vaccinat*) OR (influenza W/3 inoculat*))) AND (TITLE-ABS-KEY((program* OR intervention* OR "quality improvement" OR "quality management" OR audit OR case management OR "patient care" OR registry OR registries OR "patient education" OR "self care" OR "self management" OR reminder* OR medical record*)) AND SUBJAREA(mult OR medi OR nurs OR vete OR dent OR heal OR mult OR arts OR busi OR deci OR econ OR psyc OR soci)))
OR
((TITLE-ABS-KEY((vaccinat* W/2 rate*) OR (immuniz* W/2 rate*) OR (immunis* W/2 rate*) OR (inoculat* W/2 rate*)) AND TITLE-ABS-KEY(pneumocc* OR pneumonia OR influenza)) AND SUBJAREA(mult OR medi OR nurs OR vete OR dent OR heal OR mult OR arts OR busi OR deci OR econ OR psyc OR soci))

AND (EXCLUDE(SUBJAREA, "VETE") OR EXCLUDE(SUBJAREA, "BIOC") OR EXCLUDE(SUBJAREA, "CENG") OR EXCLUDE(SUBJAREA, "ENVI") OR EXCLUDE(SUBJAREA, "BUSI") OR EXCLUDE(SUBJAREA, "ECON") OR EXCLUDE(SUBJAREA, "AGRI") OR EXCLUDE(SUBJAREA, "ENGI") OR EXCLUDE(SUBJAREA, "EART") OR EXCLUDE(SUBJAREA, "COMP") OR EXCLUDE(SUBJAREA, "MATH") OR EXCLUDE(SUBJAREA, "NEUR")) AND (EXCLUDE(DOCTYPE, "no") OR EXCLUDE(DOCTYPE, "le") OR EXCLUDE(DOCTYPE, "ed"))

Web of Science
ISI – Sciences & Social Sciences Index
August 13, 2010
997 results

Topic=((vaccination SAME influenza) OR (vaccination SAME pneumoccoc*) OR (vaccination SAME pneumonia) OR (immuni?ation SAME influenza) OR (immuni?ation SAME pneumoccoc*) OR (immuni?ation SAME pneumonia))

AND

Topic=((vaccination SAME rate*) or (immuni?ation SAME rate*) or (vaccination SAME status) or (immuni?ation SAME status) OR (vaccination SAME coverage) OR (immuni?ation SAME coverage) OR (vaccination SAME uptake) OR (immuni?ation SAME uptake))

AND

Topic=(random* or control* or intervention* or program* or evaluat* or effect* or compar* or impact or "time series" or (before SAME after) or chang*)

Refined by: Subject Areas=(PUBLIC, ENVIRONMENTAL & OCCUPATIONAL HEALTH
OR MEDICINE, GENERAL & INTERNAL
OR IMMUNOLOGY OR INFECTIOUS DISEASES OR
MEDICINE, RESEARCH & EXPERIMENTAL OR
EDUCATION & EDUCATIONAL RESEARCH
OR GERIATRICS & GERONTOLOGY OR
HEALTH CARE SCIENCES & SERVICES OR
HEALTH POLICY & SERVICES OR
PERIPHERAL VASCULAR DISEASE OR
PHARMACOLOGY & PHARMACY OR
GERONTOLOGY OR
RESPIRATORY SYSTEM OR
VIROLOGY OR
NURSING OR
PSYCHOLOGY, APPLIED OR
PSYCHOLOGY, MULTIDISCIPLINARY OR
PSYCHOLOGY, CLINICAL OR
SOCIAL SCIENCES, INTERDISCIPLINARY OR
SOCIAL SCIENCES, BIOMEDICAL OR
CARDIAC & CARDIOVASCULAR SYSTEMS OR
ONCOLOGY OR
ENDOCRINOLOGY & METABOLISM)
Timespan=1995-2009. Databases=SCI-EXPANDED, SSCI.

PsycINFO
Ovid 1987-present
August 13 2010
261 results

1. immunization/
2. (vaccin* or immuniz* or immunis* or inoculat*).ti,ab.
3. 2 or 1
4. influenza/
5. pneumonia/
6. (influenza or pneumococc* or pneumonia).ti,ab.
7. or/4-6
8. 3 and 7
9. limit 8 to (peer reviewed journal and human)
10. limit 9 to ("0200 clinical case study" or "0400 empirical study" or "0410 experimental replication" or "0430 followup study" or "0450 longitudinal study" or "0600 field study" or "0800 literature review" or "0830 systematic review" or 1200 meta analysis or 1800 quantitative study or "2000 treatment outcome/randomized clinical trial")
11. limit 10 to "300 adulthood "

AARP Ageline
Ovid
August 13, 2010
223 results

1. (vaccin* or immuniz* or immunis* or inoculat*).mp. [mp=abstract, title, publication type, heading word, accession number]
2. (influenza or pneumonia or pneumococc* or streptocc*).mp. [mp=abstract, title, publication type, heading word, accession number]
3. 1 and 2
4. 3 not (child* or infant*).mp. [mp=abstract, title, publication type, heading word, accession number]

Social Policy and Practice
Ovid
August 13, 2010
75 results

Same search as Ageline

Exhibit A.2(b). Downs and Black quality assessment instrument for randomized and non-randomized studies

Downs and Black (1998) Quality Assessment Criteria
See Downs and Black (1998) for details. Code 1 for yes, 0 for no, and 0 for unable to determine except in questions 5 and 27.

Reporting	**Score**
1. Is the hypothesis/aim/objective of the study clearly defined?	/1
2. Are the main outcomes to be measured clearly described in the introduction or methods section?	/1
3. Are the characteristics of the patients included in the study clearly described?	/1
4. Are the interventions of interest clearly described?	/1
5. Are the distributions of principal confounders in each group of subjects to be compared clearly described?	/2
6. Are the main findings of the study clearly described?	/1
7. Does the study provide estimates of the random variability in the data for the main outcomes?	/1
8. Have all important adverse events that may be a consequence of the intervention been reported?	/1
9. Have the characteristics of patients lost to follow-up been described?	/1
10. Have actual probability values been reported for the main outcomes, except where p<0.001?	/1
External validity	**Score**
11. Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	/1
12. Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	/1
13. Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?	/1
Internal validity - bias	**Score**
14. Was an attempt made to blind study subjects to the intervention they have received?	/1
15. Was an attempt made to blind those measuring the main outcomes of the intervention?	/1
16. If any of the results of the study were based on "data dredging", was this made clear?	/1
17. In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case control studies, is the time period between the intervention and outcome the same for cases and controls?	/1
18. Were the statistical tests used to assess the main outcomes appropriate?	/1
19. Was compliance with the intervention/s reliable?	/1
20. Were the main outcome measures used accurate (valid and reliable)?	/1
Internal validity - confounding	**Score**
21. Were the patients in different intervention groups or were the cases and controls recruited from the same population?	/1
22. Were study subjects in different intervention groups or were the cases and controls recruited over the same period of time?	/1
23. Were study subjects randomized to intervention groups?	/1
24. Was the randomized intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?	/1
25. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?	/1
26. Were losses of patients to follow-up taken into account?	/1
Power	**Score**
27. Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%?	/5

Notes:

Question 5: Potential confounders were patient age, gender, chronic disease status, characteristics of chronic diseases (e.g.: duration of diabetes, if relevant), and other predictors of vaccination (e.g.: education, marital

status). For observational studies, if the distribution at baseline of some confounders was provided, then a score of “1” was assigned. A score of “2” was assigned if the distribution of age, gender, and at least one other predictor of vaccination status was reported for both treatment and control groups. Question 5 concerns reporting. The adequacy of the confounder balance achieved is judged in question 25.

Question 25: Randomized studies received a score of “1” if the distribution of potential confounders was reported and found to be balanced, “0” if the distribution of potential confounders was reported and found to be unbalanced, and “9”, for “unclear”, if the distribution of potential confounders was not reported at baseline (see question 5). For summative purposes, code “9” was treated as a score of “0”. Observational studies received a score of “1” if the distribution of potential confounders was reported and found to be balanced, and “0” otherwise.

Question 27: The interpretation of question 27 in Downs and Black (1998) is unclear. We assigned a score of “0” if no power calculation was provided, “3” if a power calculation was provided but the importance or impact of the difference between groups used in the calculation was unclear, and “5” if the difference between groups was clearly defined as a clinically important difference.

Reference:

Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. Journal of Epidemiology and Community Health, 52(6): 1998. Pp. 377-84.

Exhibit A.3. Excluded studies

First author	Year	Reference	Reasons for exclusion								Reasons for assigning "other"
			Setting	Uncontrolled	Not adults	No QI intervention	No vaccination rates reported	Review	Multiple reports	Not English	Other	
Achat	1999	(3)	0	0	0	0	0	1	0	0	0	
Alexy	1998	(4)	0	1	0	0	0	0	0	0	0	
Anderson	1979	(5)	0	1	0	0	0	0	0	0	0	
Anderson	2008	(6)	0	0	0	0	1	0	0	0	0	
Anderson	2008	(7)	0	1	0	0	0	0	0	0	0	
Andrews	2004	(8)	0	1	0	0	0	0	0	0	0	
Andrews	2005	(9)	0	1	0	0	0	0	0	0	0	
Anonymous	2004	(10)	0	0	0	0	0	1	0	0	0	
Anonymous	2005	(11)	1	0	0	0	0	0	0	0	0	
Arthur	2001	(12)	0	1	0	0	0	0	0	0	0	
Ashby-Hughes	1999	(13)	0	1	0	0	0	0	0	0	0	
Ashikaga	1980	(14)	0	0	0	0	1	0	0	0	0	
Baker	2002	(15)	0	1	0	0	0	0	0	0	0	
Balas	2000	(16)	0	0	0	0	0	1	0	0	0	
Bansal	2006	(17)	0	0	0	1	0	0	0	0	0	
Barker	1999	(18)	0	1	0	0	0	0	0	0	0	
Bearden	2005	(19)	0	1	0	0	0	0	0	0	0	
Bellaard-Smith	2008	(20)	0	0	1	0	0	0	0	0	0	
Bennett	1994	(21)	0	0	0	0	0	0	1	0	0	
Berg	2004	(22)	0	0	1	0	0	0	0	0	0	
Berry	1996	(23)	0	1	0	0	0	0	0	0	0	
Birchmeier	2002	(24)	0	1	0	0	0	0	0	0	0	
Bloom	1999	(25)	0	1	0	0	0	0	0	0	0	
Bottum	1995	(26)	0	1	0	0	0	0	0	0	0	
Bourdet	2003	(27)	1	0	0	0	0	0	0	0	0	
Bourgeois	2008	(28)	1	0	0	0	0	0	0	0	0	
Brady	1988	(29)	0	1	0	0	0	0	0	0	0	
Breslow	1977	(30)	0	0	0	0	0	1	0	0	0	

First author	Year	Reference	Reasons for exclusion								Reasons for assigning "other"
			Setting	Uncontrolled	Not adults	No QI intervention	No vaccination rates reported	Review	Multiple reports	Not English	Other	
Brown	2000	(31)	0	1	0	0	0	0	0	0	0	
Bryant	2004	(32)	0	0	1	0	0	0	0	0	0	
Byrnes	2006	(33)	0	1	0	0	0	0	0	0	0	
CDC	1995	(34)	0	1	0	0	0	0	0	0	0	
CDC	2003	(35)	0	0	0	0	1	0	0	0	0	
Caulkins	1995	(36)	0	0	0	0	0	0	1	0	0	
Clancy	1992	(37)	0	1	0	0	0	0	0	0	0	
Clancy	2003	(38)	0	0	0	0	1	0	0	0	0	
Cleghorn	2004	(39)	0	1	0	0	0	0	0	0	0	
Coady	2008	(40)	1	0	0	0	0	0	0	0	0	
Cohen	1985	(41)	0	0	0	0	1	0	0	0	0	
Cole	1979	(42)	0	1	0	0	0	0	0	0	0	
Coyle	2004	(43)	1	0	0	0	0	0	0	0	0	
Crawford	2005	(44)	0	1	0	0	0	0	0	0	0	
d'Abbs	2008	(45)	0	1	0	0	0	0	0	0	0	
Daniels	2007	(46)	0	0	0	0	1	0	0	0	0	
Davidson	1984	(47)	0	1	0	0	0	0	0	0	0	
De Bruyn	2008	(48)	0	0	0	0	0	0	0	1	0	
De Wals	1996	(49)	0	0	0	0	0	0	0	1	0	
Dettori	2005	(50)	0	1	0	0	0	0	0	0	0	
Dexheimer	2006	(51)	0	1	0	0	0	0	0	0	0	
Dexheimer	2006	(52)	0	0	0	0	0	0	0	0	1	Unpublished thesis.
Dexheimer	2008	(53)	0	1	0	0	0	0	0	0	0	
Dexter	2001	(54)	1	0	0	0	0	0	0	0	0	
Dexter	2004	(55)	1	0	0	0	0	0	0	0	0	
Diaz Gravalos	1999	(56)	0	0	0	0	0	0	0	1	0	
Doyle	2001	(57)	1	0	0	0	0	0	0	0	0	
Elangovan	1996	(58)	0	1	0	0	0	0	0	0	0	
Etkind	1996	(59)	0	0	0	0	1	0	0	0	0	
Ettner	2006	(60)	0	1	0	0	0	0	0	0	0	
Falconer	2008	(61)	0	0	0	1	0	0	0	0	0	

First author	Year	Reference	Reasons for exclusion								Reasons for assigning "other"
			Setting	Uncontrolled	Not adults	No QI intervention	No vaccination rates reported	Review	Multiple reports	Not English	Other	
Farmer	2001	(62)	0	1	0	0	0	0	0	0	0	
Fedson	1984	(63)	0	0	0	0	1	0	0	0	0	
Fera	2008	(64)	0	1	0	0	0	0	0	0	0	
Fera	2009	(65)	0	1	0	0	0	0	0	0	0	
Fischer	2008	(66)	0	0	0	0	0	0	0	0	1	Study design only
Fishbein	2006	(67)	0	1	0	0	0	0	0	0	0	
Flanagan	1999	(68)	0	0	0	0	1	0	0	0	0	
Fontanesi	2006	(69)	0	0	0	0	1	0	0	0	0	
Franzini	2007	(70)	0	0	1	0	0	0	0	0	0	
Fuchs	2006	(71)	0	1	0	0	0	0	0	0	0	
Galbis-Reig	2001	(72)	0	1	0	0	0	0	0	0	0	
Gamble	2008	(73)	0	1	0	0	0	0	0	0	0	
Garrett	1986	(74)	0	0	0	0	1	0	0	0	0	
Garrett	2005	(75)	0	1	0	0	0	0	0	0	0	
Gemson	1995	(76)	0	0	0	0	1	0	0	0	0	
Gerard	2008	(77)	1	0	0	0	0	0	0	0	0	
Gill	1998	(78)	0	1	0	0	0	0	0	0	0	
Gill	1999	(79)	0	1	0	0	0	0	0	0	0	
Gill	2000	(80)	0	1	0	0	0	0	0	0	0	
Gill	2001	(81)	0	1	0	0	0	0	0	0	0	
Gill	2004	(82)	0	1	0	0	0	0	0	0	0	
Ginson	2000	(83)	1	0	0	0	0	0	0	0	0	
Goebel	1997	(84)	0	1	0	0	0	0	0	0	0	
Golden	2002	(85)	0	1	0	0	0	0	0	0	0	
Grey	2002	(86)	0	0	0	0	1	0	0	0	0	
Gruber	2000	(87)	0	1	0	0	0	0	0	0	0	
Guldberg	2009	(88)	0	0	0	0	0	1	0	0	0	
Hak	1997	(89)	0	1	0	0	0	0	0	0	0	
Hak	1998	(90)	0	1	0	0	0	0	0	0	0	
Hak	2000	(91)	0	1	0	0	0	0	0	0	0	
Hannah	2005	(92)	1	0	0	0	0	0	0	0	0	

First author	Year	Reference	Reasons for exclusion								Reasons for assigning "other"
			Setting	Uncontrolled	Not adults	No QI intervention	No vaccination rates reported	Review	Multiple reports	Not English	Other	
Harris	2006	(93)	0	0	0	0	0	0	1	0	0	
Henk	1975	(94)	0	1	0	0	0	0	0	0	0	
Hicks	2007	(95)	0	0	1	0	0	0	0	0	0	
Hogg	2008	(96)	0	0	1	0	0	0	0	0	0	
Honkanen	1997	(97)	0	0	0	1	0	0	0	0	0	
Honkanen	2006	(98)	0	0	0	1	0	0	0	0	0	
Houston	2006	(99)	0	1	0	0	0	0	0	0	0	
Humair	2002	(100)	0	1	0	0	0	0	0	0	0	
Hussain	2006	(101)	0	1	0	0	0	0	0	0	0	
Hutchison	1991	(102)	0	1	0	0	0	0	0	0	0	
Irogoyen	2006	(103)	0	0	1	0	0	0	0	0	0	
Jha	2003	(104)	1	0	0	0	0	0	0	0	0	
Jha	2003	(105)	0	1	0	0	0	0	0	0	0	
Jha	2007	(106)	1	0	0	0	0	0	0	0	0	
Johnson	2005	(107)	0	1	0	0	0	0	0	0	0	
Johnson	2008	(108)	0	1	0	0	0	0	0	0	0	
Jones	2008	(109)	0	1	0	0	0	0	0	0	0	
Joshi	2009	(110)	0	0	1	0	0	0	0	0	0	
Juma	2000	(111)	0	1	0	0	0	0	0	0	0	
Kamal	2003	(112)	0	1	0	0	0	0	0	0	0	
Keyhani	2007	(113)	0	1	0	0	0	0	0	0	0	
Kleschen	2000	(114)	0	1	0	0	0	0	0	0	0	
Knoell	1991	(115)	0	1	0	0	0	0	0	0	0	
Kumar	1999	(116)	1	0	0	0	0	0	0	0	0	
Landis	1995	(117)	1	0	0	0	0	0	0	0	0	
Larson	1979	(118)	0	1	0	0	0	0	0	0	0	
Larson	2009	(119)	0	0	1	0	0	0	0	0	0	
Lave	1996	(120)	0	0	0	0	0	0	1	0	0	
Lawson	2000	(121)	1	0	0	0	0	0	0	0	0	
Lee	2003	(122)	0	0	0	0	0	0	0	1	0	
Litt	1991	(123)	0	0	0	0	0	1	0	0	0	

First author	Year	Reference	Reasons for exclusion								Reasons for assigning "other"
			Setting	Uncontrolled	Not adults	No QI intervention	No vaccination rates reported	Review	Multiple reports	Not English	Other	
Loughlin	2007	(124)	0	1	0	0	0	0	0	0	0	
Luthi	2002	(125)	0	1	0	0	0	0	0	0	0	
MacIntyre	2003	(126)	1	0	0	0	0	0	0	0	0	
Mackey	2005	(127)	0	1	0	0	0	0	0	0	0	
Malmvall	2007	(128)	0	1	0	0	0	0	0	0	0	
Mandel	12598	(129)	0	0	0	0	1	0	0	0	0	
Mangione	2006	(130)	0	1	0	0	0	0	0	0	0	
Marino	1998	(131)	0	1	0	0	0	0	0	0	0	
Marrero	2006	(132)	0	0	0	0	0	0	0	1	0	
Maskrey	1997	(133)	0	0	0	0	0	1	0	0	0	
McCord	2006	(134)	0	1	0	0	0	0	0	0	0	
McDonald	1980	(135)	0	0	0	0	1	0	0	0	0	
McDonald	1992	(136)	0	0	0	0	0	0	1	0	0	
McDonald	1997	(137)	0	1	0	0	0	0	0	0	0	
McDowell	1990	(138)	0	0	0	0	0	0	1	0	0	
Milman	2005	(139)	0	1	0	0	0	0	0	0	0	
Mosesso	2003	(140)	0	1	0	0	0	0	0	0	0	
Nichol	1992	(141)	0	1	0	0	0	0	0	0	0	
Nichol	1998	(142)	0	1	0	0	0	0	0	0	0	
Niroshan	2003	(143)	0	1	0	0	0	0	0	0	0	
Norton	1997	(144)	0	0	0	0	0	0	0	0	1	Abstract only, results incompletely reported.
Nowalk	2008	(145)	0	0	1	0	0	0	0	0	0	
Ogburn	2007	(146)	0	1	0	0	0	0	0	0	0	
Ogden	1993	(147)	0	0	0	0	0	0	0	0	1	News report
Onder	2008	(148)	0	1	0	0	0	0	0	0	0	
Ovbiagele	2009	(149)	1	0	0	0	0	0	0	0	0	
Parry	2004	(150)	1	0	0	0	0	0	0	0	0	
Patel	2004	(151)	0	1	0	0	0	0	0	0	0	
Pearson	1998	(152)	0	1	0	0	0	0	0	0	0	
Pearson	2005	(153)	0	1	0	0	0	0	0	0	0	
Perenboom	1996	(154)	0	1	0	0	0	0	0	0	0	

First author	Year	Reference	Reasons for exclusion								Reasons for assigning "other"
			Setting	Uncontrolled	Not adults	No QI intervention	No vaccination rates reported	Review	Multiple reports	Not English	Other	
Peters	1995	(155)	0	0	0	0	0	0	0	0	1	Unpublished thesis.
Ploeg	1994	(156)	0	0	0	0	1	0	0	0	0	
Puig-Barbera	1999	(157)	0	0	0	0	0	0	0	1	0	
Redfield	2000	(158)	0	1	0	0	0	0	0	0	0	
Reilly	1997	(159)	0	0	0	0	0	0	0	0	1	Abstract only, results incompletely reported
Reuben	1996	(160)	0	1	0	0	0	0	0	0	0	
Reynolds	2008	(161)	0	1	0	0	0	0	0	0	0	
Rhew	1999	(162)	0	0	0	0	1	0	0	0	0	
Rimple	2006	(163)	0	1	0	0	0	0	0	0	0	
Rodney	1983	(164)	0	1	0	0	0	0	0	0	0	
Rosser	1991	(165)	0	0	0	0	0	0	1	0	0	
Russell	2001	(166)	0	1	0	0	0	0	0	0	0	
Salman	2005	(167)	0	1	0	0	0	0	0	0	0	
Schectman	2005	(168)	0	1	0	0	0	0	0	0	0	
Scheurer	2006	(169)	1	0	0	0	0	0	0	0	0	
Schluter	1999	(170)	1	0	0	0	0	0	0	0	0	
Setia	1985	(171)	1	0	0	0	0	0	0	0	0	
Shahrabani	2010	(172)	0	0	0	1	0	0	0	0	0	
Sheikh	1998	(173)	0	1	0	0	0	0	0	0	0	
Shenson	2008	(174)	0	1	0	0	0	0	0	0	0	
Sherman	2002	(175)	0	0	0	0	0	1	0	0	0	
Shevlin	2002	(176)	1	0	0	0	0	0	0	0	0	
Siriwardena	1999	(177)	0	1	0	0	0	0	0	0	0	
Siriwardena	2003	(178)	0	1	0	0	0	0	0	0	0	
Siriwardena	2007	(179)	0	1	0	0	0	0	0	0	0	
Sivaprakasam	2008	(180)	0	0	0	1	0	0	0	0	0	
Slobodkin	1998	(181)	0	1	0	0	0	0	0	0	0	
Slobodkin	1998	(182)	0	1	0	0	0	0	0	0	0	
Song	2000	(183)	0	0	0	0	0	0	0	1	0	
Stevenson	2000	(184)	1	0	0	0	0	0	0	0	0	
Stone	2002	(185)	0	0	0	0	0	1	0	0	0	

First author	Year	Reference	Reasons for exclusion									Reasons for assigning "other"
			Setting	Uncontrolled	Not adults	No QI intervention	No vaccination rates reported	Review	Multiple reports	Not English	Other	
Strine	2005	(186)	0	0	0	1	0	0	0	0	0	
Szilagyi	2003	(187)	0	0	0	0	0	1	0	0	0	
Taylor	2007	(188)	0	1	0	0	0	0	0	0	0	
Thomas	2005	(189)	1	0	0	0	0	0	0	0	0	
Traeger	2006	(190)	0	0	1	0	0	0	0	0	0	
Trick	2009	(191)	1	0	0	0	0	0	0	0	0	
Tucker	1987	(192)	0	1	0	0	0	0	0	0	0	
Turner	1989	(193)	0	0	0	0	1	0	0	0	0	
Van Amburgh	2001	(194)	0	1	0	0	0	0	0	0	0	
Van Essen	1997	(195)	0	1	0	0	0	0	0	0	0	
Van Hoof	2001	(196)	0	1	0	0	0	0	0	0	0	
Vann	2005	(197)	0	0	0	0	0	1	0	0	0	
Vila-Corcoles	2006	(198)	0	0	0	1	0	0	0	0	0	
Vincent	1995	(199)	0	1	0	0	0	0	0	0	0	
Vondracek	1998	(200)	1	0	0	0	0	0	0	0	0	
Wallis	2006	(201)	0	1	0	0	0	0	0	0	0	
Weatherill	2004	(202)	0	1	0	0	0	0	0	0	0	
Weaver	2007	(203)	0	1	0	0	0	0	0	0	0	
Weber	2008	(204)	0	1	0	0	0	0	0	0	0	
Wee	2001	(205)	0	1	0	0	0	0	0	0	0	
Weitzel	2000	(206)	0	1	0	0	0	0	0	0	0	
Welch	2006	(207)	0	1	0	0	0	0	0	0	0	
Wray	2009	(208)	0	0	0	0	1	0	0	0	0	
Young	2004	(209)	0	1	0	0	0	0	0	0	0	
Zimmerman	2003	(210)	0	1	0	0	0	0	0	0	0	

Exhibit A.4. Reasons for exclusion

	Setting	Uncontrolled	Not adults	No QI intervention	No vaccination rates reported	Review	Multiple reports	Not English	Other	Reasons for assigning "other"
Electronic search citations	27	110	11	8	11	10	6	7	6	Study design only (1), unpublished thesis (2), abstract only (2), news report (1)
Reference list citations	0	2	0	0	8	1	1	0	0	None
Total	27	112	11	8	19	11	7	7	6	Total = 207

Exhibit A.5. Included studies

Study/Author	Study design	Study population	Setting	Intervention summary	Vaccination outcomes	Vaccination results	Study conclusions	Quality score
Ahmed et al. 2004 (211)	Design: Cluster RCT Group allocation: Experimental study with employers allocated to treatment and control groups. Follow-up period: 5 months	Number of patients: 3996 Group 1 Number of patients: 890 Female/male: 498/392 Age (median): 52 Group 2 Number of patients: 1138 Female/male: 626/512 Age (mean(sd)): 52 Group 3 Number of patients: 1039 Female/male: 603/436 Age (mean(sd)): 52 Control Number of patients: 929 Female/male: 511/418 Age (mean(sd)): 52 Eligibility criteria: Patients aged 18 to 64 years with high risk conditions, enrolled in a participating managed care organization. Employers claiming 3 or more eligible patients as subscribers or dependents.	Number of sites: 505 Employers participating in a large MCO Site affiliation: Private business, private MCO Number of practices or physicians: Not reported / not applicable Location: United States (Colorado)	Single post card reminder vs single post card reminder and employer outreach toolkit vs two sequential post card reminders vs two sequential post card reminders and employer outreach toolkit Intervention aim: Improve vaccination rates QI agent: Managed care plan Group 1 - Single reminder postcard and employer toolkit Patient education / reminders: Patients received postcards strongly recommending influenza vaccination: "It could save your life." Additionally, influenza tool kits were mailed to health plan employers. Tool kits included flyers, posters, newsletter articles, E-mail and payroll stuffer communications to encourage vaccination. Delivery site change: Employers were provided with support implementing work site, employer-sponsored influenza vaccination clinics. Group 2 – Two reminder postcards As above for group 1, except with two sequential postcards. Group 3 – Two reminder postcards and employer toolkit As above for Group 2, except with two sequential postcards. Control - Single reminder postcard Patient education / reminders: Patients received postcards strongly recommending influenza vaccination: "It could save your life."	Influenza Proportion of eligible patients receiving vaccination Risk and odds ratio of receiving vaccination relative to Group 1 Pneumococcal Not targeted.	Influenza Baseline Groups 1-4: 81%-83% Follow-up* Age 18-49 Control: 241/400 (60%) Group 1: 205/360 (57%) Group 2: 261/479 (54%) Group 3: 241/406 (59%) Age 50-64 Control: 387/529 (73%) Group 1: 412/530 (78%) Group 2: 512/659 (78%) Group 3: 494/633 (78%) Follow-up** Age 18-49 Group 1 OR = 0.92 Group 2 OR = 0.83 Group 3 OR = 1.04 Age 50-64 Group 1 OR = 1.26 Group 2 OR = 1.42*** Group 3 OR = 1.44*** Pneumococcal Not targeted. *, **, *** - Notes, see column at right.	A second postcard reminder increased influenza vaccination by 4% among 50- to 64- year old persons with high-risk conditions, but did not have any effect among younger adults. Influenza tool kits mailed to employers did not have any incremental effect among persons who were mailed single or multiple postcard reminders. Interventions should be evaluated in different population subgroups. Developing methods to more effectively encourage employers to use tool kits such as the one trialed here merits attention. * Crude proportions. ** Adjusted for age, sex, marital status, subscriber status, managed care organization, work-site flu shot clinics, and receipt of prior flu shot. *** Significant at $p<0.05$. The authors performed a secondary analysis combining control and group 1, and groups 2 and 3. OR for vaccination due to receiving a second postcard was 0.96 (95% CI [0.75, 1.22]) for age 18-49, and 1.29 (95% CI [1.02, 1.64]) for age 50-64.	24
Apkon et al. 2005 (212)	Design: CCT	Number of patients: 1902	Number of sites: 2 "military treatment	Clinical decision support system vs usual care	Influenza Not targeted.	Influenza Not targeted.	Implementing a specific decision support tool in a primary care	20

	Group allocation: Patients were randomly allocated to treatment and control groups. Follow-up period: 60 days	Group 1 Number of patients: 936 Female/male: 593/343 Age (mean(sd)): 34.4 (10.4) Control group Number of patients: 966 Female/male: 587/379 Age (mean(sd)): 35.4 (11.0) Eligibility criteria: Patients aged 18 years or older, with scheduled appointments during the study period, who could speak and read English. Patients were excluded if they required emergency medical conditions or obstetric care; or if they had been previously exposed to the study intervention.	facilities" Site affiliation: Military Number of practices or physicians: Not reported. Location: United States (Kentucky and Florida)	Intervention aim: Improve preventive care, improve care of chronic diseases QI agent: Medical clinics Group 1 Clinician reminders: The Department of Defense Problem-Knowledge Couplers is a computerized decision support system. Couplers uses structured questions based on the patient's chief complaint to elicit information from patients and providers. Patients were allocated 30 minutes to input their medical histories into the Coupler tool. Based on a proprietary database of medical knowledge, suggestions for patient care strategies are produced. Control group Usual care.	Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Pneumococcal Follow-up Group 1: 1/61 (2%) Control: 0/72 (0%) Follow-up OR = 0.00* P < 0.001* * Generated by multi-level logistic regression. This value is not reliable due to the small number of events in the analysis.	setting did not substantially improve quality of care, decrease resource consumption, or improve satisfaction of patients or providers.	
Armstrong et al. 1999 (213)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period: 7 months	Number of patients: 740 Female/male: 75%/25% Age (mean(sd)): 77 years (sd not reported) Group-specific covariate distributions not reported. Group 1 Number of patients: 390* Control group Number of patients: 350* Eligibility criteria: Community dwelling residents aged 65 years or older who received care at the study primary care site in the previous year. * Numbers at randomization. Survey response rates for outcome and covariate measurement were <60% in both groups.	Number of sites: 1 academic primary care site Site affiliation: University Number of practices or physicians: As above. Location: United States (Pennsylvania)	Mailed educational brochure vs mailed postcard reminders Intervention aim: Improve vaccination rates QI agent: Medical clinic Group 1 Patient education / reminders: An educational brochure pitched at the 12th grade reading level, targeted against established reasons for vaccination refusal, and including information about Medicare coverage and local vaccination access, was mailed to patients. Control group Patient education / reminders: A simple post card reminding patients that influenza is a leading cause of morbidity and mortality among seniors and that it was time for vaccination was mailed to patients.	Influenza Proportion of eligible patients receiving vaccination Odds or risk ratios of receiving vaccination between treatment and control groups	Influenza Follow-up Overall Group 1: 152/229 (66%) Control: 115/202 (57%) Previously vaccinated patients Group 1: 75.3% Control: 70.9% Patients without previous vaccination Group 1: 20.0% Control: 9.3% Follow-up Overall OR = 1.49 P = 0.04 Previously vaccinated patients RR = 1.06 95% CI = [.93, 1.21]	Patient information targeting common reasons for refusing influenza vaccination is more effective in convincing individuals to get vaccinated than a reminder alone. In the sub-group of patients who had previously not been vaccinated, the RR was 2.15 (95% CI [0.69, 6.58]).	19

					Pneumococcal Not targeted.	Patients without previous vaccination RR = 2.15 95% CI = [0.69, 6.75] Pneumococcal Not targeted.		
Arthur et al. 2002 (214)	Design: Cluster-RCT Group allocation: Experimental study with patients allocated to treatment and control groups by GP clusters and households Follow-up period: 3 months	Number of patients: 2052 Figures at analysis provided below. Group 1 Number of patients: 680 Female/male: 401/279 Age (median (IQR)): 79 (77-83) Control group Number of patients: 1372 Female/male: 847/525 Age (median (IQR)): 79 (77-83) Eligibility criteria: Aged 75 years or over and registered with the study practice. Exclusions: Those living in residential care, nursing homes, or sheltered accommodation.	Number of sites: 1 community general practice Site affiliation: Private practice Number of practices or physicians: 1 Location: United Kingdom	Influenza vaccination during a comprehensive health assessment offered in patients' homes vs invitation to receive vaccine at the clinic Intervention aim: Improve vaccination rates QI agent: Medical clinic Group 1 Patient education / reminders: Patients received an offer of a home-visit over-75 health assessment, in which an influenza vaccination could be provided. Delivery site change: Community health nurses attended patients' homes to provide a nover-75 preventive care health assessment. After the assessment, patients were offered influenza vaccine. Team change: Nurses provided vaccination in patients' homes, after a comprehensive over-75 health assessment. Control group Patient education / reminders: A personal letter was sent to eligible patients inviting them to attend any of the influenza vaccination clinics held at the surgery. The letter stressed the importance and safety of influenza vaccination.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Baseline Group 1: 331/680 (49%) Control: 641/1372 (47%) Follow-up – 3 months Group 1: 505/680 (74%) Control: 932/1372 (68%) Follow-up – 3 months OR = 1.36 P = 0.003* Pneumococcal Not targeted. * Unit of analysis error.	Combining the offer of vaccination with a comprehensive health check, and providing both in patients' homes, produced a higher uptake of influenza vaccinations than personal invitation letters alone. The effect was especially marked in those who had not received vaccine the previous year.	23
Baker et al. 1998 (215)	Design:	Number of patients: 24743	Number of sites: 1 large	Generic patient reminder postcards vs	Influenza	Influenza	Rates of vaccination increased	25

	CCT Group allocation: Experimental study, with patients allocated to treatment and control groups. Follow-up period: Not reported.	<u>Group 1</u> Number of patients: 6169 Female/male: 3560/2609 Age (mean(sd)): 67.3 (14.7) <u>Group 2</u> Number of patients: 6252 Female/male: 3606/2645 Age (mean(sd)): 67.4 (14.6) <u>Group 3</u> Number of patients: 6151 Female/male: 3525/2626 Age (mean(sd)): 66.8 (15.1) <u>Control group</u> Number of patients: 6171 Female/male: 3592/2579 Age (mean(sd)): 67.1 (14.6) <u>Eligibility criteria:</u> Adult patients aligned with a primary care physician; and age 65 years or older, or chronic disease diagnosis.	medical group serving a nonprofit HMO Site affiliation: Private MCO Number of practices or physicians: Not reported Location: United States (Michigan)	<u>personalized reminder postcards vs personalized reminder letters vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical group <u>Group 1 – Generic reminder postcards</u> Patient education / reminders: Computer generated postcards were mailed to patients. Content was based on the Health Belief Model, and included a description of who is at risk, statement of the fact that influenza can be serious, and assurance that the vaccine is safe and effective. <u>Group 2 – Personalized reminder postcards</u> Patient education / reminders as above, except the postcard was addressed to the patient and from the primary care physician. <u>Group 3 – Personalized reminder letters</u> Patient education / reminders: A personalized letter containing a message tailored to the patient's risk factors for influenza, was sent from the primary care physician, addressed to the patient at risk. <u>Control group</u> Usual care.	Proportion of eligible patients receiving vaccination Risk difference and odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Not targeted.	Overall* Follow-up Group 1: 2684/6169 (44%) Group 2:2795/6252 (45%) Group 3: 2780/6151 (45%) Control: 2505/6171 (41%) Overall* Follow-up Group 1 RD = 3.01** 95% CI = [1.22, 4.79] OR = 1.13 P = 0.001 Group 2 RD = 4.20** 95% CI = [2.43, 5.98] OR = 1.18 P < 0.001 Group 3 RD = 4.75** 95% CI = [2.97, 6.53] OR = 1.21 P < 0.001 <u>Pneumococcal</u> Not targeted. * Analyses were stratified by age 65 or older and chronic disease status. Results are available by strata.	with the intensity of the intervention. The reminder postcard from the primary care physician was more effective than the generic postcard. The personalized, tailored letter was more effective than either postcard intervention. Patients in the letter group were more likely to recall receiving a reminder. Cost savings due to improving vaccination rates were higher in the letter than the postcard groups.	
Barnas et al. 1989 (216)	Design: CCT Group allocation: Patients were randomly allocated to treatment and control groups. Follow-up period:	Number of patients: 988 (840 patients available at analysis) Age (mean, range): 74 years, range [65, 96] Female/male: 70% / 30% <u>Group 1</u> Number of patients: 406	Number of sites: 1 adult primary care clinic Site affiliation: University Number of practices or physicians: Not reported. Location: United States	<u>Patient reminder postcards vs usual care</u> <u>Group 1</u> Intervention aim: Improve vaccination rates QI agent: Medical clinics	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Follow-up Group 1: 101/406 (25%) Control: 137/434 (32%) Follow-up OR = 0.72 P < 0.02	Results substantiate an apparent lack of benefit that postcard reminders have on influencing the elderly to receive influenza vaccine. In fact, postcard reminders appeared detrimental.	19

	1 influenza season	Control group Number of patients: 434 Eligibility criteria: Patients aged 65 years or older scheduled to attend the study site during fall of 1986.	(Wisconsin)	Patient education / reminders: Patients received an additional message on their routine pre-appointment postcard reminders, mailed a week before the scheduled visit. The message prompted patients to ask their physicians for a flu shot. Control group Usual care.	Pneumococcal Not targeted.	Pneumococcal Not targeted.		
Barton et al. 1990 (217)	Design: RCS Group allocation: Patients on a reminder list were compared to patients not on the list. Reasons for not appear on the list included joining the HMO after the list had been composed, having no HMO visit during the period of list formation, or a very recent diagnosis of type I diabetes. Follow-up period: 1 year	Number of patients: 254 Group 1 Number of patients: 143 Age (mean(sd)): 53.4 (0.7) Control group Number of patients: 111 Age (mean(sd)): 54.5 (0.5) Eligibility criteria: Patients between the ages of 40 and 65, with insulin-dependent diabetes mellitus.	Number of sites: 1 large HMO Site affiliation: Private MCO Number of practices or physicians: Approximately 100 general internists at 7 health centers. Location: United States (Massachussetts)	Computer generated reminders and peer comparison feedback vs no intervention Intervention aim: Improve vaccination rates QI agent: Private MCO Group 1 Patient education / reminders: Post card reminders were sent to HMO members. Educational materials (e.g.: posters for waiting areas and examination rooms, pharmacy bag notices) were also produced. Clinician reminders: A reminder message was displayed at the front of the summary of the computerized record prepared for each scheduled primary care visit. Paper chart reminders were also implemented. Audit and feedback: Performance was fed back to service chiefs and to individual physicians. Physicians periodically received lists of patients who had not yet been vaccinated. Control group Control patients did not receive reminder postcards, and were not on lists for generating clinician reminders or audit and feedback.	Influenza Proportion of eligible patients receiving vaccination Risk difference between treatment and control groups Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up* Group 1: 80/143 (56%) Control: 30/111 (27%) Follow-up Difference = 28% (5% CI = [16%, 40%] Follow-up OR = 3.43 P < 0.001 Pneumococcal Not targeted. * The denominator of this outcome includes a small number of patients (<5%) for whom vaccination was not indicated or refused.	A patient and provider oriented reminder system appeared to improve influenza vaccination rates among non-elderly diabetic patients. Reasons for patients being allocated to the no-intervention comparison group were related to lower visit rates the year before. Patients with fewer visits were less likely to be vaccinated, raising a risk of selection bias in these results.	19
Beck et al. 1997 (218)	Design:	Number of patients: 321	Number of sites: 1 group	Group visits with a multidisciplinary	Influenza	Influenza	A group visit intervention led to	21

	CCT Group allocation: Experimental study with patients allocated randomly to treatment and control groups. Follow-up period: 1 year	<u>Group 1</u> Number of patients: 160 Female/male: 110/50 Age (mean(sd)): 72 (sd not reported) <u>Control group</u> Number of patients: 161 Female/male: 103/58 Age (mean(sd)): 75 (sd not reported) <u>Eligibility criteria:</u> Patients aged 65 years or older, with a chronic disease (heart, lung, joint, or diabetes).	medical practice at a group model HMO Site affiliation: Private MCO Number of practices or physicians: As above. Location: United States (Colorado)	<u>care team vs usual care</u> Intervention aim: Improve preventive care QI agent: Medical clinic <u>Group 1</u> Visit structure change: Patients were able to attend monthly group visits. The visit format consisted of a 15 minute socialization period; a 30 minute presentation on specific health-related topics, included medication management, exercise, nutrition, etc.; a 15 minute break; a 15 minute question and answer period; 15 minutes for planning the next group visit; and 30 minutes for informal one-to-one interactions with the physician. Team change: The health care team was introduced at the first group visit. Pharmacists, dieticians, skilled nursing personnel, and a clinical psychologist were involved in facilitating and providing content for the group visits. <u>Control group</u> Usual care	Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination (period of surveillance)	Baseline Group 1: 118/160 (74%) Control: 116/161 (72%) Follow-up Group 1: 130/160 (81%)* Control: 103/161 (64%)* Follow-up OR = 2.44 P < 0.001 <u>Pneumococcal</u> Baseline Group 1: 21/160 (13%) Control: 23/161 (14%) Follow-up Group 1: 53/160 (33%)* Control: 29/161 (18%)* Follow-up RR = 1.83 OR = 2.25 P < 0.001 * LTFU was 21/160 and 48/161 in the intervention and control groups, respectively. Differential LTFU may have resulted in bias in these results.	increased influenza and pneumococcal vaccination rates compared to a non-intervention control group. Group visits with a multidisciplinary care team were associated with reduced use of ambulatory services such as acute and specialist visits, fewer emergency care center visits, and fewer repeat hospitalizations. Costs to the healthcare system were $14.70 more per patient in intervention than in control patients.	
Becker et al. 1989 (219)	Design: CCT Group allocation: Patients were randomly allocated to treatment and control groups. Follow-up period: 4 months	Number of patients: 1055 (563 patients available at analysis, enumerated below.) <u>Group 1</u> Number of patients: 168 Female/male: 114/54 Age (mean(sd)): 50.7 (5.9) <u>Group 2</u> Number of patients: 203 Female/male: 146/57 Age (mean(sd)): 51.9 (5.9) <u>Control group</u>	Number of sites: 1 university internal medicine clinic Site affiliation: University Number of practices or physicians: Not reported. Location: United States (Virginia)	<u>Patient and clinician preventive care reminders vs clinician preventive care reminders vs usual care</u> Intervention aim: Improve preventive care QI agent: Medical clinics <u>Group 1</u> Patient education / reminders: Patients were mailed an individualized schedule for preventive care needs. The reminders were generated from a standardized telephone questionnaire and from patient	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Follow-up Group 1: 12/48 (25%) Group 2: 8/45 (18%) Control: 5/56 (9%) Overall p-value = 0.177 Follow-up Group 1 OR = 3.40 P = 0.03* Group 2 OR = 2.21 P = 0.24*	Patient and clinician reminders did not produce a significantly different improvement in vaccination rates, but this may be due to small sample sizes. The interventions – especially the additional patient reminder intervention – improved the proportion of patients receiving all recommended services.	19

		Number of patients: 192 Female/male: 123/69 Age (mean(sd)): 51.3 (5.7) Eligibility criteria: Patients were aged 40-60 years or age, had a recorded telephone number and at least one visit within 18 months at the study clinic, and had a house officer or general medicine fellow assigned as a primary physician. Exclusions: Nursing home or long-term psychiatric facility		chart review. Clinician reminders: Clinicians received an individualized schedule for each patient's preventive care needs, as memoranda appended to each patient's chart on the first clinic visit after the enrollment interview. Group 2 Clinician reminders: Clinicians received an individualized schedule for each patient's preventive care needs, as memoranda appended to each patient's chart on the first clinic visit after the enrollment interview. Control group Usual care.	Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Pneumococcal Follow-up Group 1: 2/26 (8%) Group 2: 2/34 (9%) Control: 2/29 (7%) Overall p-value = 0.966 Follow-up Group 1 OR = 1.13 P = 1.00* Group 2 OR = 0.84 P = 1.00* * Authors do not report p-values. These values have been calculated by present reviewers.		
Belcher et al. 1990 (220)	Design: CCT Group allocation: Randomized allocation of patients to treatment groups. Follow-up period: 4.5 years	Number of patients: 1224* Gender distributions not reported. Group 1 Number of patients: 277 Age (mean): 57 Group 2 Number of patients: 273 Age (mean): 57 Group 3 Number of patients: 400 Age (mean): 57 Control group Number of patients: 274 Age (mean): 58 Eligibility criteria: Patients attending any of the study site outpatient clinics during October-December 1980, who resided in the site's service area and had a medical problem diagnosed during their period of active military service. All	Number of sites: 1 VA medical center Site affiliation: Veterans Affairs Number of practices or physicians: Clinics comprising the entire outpatient department of the medical centre, including sub-specialty medical, psychiatric, and surgical clinics in addition to primary care. Location: United States (Washington)	Clinician-focused QI vs patient-focused QI vs dedicated health promotion clinic (HPC) vs usual care Intervention aim: Improve preventive care QI agent: Medical center Group 1 – Clinician-focused QI Clinician reminders: A preventive care checklist was affixed to patient charts, for physician use. Clinician education: Physicians received a training session on preventive care. Audit and feedback: As a group, physicians received annual feedback about audit results. Group 2 – Patient-focused QI Patient education / reminders: Patients were mailed an annual packet containing a preventive care information brochure. Patients also received a wallet-sized, patient held preventive care record with	Influenza Proportion of eligible patients receiving vaccination	Influenza Baseline (1978-1981) Group 1: 15% Group 2: 15% Group 3: 16% Control: 16% Follow-up (1981-1982) Group 1: 29% Group 2: 29% Group 3: 54%* Control: 29% Follow-up (1982-1983) Group 1: 46%* Group 2: 42%* Group 3: 61%* Control: 33%* Follow-up (1983-1984) Groups 1 and 2: 52%* Group 3: 47%* Control: 45%* Follow-up (1984-1985) Groups 1 and 2: 63%* Group 3: 56%* Control: 67%*	All groups experienced an increase in influenza vaccination rates, likely due to independent outpatient vaccination campaigns conducted each fall starting in 1981. The clinician-oriented program did not appear to improve vaccinations compared with other interventions. This may have been due to low physician participation. Only 13% of flow sheets showed entries about preventive care parameters, and study investigators had difficulty convincing physicians at specialty clinics to allocate staff meeting time to audit and feedback. The patient-oriented materials also did not improve preventive care. Authors suggested that patient prompting may not have been enough to overcome inertia in physician practices. The HPC was successful for most	21

		patients were male. Settings in which patients were treated include specialty medical, psychological, and surgical outpatient clinics as well as primary care clinics. Female patients were excluded. * Study featured before and after cross-sectional samples of patients. Patients in the "before" sample enumerated here.		a list of preventive care activities. Mail-outs were repeated annually. <u>Group 3 – HPC</u> Case management: A separate Health Promotion Clinic (HPC) was devoted entirely to screening, health counseling, and coordinating follow-up care. Patients were mailed an invitation to self-refer to the HPC. Team change: Nurse practitioners were delivered preventive care independently, according to tailored protocols. <u>Control group</u> Usual care	Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Not targeted.	Follow-up (1981-1982)** Group 1 OR = 1.00 Group 2 OR = 1.00 Group 3 OR = 2.86 Follow-up (1982-1983)** Group 1 OR = 1.74 Group 2 OR = 1.48 Group 3 OR = 3.19 <u>Pneumococcal</u> Not targeted. * Reported as being significantly different from baseline proportion ($p < 0.05$). ** Odds ratios calculated for years in which loss-to-follow-up was less than 20%.	preventive care processes, and showed early improvements in influenza vaccination rates compared with other interventions. Factors for success were high initial and long-term patient volunteerism rates. This study may have biased against the success of clinician-oriented or patient-oriented approaches by evaluating interventions in non-primary care settings, where clinicians are less receptive to preventive care. Additionally, the background vaccination campaigns may have masked intervention-induced improvements.	
Berg et al. 2005 (221)	Design: RCS Group allocation: Observational study with patients allocated to treatment and control groups by randomly selecting matched patients from geographic regions. Follow-up period: 5 months	Number of patients: 554 <u>Group 1</u> Number of patients: 277 Female/male: 132/145 Age (percent over 65): 21% <u>Control group</u> Number of patients: 277 Female/male: 138/139 Age (percent over 65): 22% <u>Eligibility criteria:</u> Heart failure patients continuously enrolled 12 months prior to and 12 months after the study intervention in a large MCO (Blue Cross). <u>Exclusion</u>: Patients in a skilled nursing facility, hospice claim, end-stage renal disease, dialysis, transplants, AIDS, or cancer	Number of sites: 1 heart disease management program at a Blue Cross / Blue Shield plan operating across two states Number of practices or physicians: Not reported Location: United States (Maryland and Virginia)	<u>Multi-component disease management program vs usual care</u> Intervention aim: Improve heart failure care QI agent: Commercial third party <u>Group 1</u> Patient education / reminders: A disease management plan was implemented, including formal scheduled nurse education sessions; 24 hour access to a nurse counseling and symptom advice telephone line; printed action plans, workbooks, and individualized assessment letters; medication compliance reminders; and vaccination reminders. Clinician reminders: Physicians were provided with reminders about treatment gaps and alerts for disease decompensation.	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Baseline Group 1: 27% Control: 27% Follow-up Group 1: 33% Control: 31% Follow-up OR = 1.10* P = 0.584** <u>Pneumococcal</u> Baseline Group 1: 3% Control: 2% Follow-up (Cumulative) Group 1: 15% Control: 9% Follow-up OR = 1.78* P = 0.014**	This community-based, retrospective cohort study of a commercial heart failure disease management intervention demonstrated significant reductions in inpatient admissions. Significant differences in pneumococcal vaccination rates were detected. * Not reported by study authors. The value presented here was calculated by present reviewers.	22

				Team change: A disease management nurse called patients regularly and facilitated information relay between the disease management program and each patient's physicians. Control group Usual care.		*, ** - See next column, at right.	** Adjusted for previous vaccinations, demographics, comorbidities, previous medical service utilization, prescription drug history, and previous medical procedure utilization by logistic regression with matching on propensity scores.	
Berg et al. 2008 (222)	Design: Cluster RCT Group allocation: Experimental study with households randomly allocated to treatment or control groups. Follow-up period: 5 months	Number of patients: 134791 Group 1 Number of patients: 26474 Female/male: 15779/10695 Age (mean(sd)): 77.8 (7.5) Group 2 Number of patients: 26864 Female/male: 16118/10746 Age (mean(sd)): 77.8 (7.5) Control group Number of patients: 81453 Female/male: 48546/32907 Age (mean(sd)): 77.7 (7.5) Eligibility criteria: All subscribers and their dependents in a large HMO, aged 65 years or older.	Number of sites: 1 large HMO Site affiliation: Private MCO Number of practices or physicians: Not reported Location: United States (Oklahoma, Rhode Island, Kentucky, California, Arizona, Utah, Colorado)	Patient vaccination reminder mailing vs vaccination and nursing advice telephone line reminder mailing vs usual care Intervention aim: Improve vaccination rates QI agent: Private MCO Group 1 Patient education / reminders: Patients received an information mailing containing a description of high-risk populations and the benefits of vaccination, the recommended timing for vaccination, and a recommendation for frequent hand washing. Group 2 Patient education / reminders: Patients received a mailing with a description of influenza symptoms and a brief description of high-risk populations. The mailing included an invitation to call a nurse advice service. Team change: 24/7 access to nursing advice was implemented through a community telephone service. All patients could call the nursing advice line, but only Group 2 patients received advice line reminders alongside influenza educational materials. Control group Usual care	Influenza Number of patients receiving vaccine per 10000 eligible patients Percent difference in number of patients receiving vaccine in a treatment group vs the control group Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up Group 1: 2074.11 (5491/26474) Group 2: 2018.69 (5423/26864) Control: 2076.83 (16916/81453) Follow-up Group 1: d = -0.10% P = 0.946 Group 2 d = -2.77% P = 0.069 Follow-up Group 1: OR = 0.998 P = 0.93 Group 2 OR = 0.965 P = 0.04 Pneumococcal Not targeted.	The mail delivered prompt deployed did not have a demonstrable effect on influenza vaccination rates. It did, however, show effects on health services utilization rates and cost savings. Lack of demonstrable effect on influenza vaccination rates may be due to the limited reliability of administrative data for influenza vaccination. The authors calculated a net savings of $1.43-$3.68 and $10.94-$13.84 per patient for the influenza mailing and the nurse advice interventions, respectively.	23

Black et al. (1993) (223)	Design: CCT Group allocation: Experimental study with random allocation of patients to treatment and control groups. Follow-up period: 16 months	Number of patients: 359 <u>Group 1</u> Number of patients: 204 Female/male: 145/59 Age (mean(sd)): 77.6(8.4) <u>Control group</u> Number of patients: 155 Female/male: 97/58 Age (mean(sd)): 77.8(6.5) <u>Eligibility criteria:</u> Public health clients aged >65 years not already vaccinated for influenza. Patients with cognitive impairment, and patients who were considered "inactive" to the public health clinic were excluded.	Number of sites: 1 public health clinic Site affiliation: Public health clinic Number of practices or physicians: N/a Location: Canada (Ontario)	<u>Home visit with influenza vaccination education vs usual home visit</u> Intervention aim: Improve vaccination rates QI agent: Public health clinic <u>Group 1</u> Team change: Public health nurses making routine home visits provided influenza vaccination education. Patient education: Public health nurses reviewed influenza, its vaccine, and strategies to overcome immunization barriers. <u>Control group</u> Usual care: Public health nurses provided a usual care safety promotion in lieu of influenza vaccination education.	<u>Influenza</u> Proportion of eligible patients receiving vaccination at unknown time Risk difference between treatment and control groups Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Not targeted.	<u>Influenza</u> Follow-up Group 1: 111/198 (56.1%) Control: 86/152 (56.6%) Follow-up Diff. = -0.5 95% CI = [-11.0, 10.0] Follow-up OR = 1.40 P = 1.00 <u>Pneumococcal</u> Not targeted.	No statistically significant differences in the rates of self-reported influenza immunization in the intervention and control groups.	22
Brimberry et al. 1988 (224)	Design: RCT Group allocation: Experimental study with random allocation of patients to treatment and control groups. Follow-up period: 3 months	Number of patients: 787 <u>Group 1</u> Number of patients: 267 Age and gender distribution not reported. <u>Group 2</u> Number of patients: 258 Age and gender distribution not reported. <u>Control group</u> Number of patients: 262 Age and gender distribution not reported. <u>Eligibility criteria:</u> Patients 65 years or older, or patients with chronic disease. Patients who had already received the season's received influenza vaccination were	Number of sites: 1 academic family medical centre Site affiliation: University Number of practices or physicians: Not reported Location: United States (Arkansas)	<u>Mailed patient reminders vs personalized telephone patient reminders vs usual care</u> <u>Group 1</u> Intervention aim: Improve vaccination rates QI agent: Family medicine clinic Patient education / reminders: Patients were sent a letter emphasizing their risk of complications following influenza infection and their physician's recommendation that the patient be vaccinated. <u>Group 2</u> Patient education / reminders: A clinic receptionist called patients and provided the patient's personal diagnosis leading	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Not targeted.	<u>Influenza</u> Follow-up Group 1: 26/267 (10%) Group 2: 24/258 (9%) Control: 10/262 (4%) Follow-up Group 1 vs control OR = 2.72 P = 0.009 Group 2 vs control OR = 2.58 P = 0.01 Group 1 vs Group 2 OR = 1.05 P = 1.00 <u>Pneumococcal</u> Not targeted.	Despite the very low increases in vaccination rates that the two intervention methods produced in this trial, they were nonetheless significantly higher than the no-reminder control. The increased personalization of the telephone reminder method may have increased vaccination compliance over that of the mailed reminder group.	19

		excluded.		to eligibility for vaccination, the name of the patient's physician, and a recommendation that the patient be vaccinated for influenza. Questions were referred to a nurse practitioner. Control group Usual care.				
Buchner et al. 1987 (225)	Design: RCT Group allocation: Experimental study with patients randomly allocated to treatment and intervention groups. Follow-up period: Not clear.	Number of patients: 655 (390 patients were available at analysis, enumerated below.) Female/male: 254/136 Age (mean(sd)): 74.7 (sd not reported) Group 1 Number of patients: 196 Control group Number of patients: 194 Eligibility criteria: Patients 65 years of age or over Nursing home residents, patients who had already received influenza vaccination, and those with egg allergies were excluded.	Number of sites: 3 community internist practices Site affiliation: Private practices Number of practices or physicians: As above. Location: United States (Washington)	Mailed patient reminder card vs usual care Intervention aim: Improve vaccination rates QI agent: Medical clinics Group 1 Patient education / reminders: A short message, printed on a 3x5 inch card, was mailed to patients. The message, designed to address determinants of flu shot compliance identified by the health belief model, mentioned patients' eligibility for the "flu shot", the benefits of vaccination, and instructions for receiving vaccination. The cue was signed by patients' physicians. Control group Usual care.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up Group 1: 108/196 (55%) Control: 105/194 (54%) Follow-up OR = 1.04 P = 0.92 Pneumococcal Not targeted.	In a population exposed to many community influenza vaccination cues aside from the intervention, baseline vaccination rates were 54% - higher than the estimated national baseline vaccination rate. The study cue failed to boost vaccination rates above the baseline rate of 54%. This may be due to a ceiling effect. Mailing an influenza vaccination cue increased the probability of a clinic visit for flu shots.	20
Buffington et al. 1991 (226)	Design: Cluster RCT Group allocation: Experimental study with physician practices randomly assigned to intervention and control groups within practice-size strata. Follow-up period: 3 months	Number of patients: 10525 Group 1 Number of patients: 3604 Age and gender distribution not reported Group 2 Number of patients: 2149 Age and gender distribution not reported Control group Number of patients: 4772 Age and gender distribution not	Number of sites: 13 private physician offices affiliated with a teaching hospital* Site affiliation: Private practices Number of practices or physicians: 45 physicians Location: United States (New York)	Performance feedback charts vs performance feedback charts and patient postcard reminders vs usual care Intervention aim: Improve vaccination rates QI agent: Physician practices Group 1 Audit and feedback: A 11x17 inch poster relaying the proportion of the eligible practice population vaccinated in a graphic fashion was placed in the physician office. The chart was updated	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Influenza Follow-up Group 1: 1420/2149 (66%) Group 2: 2427/3604 (67%) Control: 2405/4772 (50%) Follow-up Group 1 vs control OR = 1.92 P<0.001 Group 2 vs control OR = 2.03 P<0.001 Group 1 vs Group 2 OR = 0.95	A simple target-based system for tracking influenza immunization performance by physicians can improve delivery of vaccine to the elderly. The population-based tracking system was readily accepted by physicians and their office personnel, and, when immunizations occurring in public health clinics were included, resulted in rates that easily surpassed the 60% target.	20

		reported Eligibility criteria: Patients aged 65 years or older.	* Practices were assigned to intervention group 1 (17 physicians), intervention group 2 (13 physicians), and control (15 physicians).	weekly by office staff tracking numbers of vaccinations dispensed. Group 2 Audit and feedback, as above. Patient education / reminders: Postcard vaccination reminders were mailed to all eligible patients. Control group Usual care.	 Pneumococcal Not targeted.	P < 0.01 Pneumococcal Not targeted.	The postcard reminder had little added effect in increasing overall immunization rates.	
Cardozo et al. 1998 (1)	Design: RCS Group allocation: Observational study with patients allocated to treatment and control groups. Follow-up period: Unclear	Number of patients: 243 Group 1 Number of patients: 132 Female/male: 94/38 Age (mean(sd)): 77.4 (7.7) Control group Number of patients: 111 Female/male: 82/29 Age (mean(sd)): 74.1 (7.5) Eligibility criteria: Patients were African-Americans over the age of 50 who had received ambulatory care at a study clinic during a 2-year period. Influenza and pneumococcal vaccinations were provided to eligible patients within the study sample.	Number of sites: 1 large academic medical center Site affiliation: University Number of practices or physicians: 2 ambulatory care clinics * Location: United States (Michigan) * One clinic was staffed by nurse practitioners and staff physicians and constituted the treatment clinic. The other was staffed by medical residents and staff physicians and constituted the control clinic.	Nurse/physician collaborative care vs usual care Intervention aim: Improve preventive care QI agent: Medical clinics Group 1 Team change: Patients are seen independently for a comprehensive initial visit by a nurse practitioner. Every patient is seen by a staff physician at the second visit, and once a year. Control group Usual care.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Influenza Follow-up* Group 1: 125/132 (95%) Control: 51/111 (46%) Follow-up OR = 21.0 P < 0.001** Pneumococcal Follow-up* Group 1: 120/132 (91%) Control: 6/111 (5%) Follow-up OR = 175.0 P < 0.001** *, ** - See next column, at right.	A model of nurse/physician collaborative practice was able to achieve a high performance of preventive health services in an older, inner city African-American patient population, despite socioeconomic barriers. * Proportions extracted visually from a histogram. The denominator may include patients with a previous history of pneumococcal vaccination. ** Not reported by authors. Estimated by present reviewers.	18
Carter et al. 1986 (227)	Design: CCT Group allocation: Patients were randomly allocated to treatment and control groups. Follow-up period: 1 influenza season	Number of patients: 284 (235 patients available for analysis, reported below) Age and gender distributions not reported. Group 1 Number of patients: 121 Control group	Number of sites: 1 long-term care general medical clinic Site affiliation: Veterans Affairs Number of practices or physicians: Not reported. Location: United States	Utility-based brochure and clinic reminder letter vs clinic reminder letters alone Intervention aim: Improve vaccination rates QI agent: Medical clinics Group 1 Patient education / reminders: Patients	Influenza Proportion of eligible patients receiving vaccination during Odds ratio of receiving vaccination between treatment and control groups Pneumococcal	Influenza Follow-up Group 1: 44/121 (36%) Control: 26/114 (23%) Follow-up OR = 1.93 P < 0.025 Pneumococcal	An intervention brochure significantly increased the flu shot rate among participants who had not been vaccinated the previous year compared to standard and augmented clinic letters. The brochure was designed based on differences in the "net weighted relative utility" profiles of vaccinees vs non-vaccinees.	20

		Number of patient: 114 Eligibility criteria: Active clinic patients who had not obtained a flu shot the previous year. Eligible patients were 65 years or older, or had a diagnosis of diabetes, chronic lung, or chronic heart disease. Patients were excluded if they resided in a nursing home, or had severely disabling mental, visual, or hearing impairments.	(Washington)	received clinic letters recommending that they receive vaccination. Additionally, patients received a brochure. The brochure had been designed to address the perceptions that differed between flu vaccinees and non-vaccinees in a prior utility-based study. Control group Patient education / reminders: Patients received clinic letters recommending that they receive vaccination.	Not targeted.	Not targeted.		
CDC et al. 1995 (228)	Design: Cluster-RCT Group allocation: Experimental study with geographic ZIP code regions in two states were randomly assigned to treatment and control groups. Follow-up period: 1 year	Number of patients: Not reported. Group 1 Number of patients: Not reported Group 2 Number of patients: Not reported Control group Number of patients: Not reported Eligibility criteria: Patients aged 65 years or older enrolled in Medicare Part B. Included patients were alive and continuously enrolled during the study period.	Number of sites: 1 Non-profit foundation affiliated with state Medicare agencies (Montana-Wyoming Foundation for Medical Care) Site affiliation: Government, Medicare Number of practices or physicians: 40 ZIP code regions, number of clinic sites not reported. * Location: United States (Montana and Wyoming) * Sites were allocated to intervention with a personalized letter (4 regions), intervention with a form letter (4 regions) and to no intervention (32 regions)	Personalized letters and educational brochures from a state Medicare-affiliate vs form letters and brochures from a state Medicare-affiliate vs usual care Intervention aim: Improve vaccination rates QI agent: Non-profit Medicare affiliate Group 1 – Personalized letter Patient education / reminders: influenza reminder letters and informational brochures were sent to Medicare beneficiaries. The letter was personalized from the medical director of the Montana-Wyoming Foundation for Medical Care. Group 2 – Form letters Patient education / reminders: influenza reminder letters and informational brochures were sent to Medicare beneficiaries. The letter was a form letter from the Montana-Wyoming Foundation for Medical Care. Control group Usual care. All regions were subject to concurrent mass media campaigns.	Influenza Proportion of eligible patients receiving vaccination Difference in change in proportions vaccinated in letter regions vs non-intervention control regions Odds ratio of receiving vaccination between treatment (Group 1 and Group 2) and control groups	Influenza Baseline - Montana Group 1: 41% Group 2: 46% Control: 42% Follow-up - Montana Group 1: 50% Group 2: 53% Control: 47% Baseline - Wyoming Group 1: 24% Group 2: 21% Control: 22% Follow-up - Wyoming Group 1: 43% Group 2: 40% Control: 33% Follow-up – All states Group 1 and 2 vs Control d = 6.1% 95% CI = [5.5%, 6.7%] Follow-up – All states All patients OR = 1.3 95% CI = [1.3, 1.4] Patients vaccinated at baseline OR = 1.2 95% CI = [1.2, 1.3]	The Montana and Wyoming intervention resulted in a statistically significant, although modest, improvement in vaccination levels.	21

					Pneumococcal Not targeted.	Patients un-vaccinated at baseline OR = 1.4 95% CI = [1.3, 1.4] Pneumococcal Not targeted.		
Chambers et al. 1991 (229)	Design: Cluster RCT Group allocation: Experimental study with randomized allocation of physicians to treatment and control groups. Follow-up period: 2 months	Number of patients: 686 Female/male: 160/505* Age (mean(sd)): Not reported Group 1 Number of patients: 271 Age >/= 65: 73% Gender distribution not reported. Group 1 Number of patients: 146 Age >/= 65: 74% Gender distribution not reported. Control group Number of patients: 218** Age >= 65: 76% Gender distribution not reported. Eligibility criteria: Patients age 65 years or older, or patients with chronic diseases. Patients already having received vaccination, or patients who saw physicians assigned to different study groups were excluded. * Incomplete data ** 1 physician and associated patients excluded from the analysis in Chambers et al. as a performance outlier.	Number of sites: 1 academic department of family medicine Site affiliation: University Number of practices or physicians: 30* Location: United States (Pennsylvania) * Physicians randomly allocated to treatment and control groups, numbers not reported.	Computer generated chart reminders in 100% of charts vs computer generated chart reminders in 50% of charts vs usual care Intervention aim: Improve vaccination rates QI agent: Department of Family Medicine Group 1 Clinician reminders: Reminder forms printed and fixed to each eligible patient's visit chart. Patient eligibility determined from an EMR. Group 2 Clinician reminders as above, except reminders were printed and fixed to 50% of eligible patients' visit charts. Control group Usual care	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up Group 1: 137/271 (51%) Group 2: 42/146 (29%) Control: 65/218 (30%) Follow-up Group 1 vs control OR = 2.41 P < 0.001 Group 2 vs control OR = 0.95 P = 0.91 Overall test of significance P < 0.001 Pneumococcal Not targeted.	Computer-generated reminders to physicians resulted in significant increases in the number of patients immunized against influenza. Independent predictors of immunization include: more visits, and age >65 years. Reminders are most effective when they are provided for every appropriate patient encounter.	22
Chan et al. 2002 (230)	Design: Cross-over cluster	Number of patients: 4300	Number of sites: 135 physiatrists billing	Clinician education letters vs usual care	Influenza Proportion of eligible patients	Influenza Follow-up	The use of physician reminders to physiatrists seeing Medicare	25

	RCT Group allocation: Experimental study with physicians or physician groups allocated randomly to treatment and control groups in 1997, crossed over in 1998. Follow-up period: 2 years	Group 1* Number of patients: 2827 Female/male: 1129/1698 Age (mean(sd)): 69.7-72.7 (sd not reported) Control group* Number of patients: 1473 Female/male: 831/642 Age (mean(s)): 67.2-69.5 (sd not reported) Treatment and control groups were reversed (crossed-over) for the second follow-up time. Eligibility criteria: Medicare patients (>/= 65 years) seen by a study physiatrist. Patients seen by more than 1 physiatrist were excluded. * Patient age and gender distributions provided separately for solo and group practices, combined here. Sample composition reported for the first follow-up time after intervention implementation.	Medicare in Washington state Site affiliation: Private practices Number of practices or physicians: As above. Location: United States (Washington)	Intervention aim: Improve vaccination rates QI agent: Research group sending state-wide letters Group 1 Clinician reminders: Physicians received 4 monthly mailings, each reminding the physician to have their patients immunized against influenza. Control group Usual care.	receiving vaccination Risk ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	1997 solo practitioners Group 1: 473/1486 (32%) Control: 225/596 (38%) 1997 group practitioners Group 1: 570/1341 (43%) Control: 264/877 (30%) 1998 solo practitioners Group 1: 228/561 (41%) Control: 414/1310 (32%) 1998 group practitioners Group 1: 309/868 (36%) Control: 547/1286 (43%) Follow-up time 1997 solo practitioners RR = 0.89* 95% CI [0.63, 1.26] 1997 group practitioners RR = 1.26* 95% CI [0.98, 1.60] 1998 solo practitioners RR = 1.34* 95% CI [0.96, 1.88] 1998 group practitioners RR = 0.83* 95% CI = [0.73, 1.36] Pneumococcal Not targeted. * See next column, at right.	beneficiaries has a minimal effect on improving influenza vaccination rates. These results support the idea that most physiatrists do not see themselves as providers of primary care for their patients. * Random effects log-binomial regression, adjusted for clustering within clinics, patient age, gender, and number of claims.	
Cheney et al. 1987 (231)	Design: Cluster RCT Group allocation: Internal medicine residents were randomly allocated to treatment and control groups. Follow-up period:	Number of patients: Not reported. Group 1 Not reported. Control group Not reported, Eligibility criteria: Patients aged 60 years or older,	Number of sites: 1 outpatient internal medicine clinic Site affiliation: University Number of practices or physicians: 75 resident physicians* Location: United States	Preventive care checklist vs usual care Intervention aim: Improve preventive care QI agent: Medical clinics Group 1 Clinician reminders: Age and gender specific preventive care checklists were affixed to charts for each physician to	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients	Influenza Follow-up Group 1: 46% Control: 22% Follow-up OR = 3.02* P = 0.01** Pneumococcal Follow-up	Checklists were effective reminders, and their use led to higher rates for implementation of preventive care measures. The provision and use of the checklist was associated with a significant improvement in the rate of immunizations.	20

	9 months	attending the clinic during the study period.	(California) * 33 residents and 42 residents were allocated to treatment and control groups, respectively.	review. <u>Control group</u> Usual care	receiving vaccination (period of surveillance)	Group 1: 20% Control: 3% Follow-up OR = 8.08* P < 0.02** *, ** - See next column, at right.	* Unadjusted for clustering effects. Calculated by present reviewers from percentages ** Adjusted for clustering of patients within physicians.	
Clayton et al. 1999 (232)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period: 3 months	Number of patients: 4278 <u>Group 1</u> Number of patients: 2631 Female/male: 1481/1150 Age (mean(sd)): 73.4 (6.16) <u>Control group</u> Number of patients: 2647 Female/male: 1467/1180 Age (mean(sd)): 73.5 (6.12) <u>Eligibility criteria:</u> HMO members aged 65 years or older, enrolled in group model health centers. A concurrent control group was designed only for patients who received influenza vaccination the year before.	Number of sites: 1 large health maintenance organization Site affiliation: Private MCO Number of practices or physicians: Not reported Location: United States (Multiple states in the Northeastern region)	<u>Mailed patient reminder postcard vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Large HMO <u>Group 1</u> Patient education / reminders: A post card reminder was sent to patients. <u>Control group</u> All patients received the HMO's standard member educational materials.	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination	<u>Influenza</u> Follow-up Group 1: 2067/2631 (79%) Control: 2043/2647 (77%) Follow-up OR = 1.08 P = 0.222 <u>Pneumococcal</u> Not targeted.	This study supports the reallocation of resources to more targeted outreach. Postcard interventions should be discontinued among seniors vaccinated the previous year, with funds redirected to more intensive outreach among those at highest risk of not accepting vaccination, i.e.: seniors not vaccinated the previous year.	26
Cohen et al. 1982 (233)	Design: Cluster-RCT Group allocation: Patient-physician practice clusters (firms) at a general medicine department were randomly allocated to treatment and control groups. Follow-up period: 4 months	Number of patients: 872 Age and gender distributions not reported. <u>Group 1</u> Number of patients: 581 <u>Control group</u> Number of patients: 291 <u>Eligibility criteria:</u> Patients aged 65 years or older. Patients eligible for pneumococcal vaccination had not been previously vaccinated.	Number of sites: 1 academic general medicine outpatient department Site affiliation: University Number of practices or physicians: 3 firms, *i.e.*: patient-physician practice clusters.* Location: United States (Ohio) * 2 firms were allocated to treatment, 1 firm was allocated to control.	<u>Preventive care checklists vs usual care.</u> Intervention aim: Improve preventive care QI agent: Medical clinic <u>Group 1</u> Clinician reminders: An age appropriate checklist was affixed to the patient chart before each visit. A research assistant completed the checklist after a brief chart review. Final orders were determined by the physician. Clinician education: Seminars were held on preventive care topics.	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Follow-up* Group 1: 186/581 (32%) Control: 12/291 (4%) Follow-up OR = 10.95 P < 0.001 <u>Pneumococcal</u> Follow-up * Group 1: 230/547 (42%) Control: 14/291 (5%) Follow-up OR = 14.36 P < 0.001	An improvement in residents' attitudes towards and use of preventive procedures, including influenza and pneumococcal vaccination, occurred in clinics implementing a simple reminder checklist.	21

				Control group Clinician education, as above.		* These figures are unadjusted for potential unit of analysis errors. However, authors performed sensitivity analyses at the physician level , with p < 0.001 reported.		
Cowan et al. 1992 (234)	Design: Cluster RCT Group allocation: Experimental study with randomized allocation of medical residents to intervention and control groups. Follow-up period: Unclear.	Number of patients: 107 Group 1 Number of patients: 62 Female/male: 35/27 Age (mean(sd)): 60 (sd not reported) Control group Number of patients: 45 Female/male: 25/20 Age (mean(sd)): 57 (sd not reported) Eligibility criteria: Vaccinations were provided for adults >65 years old. Patients were only counted towards pneumococcal vaccination rates if they had not been previously vaccinated.	Number of sites: 1 academic medical center Site affiliation: University Number of practices or physicians: 29 medical residents Location: United States (Illinois)	Generic clinician reminder sheet vs usual care Intervention aim: Improve preventive care QI agent: Medical clinic Group 1 Clinician reminders: A periodic health examination fact sheet, containing age and sex specific recommendation on seven periodic health examination actions, was attached to the front of every patient chart. Control group Usual care.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination	Influenza Follow-up Group 1: 11/30 (37%) Control: 9/24 (38%) Follow-up OR = 0.96 P = 1.00 Pneumococcal Follow-up Group 1: 3/29 (10%) Control: 0/23 (0%) Follow-up OR = 5.31* P = 0.25 * Division by zero avoided by adding 0.5 to cells with no events.	A reminder system consisting of generic age- and sex- specific recommendation for the periodic health examination did not significantly improve performance of preventive procedures by medical residents. Low performance may have been due to the non-interactive nature of the fact sheet, which was designed to provide information only.	25
Dalby et al. 2000 (235)	Design: RCT Group allocation: Experimental study with patients randomly assigned to treatment and control groups. Follow-up period: 14 months	Number of patients: 142 Group 1 Number of patients: 73 Female/male: 52/21 Age (mean(sd)): 79.1 (5.8) Control group Number of patients: 69 Female/male: 43/26 Age (mean(sd)): 78.1 (5.3) Eligibility criteria: Patients 70 years or older, reporting functional impairment, or admission to hospital, or bereavement in the previous 6 months.	Number of sites: 1 Ontario Health Service Organization (HSO), i.e.: a primary care practice in which medical services are remunerated by capitation. Site affiliation: Private practice Number of practices or physicians: 2 physicians Location: Canada (Ontario)	Preventive home visits by a nurse vs usual care Intervention aim: Improve care of the elderly QI agent: Medical clinic Group 1 Team change: A nurse visited the household of each community-dwelling elderly patient. Nurses provided influenza immunizations on home visits after the development of a care plan. Case management: Nurses reviewed each person's medical record and completed an assessment addressing	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination (period of surveillance)	Influenza Follow-up* Group 1: 51/59 (90%) Control: 29/54 (53%) Follow-up OR = 5.50 P < 0.001 Pneumococcal Follow-up* Group 1: 48/59 (82%) Control: 0/54 (0%) Follow-up OR = 471.27 P < 0.001	Case management/ nurse visit quality improvement intervention improved vaccination rates among the elderly at risk for health deterioration. Combined rates of deaths and admissions to an institution were similar between the 2 groups. Nursing case management frequently uncovered new conditions, which may have led to an increase in health services utilization in the short term.	20

		Exclusions: Nursing home, involved in other research study, or had participated in a pretest of the study survey instrument.		physical, cognitive, emotional and social function, medication use, and safety and suitability of the home environment. A care plan was developed with the primary care physician, the patient, the patient's family, caregivers, and other health care professionals. The intervention adhered to the "functional consequences theory" of gerontologic nursing, and aimed at minimizing the negative effects of age-related changes and promoting positive function. Follow-up visits and phone calls were provided as needed over 14 months. Nurses played an important role in integrating health and community services. Control group Usual care.		* Follow-up rates were 81% and 78% in the treatment and control groups. Results provided for patients completing the trial. ** With substitution of 0.5 for zero cells.		
Demakis et al. 2000 (236)	Design: Cluster-RCT Group allocation: Primary care residents at the study sites were allocated, either in half-day blocks or by clinical teams, randomly to treatment or control group. Follow-up period: 17 months	Number of patients: 12989 Age (mean(sd)): 65.9 (10.9) Gender (female/male): 1.6%/98.4% Group 1 Number of patients: Not reported. Control group Number of patients: Not reported. Eligibility criteria: Medical residents at the study site who were involved in primary care. Patients aged 65 years or higher, or those with high-risk conditions (not specified) were eligible for pneumococcal vaccine once every 5 years.	Number of sites: 12 VA medical centers Site affiliation: Veterans Affairs Number of practices or physicians: 275 resident physicians* Location: United States (Multiple states) * 153 and 146 residents were allocated to treatment and control groups, respectively.	Computerized reminder system vs usual care Intervention aim: Improve preventive care QI agent: Medical clinic Group 1 Clinician reminders: Computer-generated clinical care reminders for each patient were provided to the resident in the form of a printed summary of health placed at the beginning of the medical chart on the day of a clinic visit. Participating residents were also exposed to the reminders through computer terminals in each examination room. Control group Usual care.	Influenza Not targeted. Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Proportion of eligible *visits* in which vaccination was provided	Influenza Not targeted. Pneumococcal Baseline* Group 1: 4% Control: 5% Follow-up Group 1: 13% Control: 4% Follow-up OR = 3.26** 95% CI = [2.09, 5.09] P < 0.001 Follow-up Group 1: 8% Control: 1% OR = 7.85** 95% CI = [3.83, 16.08] P < 0.001 * Refers to resident physician behavior during	Higher adherence to standards of care, including pneumococcal vaccination recommendations, were obtained with the reminder system.	25

						the 2 months before the intervention was implemented, *not* patient vaccination status in previous years. ** Adjusted for clustering within physicians by GEE.		
Dietrich et al. 1989 (237)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period = 12 months	Number of patients: 117 (114 patients available at analysis, enumerated below.) <u>Group 1</u> Number of patients: 59 Female/male: 40/19 Age (mean(sd)): 73.0(6.1) <u>Control group</u> Number of patients: 55 Female/male: 37/18 Age (mean(sd)): 75.4(7.0) <u>Eligibility criteria:</u> Patients aged 65 years or older with office visits during the 3 month enrollment period. Patients without telephone, or who were transient to the clinic, blind, demented, or terminally ill were excluded.	Number of sites: 1 community medical practice Site affiliation: Private practice Number of practices or physicians: Not reported Location: United States (New Hampshire)	<u>Patient-held preventive care checklist and patient education mailings vs patient reminder letter only</u> Intervention aim: Improve preventive care QI agent: Medical clinic <u>Group 1</u> Patient reminders / education: Patients were mailed questionnaires about their personal characteristics and their recent preventive health care; personal prevention checklists; and letters encouraging use of the checklists to track receipt of appropriate preventive care. Preventive care items were explained in detail. <u>Control group</u> Patient reminder / education: Patients received a reminder letter for influenza vaccinations	<u>Influenza</u> Proportion of eligible patients receiving vaccination during Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Not targeted.	<u>Influenza</u> Baseline Group 1: 36/59 (61%) Control: 39/55 (71%) Follow-up Group 1: Not reported Control: Not reported Follow-up OR = Unable to calculate P > 0.05 (NS) <u>Pneumococcal</u> Not targeted.	A small patient-oriented intervention was associated with improved cancer early detection services for older patients, but not with improvements in rates of blood pressure measurement or influenza vaccination. The lack of effectiveness may be due to patient reminder letters in the control group and ceiling effects, respectively.	19
Fishbein et al. 2006 (238)	Design: CBA Group allocation: Patients were allocated in consecutive blocks to treatment and control groups. Follow-up period: 1 year	Number of patients: 600* <u>Group 1</u> Number of patients: 300* Female (%): 70% Age (mean(sd)): 48 (sd not reported) <u>Control group</u> Number of patients: 300* Female (%): 66% Age (mean(sd)): 47 (sd not reported.	Number of sites: 3 family practice sites Site affiliation: 1 academic site, 1 private practice, and 1 primary health centre Number of practices or physicians: 16 physicians Location: United States (Louisiana, New Mexico, and Georgia)	<u>Patient self-assessment / provider reminder tool vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical clinics <u>Group 1</u> Facillitated relay of patient information: Patient completed a paper-based self assessment/ provider reminder (A/R) tool. The tool is comprised of a series of yes/no questions that assess patients'	<u>Influenza</u> Proportion of eligible patients receiving vaccination	<u>Influenza</u> Baseline* Group 1: 56/175 (32%) Control: 38/165 (23%) Follow-up – Vaccination during the day the A/R tool was provided ** Group 1: 25/119 (21%) Control: 31/127 (24%) Follow-up – 1 year after the A/R tool was provided** Group 1: 24/94 (26%)	Administering the A/R tool increased the proportion of same-day vaccinations for influenza at 2/3 study sites, and increased the proportion of same-day pneumococcal vaccinations at 1/3 study sites. Comparing intervention and control patients all together, the intervention improved same-day pneumococcal vaccinations. No significant difference in vaccination uptake during the period after the A/R tool was	18

		Eligibility criteria: Patients aged 18 years or older, not acutely ill, providing written consent. Influenza and pneumococcal vaccinations were recommended for patients aged 65 years or older, or those with select chronic diseases. * Includes patients for whom influenza and pneumococcal vaccinations were not indicated.		needs for 8 immunizations (reduced to 6 at two of three study sites). Clinician reminders: The A/R tool prompted clinicians to provide recommended vaccinations. The A/R tool also remained part of the patient chart after the initial visit at which it was produced. Patient education: The A/R tool was accompanied by educational material concerning recommended vaccinations. Control group Usual care. Patients received information on physical activity instead of the A/R tool.	Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Control: 30/96 (31%) Follow-up – Vaccination during the day the A/R tool was provided** OR = 0.82 P = 0.57 Follow-up – 1 year after the A/R tool was provided** OR = 0.75 P = 0.42 Pneumococcal Baseline* Group 1: 45/105 (43%) Control: 53/112 (47%) Follow-up – Vaccination during the day the A/R tool was provided** Group 1: 23/60 (38%) Control: 8/59 (14%) Follow-up – 1 year after the A/R tool was provided** Group 1: 5/37 (14%) Control: 7/51 (14%) Follow-up – Vaccination during the day the A/R tool was provided** OR = 3.96 P = 0.003 Follow-up – 1 year after the A/R tool was provided** OR – 0.98 P = 1.00 *, ** - See next column, at right.	administered was observed. Disappointing results may have been due to the large number of vaccinations (8) prompted by the A/R tool. Providers flatly stated that they were not willing, or did not have the time, to consider all eight vaccinations. Authors also suggest that the A/R tool would have become lost among other papers in the patient chart after the initial visit. * Baseline results refer to those patients who had already been vaccinated *that season* (influenza) or previously (pneumococcal). These patients were removed from the denominator of successive outcome proportions. Baseline proportions do not represent previous years' vaccination status. ** Results differed among intervention sites. Overall results extracted here.	
Frank et al. 2004 (239)	Design: CCT Group allocation: Experimental study with patients	Number of patients: 10507 Group 1 Number of patients: 5118 Female/male: 56% female Age (mean(sd)): 36.0 (21.7)	Site affiliation: Private practice Number of sites: 1 Sub-urban general practice	Automated EMR reminder prompts vs usual care Intervention aim: Improve preventive care QI agent: Medical clinics	Influenza Proportion of patient-contacts with eligible patients resulting in vaccination Odds ratio of a patient contact	Influenza Follow-up Group 1: 245/935 (26%) Control: 248/912 (27%) Follow-up	Reminders did not increase influenza vaccination rates, but did increase pneumococcal vaccination rates. Overall, reminders caused only a modest increase in opportunistic uptake.	23

	allocated to treatment and control groups by quasi-randomization. Follow-up period: Unclear	<u>Control group</u> Number of patients: 5389 Female/male: 57% female Age (mean(sd)): 35.4 (21.9) <u>Eligibility criteria:</u> GP visits of all adult patients attending the study general practice. Eligible visits for receiving influenza vaccination occurred among patients > 65 years old who had not yet received the current season's vaccination. Eligible visits for receiving pneumococcal vaccination occurred among patients > 65 years old who had not been previously vaccinated.	Number of practices or physicians: 10 physicians Location: Australia (South Australia)	<u>Group 1</u> Clinician reminders: Physicians, all of whom were experienced EMR users, received on-screen preventive care prompts for eligible patients. <u>Control group</u> Usual care	resulting in vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of patient-contacts with eligible patients resulting in vaccination Odds ratio of a patient contact resulting in vaccination between treatment and control groups	OR = 0.95 95% CI = [0.78, 1.18] P = 0.64 <u>Pneumococcal</u> Follow-up Group 1: 58/2079 (3%) Control: 39/2370 (2%) Follow-up OR = 1.72 95% CI = [1.10, 2.62] P = 0.01	A small effect may have been due to increased sensitivity of GPs to preventive care affecting the care of control patients, or to other characteristics in setting, evaluation design, or intervention design. Information overload may also be a mitigating factor.	
Garcia-Aymerich et al. 2007 (240)	Design: RCT Group allocation: Experimental study with patients randomized to treatment and control groups. Follow-up period: 12 months	Number of patients: 113 patients <u>Group 1</u> Number of patients: 44 Female/male: 11/33 Age (mean(sd)): 72 (10)* <u>Control group</u> Number of patients: 69 Female/male: 5/64 Age (mean(sd)): 73 (9)* <u>Eligibility criteria:</u> COPD patients discharged from a particular tertiary care hospital. All patients had been admitted because of an acute exacerbation, and had required hospitalization for more than 48 hours. Patients were excluded if they resided in a nursing home, or outside of study area; had lung cancer or advanced malignancies; faced logistic limitations; or suffered severe neurological or cardiovascular co-morbidities. * Age reported for patients	Number of sites: 1 department of pulmonary medicine at an academic tertiary care center Site affiliation: University Number of practices or physicians: General practices were involved in the provision of care. Numbers were not reported. Location: Spain (Barcelona)	<u>Integrated COPD care vs usual care</u> Intervention aim: Improve COPD care QI agent: Academic department of pulmonary medicine <u>Group 1</u> Case management: Patients received a comprehensive assessment at discharge, including evaluation of comorbidities, treatment adherence, and social support needs. An individually tailored care plan was developed between the patient, the case manager, and the primary care team. Patients were coached through logistical and social support issues associated with managing multiple chronic conditions. Additionally, patients were taught to identify symptoms or signs of an acute episode, and to call the case manager who could either solve the problem over the phone or initiate a home visit. No further visits were initiated by the case manager. Patients could initiate contact by telephone, or through a web based call center.	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccinations Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Follow-up* Group 1: 19/21 (91%) Control: 32/41 (78%) Follow-up OR = 2.67 P = 0.442 <u>Pneumococcal</u> Follow-up* Group 1: 16/21 (76%) Control: 25/41 (61%) Follow-up OR = 2.05 P = 0.348 * Study completion rates were 53% and 60% among treatment and control patients. Results reported for patients completing the study.	Integrated care, including self-management education, coordination among levels of care, and increased accessibility in COPD patients, was associated with improvements in disease knowledge, treatment adherence, and nutritional status. No significant changes in lifestyle variables, medical treatment, lung function, or quality of life were detected.	23

		completing the study only. ** Denominator of the pneumococcal vaccination outcome may included patients with previous vaccinations.		Patient education / reminders: A 2 hour educational session covering self-management of COPD was administered at discharge by the study nurse. Topics included knowledge of the disease, smoking cessation, physical activity, nutrition, non-pharmacologic therapy, correct use of pharmacological therapy, and self-management strategies for coping with exacerbations. Team change: Case management was provided by specially trained respiratory care nurses. Additionally, a joint visit of the specialist nurse and the primary care team was made Control group Usual care				
Goebel et al., 2005 (241)	Design: Cluster RCS Group allocation: Physician practices allocated to treatment and control arms by physician self-selection. Follow-up period: 4 years	Number of patients: 1796 Group 1 Number of patients: 912 Female/male: 693/219 Age (mean(sd)): 79 (sd not reported) Control group Number of patients: 884 Female/male: 510/374 Age (mean(sd)): 74 (sd not reported) Eligibility criteria: Patients aged 65 years or older treated by an attending physician at the study site.	Number of sites: 1 University ambulatory care center Site affiliation: University Number of practices or physicians: 4 attending physicians (2 treatment practices, 2 control practices) Location: United States (Virginia)	Standing orders for nurse vaccination vs usual care Intervention aim: Improve vaccination rates QI agent: Physician practices Group 1 Team change: Nurses were tasked with providing influenza vaccinations. Physicians issued verbal or written standing orders to their nurses to administer the influenza vaccine. Control group Usual care	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up*, ** Group 1: 575/912 (63%) Control: 336/884 (38%) Follow-up*, ** OR = 2.78 P < 0.0001 Pneumococcal Not targeted. * Combined over 4 years. ** Unadjusted for baseline imbalances in age and gender.	Standing orders for influenza vaccination are associated with higher immunization rates in the ambulatory setting. Results may be biased by imbalances in covariates among patient samples between groups, as well as differences in clinician or practice characteristics between the small number of practices involved.	21
Grabenstein et al. 1993 (242)	Design: RCT Group allocation: Patients were randomly allocated to treatment and control groups. Follow-up period:	Number of patients: 551 (482 patients available at analysis, enumerated below.) Group 1 Number of patients: 242 Female/male: 152/90 Age (mean(sd)): 66.9 (13.7)	Number of sites: 3 pharmacies belonging to 1 pharmacy chain. Site affiliation: Private community pharmacies Number of practices or physicians: 3 pharmacies,	Vaccination advocacy by community pharmacists via patient education letters vs usual care Intervention aim: Improve vaccination rates QI agent: Community pharmacies Group 1	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Influenza Follow-up Group 1: 39/125 (31%) Control: 24/134 (18%) Follow-up OR = 1.70 P = 0.013	Community pharmacists improved vaccination rates by advising at-risk patients of infection risk and describing where to be vaccinated.	22

	2 months	Control group Number of patients: 240 Female/male: 159/81 Age (mean(sd)): 67.8 (14.6) Eligibility criteria: Patients fell into two sets: Those receiving one of ten medications in the preceding six months from the study pharmacies. Medications were digoxin or nitroglycerin (heart disease); insulin, glipizide, or glyburide (diabetes); and theophylline or salbutamol (chronic respiratory disease); or patients aged 65 years or older receiving ibuprofen, naproxen, or sulindac in the preceding six months. Patient pharmacy records were screened to exclude patients with chronic diseases from this set. Patients residing in a nursing home, or patients otherwise incapable of responding to letter or survey, were excluded.	as above. Location: United States (North Carolina)	Patient education / reminders: Patients were mailed a letter on pharmacy stationery, advising them of their infection risk and of influenza vaccine availability. Letters were written in a manner consistent with the Health Beliefs Model, explaining influenza susceptibility and severity, vaccine efficacy, and providing information to mitigate barriers of fear or uncertainty. All patients, including control patients, also received a reminder postcard 2 weeks later. Control group Patient education / reminders: Patients received a poison control pamphlet, as well as a vaccination reminder postcard.	Pneumococcal Not targeted.	Pneumococcal Not targeted.		
Grabenstein et al. 2001 (243)	Design: Cluster RCS Group allocation: Observational study with geographic regions (states) allocated to treatment or control. Follow-up period: 1 year	Number of patients: 4403* Female/male: 1212/878 Age (mean(sd)): 64.8 (15.2) Group specific age and gender distributions not reported. Group 1 Number of patients: 2211 Control group Number of patients: 2192 Eligibility criteria: Patients aged 65 years or older receiving any prescription medication, or patients 21 to 64 years old who received medications related to certain chronic diseases; medication was received from a participating pharmacy during	Number of sites: 1 large chain of commercial pharmacies Site affiliation: Commercial pharmacies Number of practices or physicians: 24 pharmacies* Location: United States (Washington and Oregon) * US states were allocated to treatment (Washington state, 11 pharmacies) and control (Oregon state, 13	Pharmacist vaccination vs limited, single day, nurse-led pharmacy vaccination clinics Intervention aim: Improve vaccination rates QI agent: Commercial pharmacies Group 1 Team change: Pharmacists in commercial community pharmacies started identifying eligible patients and administering influenza vaccinations. Delivery site change: Patients were able to obtain vaccinations from pharmacists in commercial community pharmacies. Control group	Influenza Proportion of eligible patients receiving vaccination Mean between-group difference in change scores from baseline performance, treated as a continuous outcome for each pharmacy, *diff.* (mean (95% CI)). Odds ratio of receiving	Influenza Baseline All patients Group 1: 689/1004 (69%) Control: 806/1086 (74%) Follow-up All patients Group 1: 754/1004 (75%) Control: 800/1086 (74%) Follow-up Age >/= 65 Diff. = +4.7% ([-4.5%, +13.9%]) Age < 65 Diff. = +10.6% ([0.0%, 21.2%]) Follow-up	Vaccine delivery by pharmacists was associated with a 10.6% higher influenza vaccination rate among respondents aged <65 years who took medications for prolonged conditions, and a 10.8% higher rate among adult prescription recipients unvaccinated against influenza in the previous year. Vaccination rates for prescription recipients aged >/= 65 years increased only slightly. This may have been due to a ceiling effect. Pharmacists can identify and motivate pharmacy patrons at risk of influenza to be vaccinated.	15

		October 1998. Patients were excluded if they were living in a nursing home. * 4430 patients were identified by database. However, only 2090 patients responded. Statistics provided for responders only.	pharmacies) groups.	Delivery site change: Each pharmacy hosted vaccination nurses for a single day vaccination clinic during the Fall.	vaccination between treatment and control groups Proportion of patients not vaccinated at baseline, receiving vaccination at follow-up Odds ratio of receiving vaccination between treatment and control groups, among patients unvaccinated at baseline Pneumococcal Not targeted.	OR = 1.08 P = 0.48 Follow-up All patients unvaccinated at baseline Group 1: 111/315 (35%) Control: 67/146 (22%) Unvaccinated at baseline, age >/= 65 Group 1: 51/141 (36%) Control: 24/107 (22%) Unvaccinated at baseline, aged < 65 Group 1: 60/174 (35%) Control: 43/173 (25%) Follow-up All patients unvaccinated at baseline* OR = 1.56 P = 0.03 Unvaccinated at baseline, age >/= 65* OR = 1.96 P = 0.03 Unvaccinated at baseline, age < 65* OR = 1.62 P = 0.05 Pneumococcal Not targeted.		
Gutschi et al. 1998 (244)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period:	Number of patients: 143 (135 patients were available at analysis, enumerated below.) Group 1 Number of patients: 44 Female/male: 9/35 Age (mean(sd)): 59.6 (11.8) Group 2 Number of patients: 44	Number of sites: 1 pharmaceutical services department of a large tertiary care hospital Site affiliation: University Number of practices or physicians: No particular community providers were involved *a priori* in this	Hospital pharmacist vaccination counseling vs hospital pharmacist vaccination counseling and letter for community pharmacists vs hospital pharmacist vaccination counseling and letters for community pharmacists and physicians Intervention aim: Improve vaccination rates QI agent: Hospital pharmacy department	Influenza Proportion of eligible patients receiving vaccination	Influenza Baseline Control: 34% Group 1: 57% Group 2: 38% Follow-up Control: 29/44 (66%) Group 1: 35/44 (80%) Group 2: 33/47 (70%)	The addition of follow-up letters addressed to family physicians and/or community pharmacists did not increase vaccination rates among high risk patients receiving vaccination counseling from hospital pharmacists. The follow-up letters may have been effective due to failure to enlist community health care	20

	3 months	Female/male: 6/38 Age (mean(sd)): 62.0 (11.4) <u>Group 3</u> Number of patients: 47 Female/male: 15/32 Age (mean(sd)): 59.5 (11.1) <u>Eligibility criteria:</u> Patients had just been discharged after cardiac surgery at a university hospital. <u>Exclusion</u>: Egg allergy, previous serious reaction to vaccine, receipt of both vaccines in the previous two years.	study Location: Canada (Ontario)	<u>Group 1</u> Patient education / reminders: A pharmacist assessed patents for, and counseled patients regarding the risks and benefits of influenza and pneumococcal vaccination. Clinician reminders: A follow-letter and pharmacy care plan was given to the patient and addressed to their community pharmacist. <u>Group 2</u> Patient education / reminders, as above. Clinician reminders: Follow-letters and pharmacy care plans were given to the patient and addressed to patients' community pharmacist and family physician. <u>Control</u> Patient education / reminders, as above.	Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Test of overall significance P = 0.347 Follow-up Group 1 OR = 2.01 P = 0.23 Group 2 OR = 1.22 P = 0.82 <u>Pneumococcal</u> Baseline Control: 14% Group 1: 14% Group 2: 11% Follow-up Control: 19/44 (43%) Group 1: 16/44 (36%) Group 2: 22/47 (47%) Overall test of significance P = 0.594 Follow-up Group 1 OR = 0.75 P = 0.66 Group 2 OR = 1.16 P = 0.83	providers. Community pharmacists, for example, often refused to accept the follow-up letter.	
Harari et al. 2008 (245)	Design: RCT Group allocation: Experimental study, with patients randomly allocated to treatment or control groups. Patients from the same household were allocated to the same group.	Number of patients: 2503 (2006 patients were available for analysis, enumerated below.) <u>Group 1</u> Number of patients: 940 Female/male: 526/414 Age (mean(sd)): 74.7(6.3) <u>Control group</u> Number of patients: 1066 Female/male: 564/502 Age (mean(sd)): 74.2 (6.0)	Number of sites: 3 computerized GP practices Site affiliation: Private practices Number of practices or physicians: 18 general practitioners * Location: United Kingdom (London)	<u>Comprehensive patient health risk survey leading to computer generated patient and GP feedback vs usual care</u> Intervention aim: Improve preventive care QI agent: Medical clinics <u>Group 1</u> Patient education / reminders: Patients were mailed a questionnaire (HRA-O) comprised of sections on health behavior, preventive care uptake, and	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Follow-up Group 1: 788/939 (84%) Control: 916/1066 (86%) Non-participating site: 65% Follow-up Group 1 vs control OR = 0.8 P = 0.12 Group 1 vs non-participating site P < 0.0001	Integration of an evidence-based delivery instrument (HRA-O) for the promotion of health in older people into the current IT driven system of three British primary care group practice did not improve self-reported health risk variables over 12 months, other than increased pneumococcal vaccination take-up. The authors suggest that contamination may have obscured the intervention effect, since all	20

	Follow-up period: 1 year	Eligibility criteria: Patients aged 65 years or older. Patients were excluded if they were nursing home residents, required help with activities of daily living, had dementia, had a terminal illness, or could not speak English.	* Outcomes were measured at an additional, non-participating GP group practice with 8 practitioners to check for contamination.	self-reported health. Based on questionnaire results, patients were mailed individualized advice on modifying health risks, a preventive health checklists, sources of support, and other information. The 20-35 page individualized report was accompanied by a letter from the patient's practice, asking patients to discuss issues with their GP or practice nurse. Non-responders were issued a reminder card 6 months later. Facilitated relay of clinical information: Information from the patient questionnaire was forwarded to GPs, who selected relevant data elements for entry into the patient's EMR. Clinician reminders: The EMR was programmed to issue electronic prompts when the patient record was accessed, based on the health risks detected in the patient survey. Clinician education: GPs and practice nurses participated in training and review sessions on current preventive care and health behavior recommendations. Control group Clinician education: GPs and practice nurses participated in training and review sessions on current preventive care and health behavior recommendations.	Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Pneumococcal Follow-up Group 1: 308/939 (33%) Control: 291/1066 (28%) Follow-up Group 1 vs control OR = 1.2 P = 0.04 Group 1 vs non-participating site P = non-significant	health care workers received preventive care education. This explanation is supported by much lower vaccination rates in the non-participating practice. Supplementary reinforcement involving direct professional/patient follow-up contact may be necessary to achieve benefit.	
Harris et al. 1990 (246)	Design: RCS Group allocation: Patients self-selected into a group enrolled in continuous care, and an episodic consultative care group. Patients in	Number of patients: 112* Female/male: 112/0 Age (mean): 65 Group 1 Number of patients: 62* Female/male: 62/0 Control group Number of patients: 50*	Number of sites: 1 university-based general medicine clinic Site affiliation: University Number of practices or physicians: 24 faculty physicians and 70 resident physicians	Patients exposed to a computer clinician reminder system vs usual (episodic) care Intervention aim: Improve preventive care QI agent: Medical clinic Group 1 Clinician reminders: Following patient	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving	Influenza Baseline*, ** Group 1: 23/34 (68%) Control: 22/71 (31%) Follow-up *** Group 1: 51/62 (83%) Control: 15/50 (29%) Follow-up ***	Computer prompting appears to improve performance of preventive care procedures. However, the patient population was self-selected into intervention and control groups. Intervention patients had longer associations with the practice, visited the practice more frequently, and more high risk illnesses, all of	14

	the former group were subject to the intervention. Follow-up period: 12 months	Female male: 50/0 Eligibility criteria: Women aged 50 years or older, who had visited the practice at least twice in the preceding year. Men were excluded. * This study analyzed before and after cross-sectional samples of patients. During the follow-up period, 150 patients were eligible for all preventive care activities, of which 112 patients were eligible for influenza vaccination.	Location: United States (North Carolina)	enrollment, a specially trained nurse reviewed patients' medical records for past performance of recommended preventive care procedures. Clerical personnel entered the nurse's review information into the practice computerized mini-medical record. On subsequent patient visits, a computer-generated encounter form automatically listed "due" procedures. Control group Usual care, i.e.: episodic consultations with clinic physicians.	vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination (period of surveillance)	OR = 10.82 P < 0.001 Pneumococcal Baseline*, ** Group 1: 5/18 (29%) Control: 4/39 (10%) Follow-up *** Group 1: 11/33 (33%) Control: 0/25 (0%) Follow-up*** OR = 25 P = 0.001 *, **, and *** notes: See next colum.	which are predictors of vaccination. This study suffers high risk of bias. * Baseline results were reported for a period during which a nurse reminder system had been implemented. ** Numerous patients crossed between groups during the study period. *** Covariates known to be predictive of vaccination varied significantly between groups. ORs calculated by present reviewers, by substituting 0.5 for zero cells.	
Harris et al. 2009 (247)	Design: CBA Group allocation: Two geographic regions in metropolitan Adelaide were allocated to treatment and control arms. Follow-up period: 12 months	Number of patients: 249 Group 1 Number of patients: 125 Female/male: 56/69 Age (mean(sd)): 73.6 (sd not reported) Control group Number of patients: 124 Female/male: 59/65 Age (mean(sd)): 73.1 (sd not reported) Eligibility criteria: Patients discharged from hospital for COPD or attending respiratory outpatient clinics for COPD, with moderate to severe disease according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria. Exclusions: Lung cancer, dementia, other major or unstable illness, inability to read English or lack of access	Number of sites: One university research group delivered the intervention in 2 metropolitan areas Site affiliation: University Number of practices or physicians: Not reported. Location: Australia (South Australia)	Patient-held evidence-based care manual vs usual care with a COPD information pamphlet Intervention aim: Improve COPD care QI agent: University research team Group 1 Patient education / reminders: Patients were provided with a manual summarizing Cochrane reviews of evidence about COPD treatments, along with additional background information. Text was delivered in plain language, small page size, large print, question-and-answer format, and with illustrations. Tips or suggests regarding questions patients could ask of their physicians were also provided. Control group Usual care, with patients receiving a single sheet foldout pamphlet covering numerous COPD topics without referencing research evidence.	Influenza Proportion of eligible patients receiving vaccination at baseline Change in proportion of eligible patients receiving vaccination from baseline Pneumococcal Not targeted.	Influenza Baseline Group 1: 110/125 (88%) Control: 108/124 (87%) Follow-up Patients above median SES Group 1: +7% Control: -1% P = 0.83* Patients below median SES Group 1: +7% Control: +5% P = 0.98* Pneumococcal Not targeted. * Calculated from ANCOVA on the change scores, with adjustment for baseline performance and a propensity score derived from baseline patient characteristics.	Providing summaries of evidence to COPD patients did not lead to improved application of evidence in medical care. Lack of an effect may have been due to deployment of a COPD pamphlet among control patients, which provided similar recommendations and coverage of content, without referencing research support.	20

Herman et al. 1994 (248)	Design: Cluster-RCT Group allocation: Experimental study with practice groups allocated to treatment and control groups. Follow-up period: 6 months	Number of patients: 1202 <u>Group 1</u> Number of patients: 387 Female/male: 261/126 Age (mean(sd)): 72.9 (6.1) <u>Group 2</u> Number of patients: 389 Female/male: 278/111 Age (mean(sd)): 73.8 (6.6) <u>Control</u> Number of patients: 426 Female/male: 293/133 Age (mean(sd)): 73.5 (6.6) <u>Eligibility criteria:</u> Clinic patients aged 65 years or older attending the ambulatory medicine clinic for any visit between October 1, 1989 and March 31, 1990; seen by the resident physician, a nurse practitioner, or a nurse for either a medication refill or education visit. <u>Exclusion</u>: Contraindication to vaccination	Number of sites: 1 outpatient general medicine clinic at a major public hospital affiliated with an academic school Site affiliation: University Number of practices or physicians: 3 practice groups, each with 21 to 23 residents, 1 nurse, and 1 nurse practitioner. Residents had been randomly allocated to groups. Location: United States (Ohio)	<u>Preventive team care with patient educational materials vs patient educational materials only vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical clinics <u>Group 1</u> Clinician education: All study providers were provided with educational materials and opportunities for attendance at lectures on preventive services for the older patient. Materials consisted of background papers and succinct guidelines related to routine preventive services. Patient education / reminders: Educational materials were given to patients by the nurse at each clinic visit. Nurses provided the National Institute on Aging's *Age Page* "Shots for Safety", as well as material from the Ohio Department of Health recommending annual vaccination. Team change: A protocol was developed to allow nurses to vaccinate patients before they were seen by the physician or nurse practitioner. A health maintenance flow sheet was attached to each patient's chart and updated during the study period. <u>Group 2</u> Clinician education and patient education / reminders, as above. <u>Control group</u> Clinician education, as above.	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Baseline*, *** Group 1: 76/243 (31%) Group 2: 113/242 (47%) Control: 93/271 (34%) Follow-up*, *** Group 1: 134/243 (55%) Group 2: 108/242 (45%) Control: 113/271 (42%) Follow-up[t] Group 1 vs Control OR = 1.72 P < 0.001 Group 2 vs Control OR = 1.23 P = Not significant Group 1 vs Group 2 OR = 1.53 P = 0.001 <u>Pneumococcal</u> Baseline Group 1: 73/387 (19%) Group 2: 97/389 (25%) Group 3: 131/426 (31%) Follow-up**, *** Group 1: 68/314 (22%) Group 2: 15/292 (5%) Control: 10/295 (3%) Follow-up [t] Group 1 vs Control OR = not reported P = 0.001 Group 2 vs Control OR = not reported P = not significant Group 1 vs Group 2 OR = Not reported P = 0.0001	Vaccination rates improved statistically and clinically significantly for influenza and pneumococcal vaccination in the clinical team offering preventive team care. Using standing orders, the clinic nurses doubled the rates of immunizations. Patient education did not increase vaccination rates over provider education alone. The rates at which eligible patients were offered vaccination were still low compared with national targets. Patient refusal of vaccination was also higher in the team care intervention group. * Denominator composed of patients who had attended the practice during 2 consecutive influenza seasons, i.e.: baseline and intervention periods.Covariate distribution is similar to that of the overall sample. ** Denominator composed of patients without previous pneumococcal vaccination. ***Statistically significant racial imbalances detected between groups. [t] From logistic regression analyses adjusted for baseline vaccination history, age, gender, race, physician's level of training, or physician's attitudes.	24

Hermiz et al. 2002 (249)	Design: CCT Group allocation: Patients were randomly allocated to treatment and control groups. Follow-up period: 3 months	Number of patients: 177 Group 1 Number of patients: 84 Female/male: 43/41 Age (mean(sd)): 67.1 (sd not reported) Control group Number of patients: 93 Female/male: 50/43 Age (mean(sd)): 66.7 (sd not reported) Eligibility criteria: Patients aged 30 to 80 years old, discharged to the community from emergency or in-patient care for COPD at the study hospital. Exclusions: Insufficient English speaking skills, resident in a nursing home, confused or demented, and resident outside the hospital catchment region.	Number of sites: 1 tertiary care hospital Site affiliation: University Number of practices or physicians: Not reported. Location: United Kingdom (Liverpool)	Home visits by community nurses after hospital discharge vs usual GP care Intervention aim: Improve care of COPD QI agent: Community nurses Group 1 Team change: Community nurses provided two home visits per patient. The first occurred within a week of a patient's discharge from hospital, and included a health assessment, COPD education, problem identification and disease management advice. Nurses worked with patients to develop care plans documenting problem areas, education provided, and referral to other services. Care plans were mailed to each patient's GP. At the second visit, one month later, nurses reviewed patients' progress and need for further follow-up. Patient education: Nurses provided verbal and written education on COPD, smoking cessation, management of activities of daily living, exercise, drug use, health maintenance, and when to seek medical intervention. Case management: Community nurses set up care plans with patients, including referral to other services. An additional follow-up visit was provided. Control group Usual care.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Influenza Follow-up Group 1: 48/67 (72%) Control: 60/80 (75%) Follow-up OR = 0.84 P = 0.65 Pneumococcal Follow-up Group 1: 42/67 (63%) Control: 42/80 (53%) Follow-up OR = 1.52 P = 0.28	Home follow-up by a community nurse of patients discharged from hospital after an acute exacerbation of COPD did not improve vaccination rates. Total functional status, use of the emergency department, GP visits, re-admission to hospital, and satisfaction also did not differ between groups during the follow-up period. Patient knowledge and some aspects of functional status improved. The ineffectiveness of the intervention may have been due to severe disease. Patients were selected from those requiring hospitalization, and 19/147 patients died during the 3 months of follow-up.	20
Hoey et al. 1982 (2)	Design: CBA Group allocation: Mornings and afternoons at a large general medicine polyclinic were allocated to	Number of patients: 783 Age / gender distributions not reported. Group 1 Number of patients: 435 Control group Number of patients: 348	Number of sites: 1 university-affiliated general medicine outpatient polyclinic Site affiliation: University Number of practices or physicians: Not reported.	Nurse vaccinations vs usual care Intervention aim: Improve vaccination rates QI agent: Medical clinics Group 1 Team change: Nurses reviewed patient charts for vaccination indications,	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal	Influenza Follow-up Group 1: 152/435 (35%) Control: 8/348 (2%) Follow-up OR = 22.83 P < 0.001* Pneumococcal	Outpatient general medicine clinic nurses were able to vaccinate a substantial proportion of eligible patients. Vaccination rates may have been further improved if clinic nurses had more time.	14

	treatment and control groups. Follow-up period: 6 weeks	Eligibility criteria: Patients attending the study polyclinic. Eligibility criteria for vaccination were not reported.	Location: Canada (Quebec)	inquired about contraindications, administered vaccine, and checked inject sites after 20 minutes. Control group Usual care.	Proportion of eligible patients receiving vaccination	Not targeted. * Calculated by present reviewers.		
Hogg et al. 1998 (250)	Design: CCT Group allocation: Patients' families were randomly allocated to treatment and control groups. Follow-up period: 6 months	Number of patients: 1971 patients in 719 families Group 1 Number of patients: 613 Percent male per family (mean(sd)): 50.1% (24.6%) Age per family (mean(sd)): 37.5 (18.7) Group 1 Number of patients: 676 Percent male per family (mean(sd)): 47.7% (26.4%) Age per family (mean(sd)): 41.9 (19.8) Control group Number of patients: 682 Percent male per family (mean(sd)): 47.7% (29.6%) Age per family (mean(sd)): 41.6 (18.9) Eligibility criteria: Patients registered at the site for at least 1 year, who had attended the clinic at least once in the preceding 2 years. Patients eligible for influenza vaccination were aged 65 years or older, or had high-risk diseases (e.g.: COPD, diabetes).	Number of sites: 1 rural family medicine teaching clinic Site affiliation: University Number of practices or physicians: Not reported. Location: Canada (Quebec)	Customized preventive care reminder letters vs form letters vs usual care Intervention aim: Improve preventive care QI agent: Medical clinics Group 1 Patient education / reminders: Computer-generated individualized letters were sent to patients reminding them of outstanding preventive care procedures. The tone of each letter was positive and nonthreatening. Letters included dates on which participants had last received the recommended procedures, and were generated from the computerized medical record. Group 2 Patient education / reminders: Patients received a form letter outlining all the recommended preventive procedures for all ages and sexes. The letter was identical to the individualized letter received by patients in Group 1, except the date of previous procedures was not provided. Control group Usual care.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up Patients aged 65 years or older Group 1: 6/30 (20%) Group 2: 8/48 (17%) Control: 9/47 (19%) P = 0.11 Patients with chronic disease Group 1: 3/17 (18%) Group 2: 1/11 (9%) Group 3: 3/20 (15%) P = 0.75 Follow-up Patients aged 65 years or older Group 1 OR = 1.06 P = 1.00 Group 2 OR = 0.84 P = 0.79 Patients with chronic disease Group 1 OR = 1.21 P = 1.00 Group 2 OR = 0.57 P = 1.00 Pneumococcal Not targeted.	No differences in influenza vaccination were detected between groups. However, taking all recommended preventive procedures together, those receiving the customized letters obtained more preventive procedures than patients in the control group, while those receiving the form letter did not.	21
Hull et al. 2002 (251)	Design: CCT	Number of patients: 1261* patients from 1206 households	Number of sites: 3 inner city general practices	Telephone appointments scheduled by practice receptionists vs usual care	Influenza Proportion of eligible patients receiving vaccination	Influenza Follow-up Group 1: 328/660 (50%)	General practices can boost immunization rates for influenza vaccination among the fit older	25

	Group allocation: Experimental study with households randomly allocated to treatment and control groups. Follow-up period: 2 months	Group 1 Number of patients: Not reported Female/male: 53.9% female Age (mean(sd)): 69.2 (sd not reported) Control group Number of patients: Not reported Female/male: 53.3% female Age (mean(sd)): 69.3 (sd not reported) Eligibility criteria: Patents aged between 65 and 74 years. Patients with chronic disease, and those who had been subject to similar interventions in previous years were excluded. * Patient numbers in Hull et al. 2002 (251) are not internally consistent. Patients in the outcome denominators exceed total patients reported in the patient flow diagram.	Site affiliation: Private practices Number of practices or physicians: As above. Location: United Kingdom (East London and Essex)	Intervention aim: Improve vaccination rates QI agent: Medical practices Group 1 Patient education / reminders: Receptionists called households, recalling eligible patients to receive their flu vaccinations. Control group Usual care.	Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Control: 288/658 (44%) Follow-up OR = 1.29* P = 0.026* Pneumococcal Not targeted. * Adjusted for clustering within clinic and households.	population by about 6% using a telephone call from practice receptionists. This effect was achieved in addition to national and community advertising and mail campaigns. Costs of the intervention were estimated.	
Hutchison et al., 1989 (252)	Design: CBA Group allocation: Similar Ontario HSOs were selected, by study investigators, to be treatment and control sites. Follow-up period: 1 year	Number of patients: 1211 Age and gender not reported. Group 1 Number of patients: 593 Control group Number of patients: 618 Eligibility criteria: Patients aged 65 years or older, enrolled in the practice since September 1, 1982. Residents of long-term care facilities were excluded.	Number of sites: 2 Health Services Organizations (HSOs)* Site affiliation: Private community delivery system Number of practices or physicians: Not reported Location: Canada (Ontario) * 1 treatment site, 1 control site.	Computer-generated nurse/physician reminders vs usual care Intervention aim: Improve influenza vaccination rates QI agent: Health Services Organizations Group 1 Clinician reminders: A nurse/physician reminder message was printed on the computer-generated encounter form for each eligible patient and attached to the front of the patient's chart. Patients who received or refused vaccine were deleted from the reminder system for the remainder of the intervention period. Control group: Usual care	Influenza - All patients Proportion of eligible patients receiving vaccination during influenza season Percent increase 1984-85 to 1985-86 Odds ratio of receiving vaccination between treatment and control groups Influenza - Patients with chronic disease	Influenza - All patients Baseline - 1984-85 Group 1: 60/593 (10%) Control: 171/618 (28%) Follow-up - 1985-86 Group 1: 159/593 (27%) Control: 178/618 (29%) Percent increase Group 1: 165% P < 0.0001* Control: 4.1% P = 0.56* Follow-up** OR = 0.91 P = 0.44 Influenza - Patients with chronic disease	The clinician reminder intervention was associated with a dramatic percent rise in influenza immunization rates among elderly patients fro 1984-85 to 1985-86. This association was observed in the community setting, corroborating results from studies of clinician reminders in academic primary care. Compliance with the intervention emerged as an issue, with approximately half of eligible attendees receiving vaccine or having a documented refusal. The authors suggested that clinician compliance may be improved by increasing the visual impact of the reminder.	14

					Proportion of eligible patients receiving vaccination during influenza season Percent increase 1984-85 to 1985-86 Odds ratio of receiving vaccination between treatment and control groups <u>Influenza - Office-attendees only</u> Proportion of eligible patients receiving vaccination during influenza season Percent increase 1984-85 to 1985-86 Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Not targeted/	Baseline - 1984-85 Group 1: 22/162 (14%) Control: 67/204 (33%) Follow-up - 1985-86 Group 1: 56/162 (35%) Control: 74/204 (36%) Percent increase Group 1: 155% P < 0.0001* Control: 10% P = 0.37* Follow-up** OR = 0.93 P = 0.74 <u>Influenza - Office attendees only</u> Baseline - 1984-85 Group 1: 60/378 (16%) Control: 171/392 (44%) Follow-up - 1985-86 Group 1: 159/385 (42%) Control: 178/379 (47%) Percent increase Group 1: 162% P < 0.0001* Control: 8% P = 0.39* Follow-up** OR = 0.79 P = 0.13 <u>Pneumococcal</u> Not targeted. *, ** - See next column.	The intervention and control practices were not alike, especially with respect to baseline vaccination rates. Risk of bias is substantial. An odds ratio cannot be calculated. Other primary care providers may wish to take advantage of opportunities to employ and test similar innovations under "real conditions". * Single-tailed Z test comparing before and after proportions within group. ** Odds ratios from this study were not entered into meta-analysis due to substantial baseline imbalance between groups.	
Ives et al. 1994 (253)	Design: CCT Group allocation: Experimental study with patients	Number of patients: 3884 Female/male: 2205/1679 Group-specific age and gender distribution not reported. <u>Group 1 – Capitation (CAP),</u>	Number of sites: 1 Medicare demonstration project Site affiliation: Government, Medicare	<u>Multi-component demonstration with insurance coverage extensions and capitated clinician reimbursement vs insurance coverage extension and FFS clinician reimbursement vs simple vaccination prompts</u>	<u>Influenza</u> Proportion of eligible patients receiving vaccination	<u>Influenza</u> Baseline Group 1: 41.2% Group 2: 41.3% Control: 40.6%	Providing free immunizations through Medicare will increase immunization rates among the elderly. The elderly are more likely to receive flu shots provided through physicians'	21

	randomly allocated to treatment and control groups. Follow-up period: 1 year	with delivery via hospital preventive care clinic Number of patients: 1347 (558 patients in analysis) Group 1 – Fee for service (FFS) payment to community physicians Number of patients: 1312 (670 patients in analysis) Control group Number of patients: 1225 761 patients in analysis Eligibility criteria: Medicare beneficiaries aged 65 to 79 years old, community-dwelling, ambulatory, without a diagnosis of a life-threatening cancer within the previous 5 years.	Number of practices or physicians: 8 hospitals, 94 primary care providers Location: United State (Pennsylvania)	Intervention aim: Improve preventive care QI agent: State Medicare agency Group 1 - CAP Patient education / reminders: Patients completed a 1.5 hour health risk appraisal (HRA)interview. Physiological parameters were measured. Based on the findings from the interview, participants were mailed color-coded vouchers redeemable for various preventive care interventions. Financial incentive – clinicians: Hospitals were reimbursed $150 for each patient at initial screening. Financial incentive – patients: Vouchers were funded by the Medicare demonstration project. Delivery site change: Hospitals provided vaccination through capitated preventive care clinics. Group 2 – FFS Patient education / reminders and patient financial incentives, as above. Financial incentive – clinicians: Physicians and hospitals were reimbursed for voucher services through a fee-for service arrangement. Control group Patient received vaccination prompts following HRA appraisals.	Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Follow-up Group 1: 335/558 (64%) Group 2: 463/670 (69%) Control: 412/761 (54%) Follow-up Group 1 and 2 vs control Study reports significant difference in proportions ($p < 0.0001$). Group 1 vs group 2 Study reports significant difference in proportions ($p = 0.042$). Follow-up Group 1 vs control OR = 1.45* 95% CI = [1.15, 1.83] Group 2 vs control OR = 1.95* 95% CI = [1.56, 2.44] Pneumococcal Not targeted. * Adjusted for gender, age, education, marital status, insurance, healthcare utilization, and health status.	offices than through hospital-based clinics.	
Jacobson et al. 1999 (254)	Design: CCT Group allocation: Experimental study with patients	Number of patients: 433 Group 1 Number of patients: 221 Female/male: 161/60 Age (mean(sd)): 64.2 (13.1)	Site description: Ambulatory care clinic of a large inner city teaching hospital Site affiliation: Private	Education brochure used to pre-activate patients in advanced of the physician visit vs usual care Intervention aim: Improve vaccination rates	Influenza Not targeted. Pneumococcal Proportion of eligible patients receiving vaccination	Influenza Not targeted. Pneumococcal Follow-up Group 1: 44/221 (20%)	Patient-physician communication and quality of preventive care can be enhanced through the use of a simple, low-literacy, inexpensive, education vehicle that activates patients' participation in the	20

	randomly allocated to patient and control groups. Follow-up period: Not reported.	<u>Control group</u> Number of patients: 212 Female/male: 139/73 Age (mean(sd)): 61.9 (12.2) <u>Eligibility criteria:</u> Patients attending clinic for routine primary care visit, who are aged 65 years or older, or have chronic heart disease, lung disease, or diabetes. Patients had not received pneumococcal vaccination in the previous 5 years. Exclusions: Received pneumococcal vaccine in the previous 5 years, walk-in visits, first visits, medication-refill visits without a physician interaction, blind patients, clinically documented dementia, non-English speaking.	community delivery system, university/ teaching Number of sites: 1 hospital Number of practices or physicians: 1 ambulatory care clinic, with 148 physician / residents, 2 physician assistants, and 6 nurse practitioners Location: United States (Georgia)	QI agent: Medical clinic <u>Group 1</u> Patient education / reminders: A single page educational brochure was developed, with text describing eligibility criteria for and the benefits of vaccination. The brochure was attached to the chart of eligible patients. Patients were asked to read the brochure before seeing their physicians. <u>Control group</u> Patients received a similar brochure about nutrition.	Odds ratio of receiving vaccination between treatment and control groups	Control: 8/212 (4%) Follow-up OR = 6.34 P < 0.001	health-care interaction. Vaccination rates increased more than 5-fold. Patient-clinician communication, i.e.: proportion of visits in which the clinician recommended the vaccine, increased approximately 4-fold.	
Jans et al. 2000 (255)	Design: Cluster CBA Group allocation: Experimental study, with medical clinics allocated to treatment and control groups. Follow-up period: 1 year	Number of patients: 607 <u>Group 1</u> Number of patients: 455 Female/male: 278/177 Age (% > 60): 16% <u>Control group</u> Number of patients: 152 Female/male: 90/62 Age (% > 60): 15% <u>Eligibility criteria:</u> Patients between 16 and 70 years of age, with a diagnosis of asthma or COPD, who were not under the care of a specialist pulmonologist. Patients were required not to have a disease expected to influence short-term survival, or another disease affecting lung function.	Number of sites: 19 general practice clinics * Site affiliation: Private practices Number of practices or physicians: 21 physicians Location: Netherlands * Clinics were allocated to treatment (14 practices with 16 physicians) and control (5 practices with 5 physicians) groups	<u>Quality improvement system with educational sessions and performance feedback vs usual care</u> Intervention aim: Improve care of COPD and asthma QI agent: Medical clinics <u>Group 1</u> Clinician education: Frank discussions of controversial aspects of Dutch treatment guidelines were held during eleven 90-minute educational meetings over a 15 month period. Audit and feedback: Physicians received data on the care given to patients with asthma or COPD. Discrepancies between actual care and recommendations were discussed. Experiences were shared among peers. <u>Control group</u>	<u>Influenza</u> Proportion of eligible patients receiving vaccination, taken as a continuous score for each physician (median (range)) <u>Pneumococcal</u> Not targeted.	<u>Influenza</u> Follow-up* Group 1: 61% (R [42%, 81%]) Control: 50% (R [20%, 82%]) P > 0.2** <u>Pneumococcal</u> Not targeted. * Outcome survey response rates were 61% in the treatment group and 72% in the control group. ** Mann-Whitney U Test	Implementation of a quality system improved physician compliance with several recommendations given in guidelines on management of patients with asthma and COPD over time. However, improvement does not appear to be reflected in between-group comparisons with concurrent control practices.	18

				Usual care.				
Johnson et al. 2003 (256)	Design: CBA Group allocation: Experimental study with media market regions in a US state allocated to treatment and control groups for a community media intervention, and patients randomly allocated to treatment and control groups for a patient reminder intervention nested within media market groups. Follow-up period: 3 months	Number of patients: 20755 Age and gender distribution not reported. <u>Mass media campaign</u> Group 3 – reminders Number of patients: Approx. 6639 Group 2 – no reminders Number of patients: Approx. 3735 <u>No mass media campaign</u> Group 1 - reminders Number of patients: Approx. 6540 Control – no reminders Number of patients: Approx. 3841 <u>Eligibility criteria:</u> Medicare beneficiaries aged 65 years or older	Number of sites: A non-profit state-wide foundation conducted the interventions on a Medicare contract, in two geographic "media market" regions in Montana* Site affiliation: Non-profit foundation, government, Medicare Number of practices or physicians: Not reported Location: United States (Montana) * Media market regions were allocated to treatment (1 region) and control (1 region) groups for a mass media education campaign.	<u>Community media campaign with patient reminder letters vs community media campaign without reminder letters vs reminder letters only vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Non-profit foundation <u>Group 1 – Reminders only</u> Patient education / reminders: Reminder letters and a brochure were mailed to a sample of Medicare beneficiaries. <u>Group 2 – Media only</u> Patient education / reminders as above, except without the reminder letters. <u>Group 3 – Media + reminders</u> Patient education / reminders: A community-wide mass media campaign promoting pneumococcal vaccination was implemented. The campaign involved 30 second television advertisements, newspapers advertisements, posters, and brochures. Organizers recruited members of the health care and business community to display campaign materials. Reminder letters and a brochure were also mailed to a sample of Medicare beneficiaries. <u>Control – Usual care</u> Usual care	<u>Pneumococcal</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination <u>Influenza</u> Not targeted.	<u>Pneumococcal</u> Follow-up Group 1: 1175/10381 (11.3%) Group 2: 617/5741 (10.8%) Group 3: 1355/10374 (13.1%) Control: 481/6091 (7.9%) Follow-up Media vs no media OR = 1.14 95% CI = [1.07, 1.22] Group 1 vs Control[1] OR = 1.49 95% CI = [1.33, 1.67] Group 2 vs Control[2] OR = 1.40 95% CI = [1.24, 1.59] Group 3 vs Group 1[3] OR = 1.18 95% CI = [1.08, 1.28] Group 3 vs Group 2[4] OR = 1.25 95% CI = [1.13, 1.38] <u>Influenza</u> Not targeted. <u>Interpretations</u> [1] Reminder vs no reminder in a usual care environment. [2] Community media campaign vs no media campaign in a usual care environment [3] Community media campaign vs no media campaign in a reminder environment [4] Reminder vs no reminder in a community media campaign environment.	Both community education and reminder campaigns increased immunization awareness and recent pneumococcal immunizations. Community-wide education campaign augmented the effect of the mailed reminders. However, the additive effect was relatively small.	20

Johnson et al. 2005 (257)	Design: RCS Group allocation: Observational study, with patients self-selected into treatment and control groups. Follow-up period: 12 months	Number of patients: 1042 <u>Group 1</u> Number of patients: 521 Female/male: 308/213 Age (% > 65): 75% <u>Control group</u> Number of patients: 521 Female/male: 307/214 Age (% > 65): 78% <u>Eligibility criteria:</u> Adult Blue Cross HMO, point-of-service, or Medicare+Choice members with heart failure. Patients were not already participants in a local heart failure disease management program. <u>Exclusion</u>: Patients not enrolled in the health plan 3 months prior and 3 months after the study period, cancer, AIDS, transplant recipients, renal failure / dialysis, living in a skilled nursing facility, participated in the disease management program less than 90 days (treatment cohort)	Number of sites: 1 Commercial disease management organization contracted by a large HMO Site affiliation: Commercial disease management organization, private MCO Number of practices or physicians: Not reported Location: United States (Ohio)	<u>Integrated disease management for heart failure program vs usual care</u> Intervention aim: Improve care of heart failure QI agent: Commercial disease management organization <u>Group 1</u> Patient education / reminders: In addition to the health plan's usual activities, scheduled nurse education sessions and 24 hour nurse counseling and symptom advice were offered by telephone. Printed action plans, workbooks, individualized assessment letters, medication compliance reminders, and vaccination reminders were mailed to patients. Case management: A registered nurse provided a range of accessible services to heart failure patients, including risk stratification, and educational services. Case managers coordinated support with patients' health care plans. Interventions took place primarily via telephone. Clinician reminders: Nurse case managers communicated to physician alerts about signs and symptoms of decompensation. And gaps between patient-reported practice and guideline recommendations. Team change: Nurse case management, as above. <u>Control group</u> Patient education / reminders: Educational materials, immunization, and health screening reminders were mailed to patients. Health plan members identified as noncompliant for health screenings received additional mailings and automated phone calls.	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination	<u>Influenza</u> Baseline Group 1: 263/521 (51%) Control: 259/521 (50%) Follow-up Group 1: 284/521 (55%) Control: 236/521 (45%) Follow-up OR = 1.45 P = 0.003 <u>Pneumococcal</u> Baseline Group 1: 30/521 (6%) Control: 29/521 (6%) Follow-up Group 1: 61/521 (12%) Control: 44/521 (8%) Follow-up OR = 1.44 P = 0.080	Participants in a comprehensive, integrated disease management program aimed at improving self-management skills experiences significantly fewer cardiac-related hospital admissions, cardiac-related bed days, and invasive medical procedures compared with a matched cohort group. A significantly greater proportion of the intervention participants had influenza vaccinations.	21

Karuza et al. 1995 (258)	Design: Cluster RCT Group allocation: Randomized allocation of physician practice groups to treatment and control groups. Follow-up period: 2-6 months	Number of patients: Not reported. (Analysis occurred at the physician level. Physician characteristics reported below.) <u>Group 1</u> Average patient age per physician: 74 Average proportion female per physician: 63% <u>Control group</u> Average patient age per physician: 75 Average proportion female per physician: 64% <u>Eligibility criteria:</u> Patients aged 65 years or older, not institutionalized, who had been seen at least once by a study physician during an 18 month pre-study period	Number of sites: 13 physician groups* Site affiliation: University, private MCO, private community delivery system, private practices Number of practices or physicians: 51 physicians* Location: United States (New York) * Physician groups randomized to treatment (7 groups, 23 physicians) and control (6 groups, 28 physicians) arms	<u>Small group consensus process vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical clinics <u>Group 1</u> Continuous quality improvement (or similar): Physicians in a group practice participated in a facilitated small group discussion. Steps included initial commitment, performance feedback, problem finding, solution generation, and group decision-making. Clinician education: A didactic lecture on influenza and influenza vaccination were provided for study physicians. Additionally, 2 physician practice groups scheduled in-service influenza vaccination educational sessions. Patient education / reminders: Mailed patient reminders adopted in 6/7physician groups. Clinic posters were adopted in 5groups. Clinician reminders: 5/7 physician groups adopted a system of chart reminders. Team change: 4/7 physician groups made organization al changes, like having nurses make special appointments with high-risk patients and/or administer vaccine. <u>Control group</u> A small group consensus process concerning a different quality improvement topic was facilitated among control practice groups.	<u>Influenza</u> Proportion of eligible patients receiving vaccination, taken as a continuous score for each physician (mean(sd)) <u>Pneumococcal</u> Not targeted.	<u>Influenza</u> Baseline Group 1: 48% (24%) Control: 57% (21%) P>0.70* Follow-up Group 1: 63% (21%) Control: 46% (21%) P<0.01* <u>Pneumococcal</u> Not targeted. * Calculated by ANCOVA at the physician level. Authors performed a sensitivity analysis at the level of physician practice groups. P < 0.05 reported.	The small-group consensus buy-in process was effective in increasing physician compliance with the influenza vaccination guideline in group practices. Physicians' attitudes toward prevention and knowledge about influenza vaccination were not correlated with increased vaccination rates.	23
Kellerman et al. 2000 (259)	Design: CCT	Number of patients: 370 Age and gender distributions not reported.	Number of sites: 1 community family practice center	<u>Supplemental telephone reminders after postcard mailings vs postcard mailings only</u>	<u>Influenza</u> Proportion of eligible patients receiving vaccination	<u>Influenza</u> Follow-up Group 1: 11/154 (7%)	No significant increase in immunization rates among patients receiving an additional	16

	Group allocation: Experimental study with patient households assigned to treatment and control groups. Follow-up period: Not reported.	<u>Group 1</u> Number of patients: 154 <u>Control group</u> Number of patients: 216 <u>Eligibility criteria:</u> Patients aged 65 years or older, living in the community, who had received at least 1 office service within the previous 2 years. All patients were non-responders at 1 month after a post-card influenza vaccination reminder.	Site affiliation: Private community delivery system, university/teaching site Number of practices or physicians: As above. Location: United States (Kansas)	Intervention aim: Improve vaccination rates QI agent: Community delivery system <u>Group 1</u> Patient education / reminders: Patients were sent postcards describing the availability of influenza. Patients who had not responded to the postcard within 1 month were reminded by telephone call. <u>Control group</u> Patient education / reminders as above, except without supplemental telephone reminder calls.	Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Not targeted.	Control: 19/216 (9%) Follow-up OR = 0.80 P = 0.70 <u>Pneumococcal</u> Not targeted.	telephone intervention, compared with patients receiving post card reminders only. This may be due to unreliable clinic records, which did not record receipt of influenza vaccination at non-practice community sites.	
Kerse et al. 1999 (260)	Design: Cluster RCT Group allocation: Experimental study, with general practitioners allocated to treatment and control groups. Follow-up period: 1 year	Number of patients: 307 (267 patients were randomized. 233 patients available at analysis, enumerated below.) <u>Group 1</u> Number of patients: 121 Female/male: 66/55* Age (mean(sd)): 72.9 (0.57) <u>Control group</u> Number of patients: 112 Female/male: 60/52* Age (mean(sd)): 74.2 (0.62) <u>Eligibility criteria:</u> General practitioners working more than 12 hours per week, single GP practice-sites, and no computerized recall system for influenza vaccination. Patients aged 65 years or older, English speaking, community dwelling, attended a study practice in the previous 18 months, and attended the enrolled GP for 3 of the last 5 GP consultations.	Number of sites: 42 general practices Site affiliation: Private practices Number of practices or physicians: 42 general practices, as above.* Location: Australia (Victoria) * General practitioners were allocated to treatment (21 GPs) and control (21 GPs) groups	<u>GP education and audit and feedback vs usual care</u> Intervention aim: Improve care of the elderly QI agent: Medical clinics <u>Group 1</u> Audit and feedback: Clinicians discussed exercise and social activity, and reviewed the medication and vaccination status of 50 consecutive elderly patients. Clinician education: Didactic seminars on exercise, social activity, and prescribing, from experienced practitioners. GPs were also provided with directories of community services for elderly patients. Clinician reminders: Practice reception staff attached a yellow prompt card to the medical records of all patients over 65 years of age. Cards recorded discussions of physical and social activity, vaccination, drug lists, and problem reviews.	<u>Influenza</u> Proportion of eligible patients receiving vaccination Risk difference associated with the intervention <u>Pneumococcal</u> Not targeted.	<u>Influenza</u> Baseline Group 1: 76/121 (63%) Control: 78/112 (70%) Follow-up Not reported Follow-up RD = -0.63%* 95% CI = [-1.45%, 0.20%] P = 0.14 <u>Pneumococcal</u> Not targeted. * Adjusted for baseline immunization status, GP billing status, and intra-cluster correlations	No differential effect on influenza vaccination status was observed. Influenza vaccination rates increased by almost 10% in both groups, and baseline rates were higher than expected. An education intervention in general practice showed an increase in physical activity, frequency of pleasurable activities, and self rated health of elderly patients, important independent predictors of wellbeing.	24

				Control group Usual care				
Kiefe et al. 2001 (261)	Design: Cluster RCT Group allocation: Experimental study with physicians randomly allocated to treatment and control groups. Follow-up period: 3 years	Number of patients: 1931* Group 1 Number of patients: 965* Age (mean(sd)): 75.9 (sd not reported) Control group Number of patients: 966* Age (mean(sd)): 76.1 (sd not reported) Eligibility criteria: Physicians practicing family medicine, internal medicine, or endocrinology with a minimum of 2 eligible diabetic patients enrolled in a fee-for-service Medicare plan. Eligible patients were aged 65 years or older, had a billing diagnosis of diabetes mellitus, had no end-stage renal disease, were community-dwelling, and were alive at baseline. 20 patients were selected from Medicare records for each physician enrolled. * Measurement designed as serial cross-sections of patients for each physician. Patient characteristics reported for baseline.	Number of sites: 1 quality improvement demonstration project sponsored by federal Medicare administrators Site affiliation: Medicare, government Number of practices or physicians: 97* Location: United States (Alabama) * 97 physicians were allocated to treatment (48 physicians) and control (49 physicians) groups. In both groups, the number of physicians remaining at analysis were 35 and 35, respectively.	Audit and feedback with physician performance benchmarking vs audit and feedback only Intervention aim: Improve diabetes care QI agent: Medicare-affiliated organization Group 1 Audit and feedback: Physicians were informed of their individual performance on performance indicators as well as the mean performance of their peers. Feedback was provided in mailings 3 to 6 weeks apart. Additionally, intervention physicians were benchmarked against the average performance of the top 10% of physicians assessed in feedback reports. CQI (or similar): The quality improvement agency offered assistance to physicians developing quality improvement plans. Plans varied widely, and included formal group meetings; root cause analyses; and changes in office practices, such as chart interventions, reminders, clinical "flow sheets", and standing orders for appropriate nurse administration of influenza vaccination. Control group Audit and feedback: As above, without the physician benchmarking. CQI (or similar): As above.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted	Influenza Baseline Group 1: 40% Control: 40% Follow-up Group 1: 58% Control: 46% Follow-up OR = 1.57* P < 0.001 OR = 1.54 ** 95% CI = [1.21, 1.96] Pneumococcal Not targeted. * Adjusted for baseline performance and for nesting of patients within physicians. ** Adjusted for baseline performance, nesting of patients, and for select physician characteristics.	Benchmark feedback improved clinician performance beyond the effect produced by an underlying audit and feedback / CQI intervention. For influenza vaccination, foot examination, and long-term glucose control measurement, physician receipt of achievable benchmark feedback was associated with 33% to 57% improvement in the odds of patients receiving appropriate care at follow-up compared to comparison physicians.	23
Kim et al. 1999 (262)	Design: Cluster RCT Group allocation:	Number of patients: 1810 Group 1 Number of patients: 905	Number of sites: 1 Large health maintenance organization	Pharmacist preventive care detailing and performance feedback with benchmarking vs clinician education mailings only	Influenza – patient survey results Proportion of eligible patients *offered or receiving* vaccination	Influenza – survey results Baseline Group 1: 565/706 (80%) Control: 548/694 (79%)	A comprehensive clinician education program supported by audit and feedback had mixed effects on a number of preventive	23

	Experimental study with physicians randomized to treatment and control groups. Follow-up period: 3 years	Female/male: 456/449 Age (mean(sd)): 73 (3) <u>Control group</u> Number of patients: 905 Female/male: 500/405 Age (mean(sd)): 73 (3) <u>Eligibility criteria:</u> Patients belonging to primary care practitioners within a large HMO, aged 65 to 75 years.	Site affiliation: Private MCO Number of practices or physicians: 48 physicians* Location: United States (California) * Physicians were randomized to treatment (24 physicians) and control (24 physicians) groups	Intervention aim: Improve preventive care QI agent: Large HMO <u>Group 1</u> Clinician education: Pharmacists provided physicians with face-to-face education about up-to-date recommendations for preventive care services in several sessions of 15 minutes each. Additionally, all study physicians were mailed educational materials containing one-page overviews of recommended preventive care services. Audit and feedback: Results from patient surveys and medical record review for physician compliance with preventive care procedures and patient satisfaction were presented to each physician in the form of bar graphs comparing each physician's score with those of her or his peers. Team change: Pharmacists were enlisted to provide outreach education to clinicians. <u>Control group</u> Clinician education: All study physicians were mailed educational materials containing one-page overview of recommended preventive care services.	Odds ratio of *being offered or receiving* vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients *offered or receiving* vaccination Odds ratio of *being offered or receiving* vaccination between treatment and control groups	Follow-up Group 1: 643/706 (91%) Control: 618/694 (89%) Test of significance* P = 0.86 Follow-up ** OR = 1.25 P = 0.21 <u>Pneumococcal</u> Baseline Group 1: 222/653 (34%) Control: 273/650 (42%) Follow-up Group 1: 477/653 (73%) Control: 475/650 (73%) Test of significance* P = 0.02 Follow-up** OR = 1.00 P = 1.00 * Analysis of change scores for individual patients performed with mixed-effects ANOVA. ** Crude estimate calculated by present reviewers.	care measures. The addition of audit and feedback and academic detailing with a pharmacist did not change influenza immunization rates in the background of clinician education. Pneumococcal immunization rates were not different at follow-up – however, members of the intervention group appeared to exhibit better *improvement* in immunization rates than members of the control group.	
Korn et al. 1988 (263)	Design: Cluster PCS Group allocation: Medical residents who had previously rotated through a site with a multifactoral preventive care	Number of patients: 150 Age and gender distributions not reported. <u>Group 1</u> Number of patients: 73 for influenza, 71 for pneumococcal vaccination <u>Control group</u>	Number of sites: 1 VA ambulatory internal medicine clinic* Site affiliation: University and VA Number of practices or physicians: Not reported	<u>Previous exposure to a multifactoral preventive care intervention vs usual care</u> Intervention aim: Improve preventive care QI agent: Medical clinics <u>Group 1</u>	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Follow-up* Group 1: 28% Control: 7% P = 0.03 Follow-up* OR = 5.43 P < 0.001	Resident physicians exposed in the previous year to a multifaceted intervention provided more influenza vaccinations at a non-intervention clinical site than those who had not been exposed. The intervention had significant effects in a separate clinic environment.	20

	intervention were compared to medical residents who had not. Follow-up period: 12 months	Number of patients: 77 Eligibility criteria: Patients aged 65 years or older attending the study sites. Patients eligible for pneumococcal vaccine had not previously been vaccinated.	Location: United States (Minnesota) * This study also reported before-and-after results at an intervention site prior to the controlled evaluation at the VA site.	Audit and feedback: Residents had attended chart review conferences, where they were given performance feedback regarding patient management, including attention to preventive care. Clinician education: Residents had attended a didactic seminar addressing issues in adult health maintenance. Clinician reminders: Residents had been exposed to preventive care checklists attached to outpatient charts. Control group Usual care, no previous exposure to intervention.	Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Pneumococcal Follow-up* Group 1: 27% Control: 16% P = Non-significant Follow-up* OR = 1.98 P = 0.11 * Percentages were visually extracted from a graph. Odds ratios calculated by present reviewers from these reported values. Tests are unadjusted for potential unit of analysis errors.		
Kouides et al. 1993 (264)	Design: Cluster CBA Group allocation: Physicians at one academic general medicine site were exposed to the intervention and compared with unexposed community practitioners. Follow-up period: 1 year	Number of patients: 42658 Age and gender distribution not reported. Group 1 Number of patients: 12271 Control group Number of patients: 30387 Eligibility criteria: Primary care physicians in Monroe County and at the Genesee hospital, Rochester, NY, able to identify a stable group of at least 50 ambulatory elderly patients. Patients aged 65 years or older were targeted for influenza vaccination.	Number of sites: Medicare demonstration project involving 1 hospital outpatient general medicine clinic and community general medicine practices in Monroe County, New York* Site affiliation: University, private practice Number of practices or physicians: 53 physicians at the hospital clinic, and 82 physicians in the community Location: United States (New York) * Physicians at the former site were exposed to the intervention, while physicians in the community comprised the unexposed comparison group.	Performance based incentives vs no incentives Intervention aim: Improve vaccination rates QI agent: Medicare demonstration project Group 1 Financial incentive - clinicians: Physicians at the intervention site were eligible for an extra 10% ($0.80/patient) above the $8.00/patient Medicare immunization fee if they attained a final immunization rate of 70% or greater. At a final immunization rate of 85% or greater, physicians received an additional 20% ($1.60/patient) above the usual Medicare fee. Immunizations provided at outside sites were counted towards the final coverage rate, but physicians received the performance premium only for those patients immunized at the physician's office. Audit and feedback: All study physicians, including those in the comparison practices, used a poster to track immunization coverage on a	Influenza Proportion of eligible patients receiving vaccination, taken as a continuous physician performance score (mean (95% CI)) Improvement in physician performance score associate with the intervention Proportion of physicians attaining the 75% target rate Proportion of physicians attaining the 85% target rate Pneumococcal Not targeted.	Influenza Follow-up Group 1: 73.1% (95% CI [69.1%, 77.1%]) Control: 55.7% (95% CI [52.1%, 59.3%]) P < 0.001 Follow-up Coefficient = +8.7%* P = 0.003 Follow-up Group 1: 32/53 (60%) Control: 14/82 (17%) P < 0.001 Follow-up Group 1: 10/53 (19%) Control: 4/82 (5%) P < 0.002 Pneumococcal Not targeted. * In a linear regression model adjusted for practice size, gender and specialty of the provider, use of	A performance-based incentive program was associated with increased influenza immunization rates among the elderly, in a setting where practitioners tracked their immunization coverage using a weekly-updated office poster. Physicians in this study deployed numerous tactics to improve their vaccination rates, including chart reminders, postcards, and office signs.	18

				weekly basis. Physicians could deploy any QI technique to improve vaccination rates. Control group Audit and feedback: All study physicians used a poster to track immunization coverage on a weekly basis. Physicians could deploy any QI technique to improve vaccination rates.		reminder postcards, and service to medically indigent populations. These attributes had been found on univariate analysis to be statistically significant predictors of vaccination rates.		
Kouides et al. 1998 (265)	Design: Cluster RCT Group allocation: Experimental study with physician practices randomly allocated to treatment or control groups. Follow-up period: 1 year	Number of patients: 38804 Age and gender distribution not reported Group 1 Number of patients: 21196 Control group Number of patients: 17608 Eligibility criteria: Physicians – Provision of primary care to at least 50 elderly patients, participation in the demonstration project, use of a target-based poster audit and feedback method of tracking immunizations, and lack of participation in a previous study. Patients – Non-institutionalized patients aged 65 years or older, who had an office visit in the last year.	Number of sites: 1 Medicare influenza vaccination demonstration project, in a single New York county. Site affiliation: Medicare Number of practices or physicians: 54 practices* Location: United States (New York) * Practices were allocated to treatment (27 practices) and control (27 practices) groups.	Pay for performance in addition to audit and feedback vs audit and feedback only Intervention aim: Improve vaccination rates QI agent: State Medicare organization Group 1 Audit and feedback: All study practices implemented target-based vaccination performance tracking posters, placed in a prominent location. Financial incentive – clinicians: Physicians were eligible for reimbursement above the standard $8 vaccine administration fee established by the Medicare Demonstration Project, if immunization rates above 70% or 85% were attained. At rates above 70% or 85%, physicians received an additional 10% ($0.80 per shot) or 20% ($1.60 per shot) reimbursement, respectively. Immunizations obtained outside the clinic were included under the physician's performance. Patient education / reminders: All patients in the study region were exposed to an extensive media campaign and beneficiary letters to all Medicare recipients. Control group Audit and feedback and patient	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Mean proportion of eligible patients receiving vaccination, treated as a continuous outcome for each physician (mean (sd)) Mean change from baseline performance, treated as a continuous outcome. Change in vaccination performance for each physician, associated with the intervention. Pneumococcal Not targeted.	Influenza Follow-up Group 1: 14182/21196 (67%) Control: 10580/17608 (60%) Follow-up* OR = 1.34 P < 0.001 Follow-up Group 1: 68.6% (16.6%) Control: 62.7% (18.0%) Follow-up Group 1: 10.3% Control: 3.5% Follow-up Coefficient = 7.1%** P = 0.05 Pneumococcal Not targeted. * Crude estimates calculated by present reviewers. **Adjusted for baseline immunization performance using linear regression.	Performance-based financial incentives for immunization resulted in a significant 7.1% better change in immunization rates from baseline.	23

				education / reminders, as above.				
Krieger et al. 2000 (266)	Design: CCT Group allocation: Experimental study with participants allocated to treatment and control groups. Follow-up period: Unclear.	Number of patients: 1246 <u>Group 1</u> Number of patients: 622 Female/male: 266/356 Age (mean(sd)): 75.1 (sd not reported) <u>Control group</u> Number of patients: 624 Female/male: 298/326 Age (mean(sd)): 75.6 (sd not <u>Eligibility criteria:</u> Participants aged 65 years or older, residing in the senior center's service area. Patients were eligible for pneumococcal vaccination only without a previous pneumococcal vaccination history.	Number of sites: 1 senior center in an urban low-income area Site affiliation: Private community delivery system Number of practices or physicians: None Location: United States (Washington)	<u>Patient reminder letters and telephone outreach vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Seniors center <u>Group 1</u> Community engagement: The research orientation was participatory action research. Senior center staff and members collaborated with researchers in project design, implementation and evaluation, and shared direction. Patient education / reminders: Each participant was mailed an educational brochure with a postage paid reply card for tracking immunization status. Patient education / reminders: Volunteers called participants if the reply card had not been returned or if the card indicated that immunization was lacking. Electronic patient registry: The project coordinator used a computer registry to track the contact and immunization status of each participant. <u>Control group</u> Usual senior center and community immunization promotion activities (i.e.: newsletter articles, health fairs, etc.)	<u>Influenza</u> Proportion of eligible patients receiving vaccination Risk and odds ratios of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination Risk/odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Baseline Group 1: 487/622 Control: 518/624 Follow-up Overall Group 1: 446/503 (87%) Control: 435/528 (82%) Patients not previously immunized Group 1: 51/102 (50%) Control: 21/91 (23%) Patients previously immunized Group 1: 395/401 (99%) Control: 414/437 (95%) Follow-up Patients not previously immunized OR = 3.33 P = <0.001 Patients previously immunized OR = 3.66 P = 0.004 Adjusted odds ratio* OR = 3.80 95% CI = [2.2, 6.5] <u>Pneumococcal</u> Baseline Group 1: 259/622 Control: 253/624 Follow-up Group 1: 170/327 (52%) Control: 112/363 (31%) Follow-up RR = 1.69 OR = 6.68	An intervention consisting of an educational mailing followed by tracking and outreach by volunteers was effective in increasing pneumococcal and influenza immunization levels among an ethnically divers, inner-city group of senior citizens. The intervention had its greatest effect on influenza immunization rates among participants who had not received an immunization in the prior year. The immunization achieved an influenza immunization rate 88.2%, which exceed previously suggested ceiling rates. Program costs were $205 per additional pneumococcal and $38 per additional influenza vaccination delivered. Program costs may be decreased by targeted on seniors who had not previously been vaccinated. * Adjusted for previous immunization history, perceived primary health care provider	23

						P < 0.01 Adjusted odds ratio** OR = 2.56 95% CI [1.57, 4.68] *, ** See notes in the next column, at right.	interest, and self-reported health status ** Adjusted for primary care provider interest, and patient income.	
Larson et al. 1982 (267)	Design: CCT Group allocation: Experimental with patients randomly allocated to treatment and control groups. Follow-up period: Unclear.	Number of patients: 395 (283 patients were available for analysis, enumerated below.) <u>Group 1</u> Number of patients: 70 Female: 69% Age (mean(sd)): 68.1 (14.4) <u>Group 2</u> Number of patients: 61 Female: 63% Age (mean(sd)): 63.8 (19.6) <u>Group 3</u> Number of patients: 68 Female: 75% Age (mean(sd)): 66.5 (16.1) <u>Control group</u> Number of patients: 84 Female: 65% Age (mean(sd)): 68.0 (15.4) <u>Eligibility criteria:</u> Patients 65 years or older or patients with chronic diseases.	Number of sites: 1 academic family medicine centre Site affiliation: University Number of practices or physicians: Not reported Location: United States (Washington)	<u>Patient reminder postcard based on HBM theory vs neutral patient reminder postcard vs personalized patient reminder postcard vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical clinic <u>Group 1</u> Patient education reminders: Patients were mailed a postcard that emphasized the severity of influenza, the susceptibility of older persons to influenza, and the benefits of vaccination. The postcard was designed according to the Health Belief Model. <u>Group 2</u> Patient education / reminders: Patients received a neutral postcard, informing patients of the availability of influenza vaccination. <u>Group 3</u> Patient education / reminders: Patients received a personal post card, in which the patient is named and the influenza vaccination is endorsed by her or his personal physician. <u>Control group</u> Usual care	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups (crude estimates calculated by present reviewers) Proportion of eligible patients receiving vaccination, adjusted for age and vaccination experience in the previous year *	<u>Influenza</u> Follow-up (Crude) Group 1: 36/70 (51%) Group 2: 17/68 (25%) Group 3: 26/61 (41%) Control: 17/84 (20%) Follow-up Group 1 OR = 4.17 P < 0.001 Group 2 OR = 1.31 P = 0.56 Group 3 OR = 2.93 P = 0.005 Follow -up Results adjusted for age and vaccination experience in the previous year Group 1: 24% Group 2: 11% Group 3: 14% Control: 10% Tests of significance, after adjusting for age and vaccination status Group 1 vs control P < 0.025 Group 1 vs group 2 P < 0.05 All other comparisons reported as either p > 0.05 (NS) or p < 0.25.	The Health Belief Model-based postcard was more effective than either no postcard or the neutral postcard. A personal postcard, designed to provide a message from the patient's personal physician, was effective in the crude analysis, but not more effective after adjusting for age and prior vaccination experience. Prior vaccination experience is an important potential confounder of intervention effect and should be measured even in randomized controlled trials.	19

					Pneumococcal Not targeted. * Proportions estimated for a 65 year old patient with no vaccination the year before. Precision of results is not provided.	Pneumococcal Not targeted.		
Latessa et al. 2000 (268)	Design: Cluster-CBA Group allocation: Four family practice center practice "modules" were allocated to treatment and control groups. Follow-up period: 6 months	Number of patients: 778 Group 1 Number of patients: 205 Female/male: 130/75 Group 2 Number of patients: 187 Female/male: 129/58 Control group* Number of patients: 386 Female/male: 245/141 Eligibility criteria: Patients aged 65 years or older, or patients aged 2-64 with diabetes. Patients had not previously received pneumococcal vaccination. Exclusion: Patients receiving care at a "module" other than the one in which they usually receive care. * Two control groups were collapsed into a single group at analysis.	Site description: University family practice center Site affiliation: University Number of sites: 1 academic family practice center Number of practices or physicians: 21 attending physicians, 34 family practice residents, and 4 nurse practitioners / physician assistants divided into 4 practice "modules"* Location: United States (North Carolina) * Family practice modules were allocated to group 1 (1 module), group 2 (1 module), and control (2 modules).	Clinician chart reminder stickers and patient reminder office sign developed as a result of a CQI process vs patient reminder office sign only vs usual care Intervention aim: Improve vaccination rates QI agent: Medical practices Group 1 CQI (or similar): A team of two family practice residents and a nurse met monthly over 3 months. During this time, the team was introduced to CQI methods, identified potential causes of low pneumococcal vaccination rates, investigated causes with patient and clinician surveys, and developed a two-pronged strategy for addressing low vaccination rates. Clinician reminder: Nurses placed a "Pneumovax needed?" sticker on physicians' work-up sheets if the patient met criteria for vaccination. Patient education / reminders: A sign was placed in each examination room prompting patients to inquire about pneumococcal vaccination. Group 2 Patient education / reminders: As above. Control group Usual care	Influenza Not targeted. Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Influenza Not targeted. Pneumococcal Follow-up Group 1: 42/205 (20%) Group 2: 21/187 (11%) Control: 27/386 (7%) Follow-up Group 1 OR = 3.43 P < 0.001 Group 2 OR = 1.68 P = 0.086	A simple intervention, developed as a result of a CQI process designed to impact the office patterns of primary care physicians, can produce measureable changes in pneumococcal vaccination rates.	20

Leirer et al. 1989 (269)	Design: RCT* Group allocation: Elderly individuals were randomly allocated to voice-mail reminder or no reminder groups.* Follow-up period: 1 week * Additionally, individuals were analyzed in observational strata defined by exposure to repeated posted or verbal vaccination clinic announcements.	Number of patients: 321 patients originally allocated, 184 patients at analysis. Age and gender distributions not reported. Group 1 Number of patients: 68 Group 2 Number of patients: 25 Group 3 Number of patients: 24 Group 4 Number of patients: 65 Eligibility criteria: Individuals aged 65 years or older who attended a lunch program at the study site.	Number of sites: 1 seniors center Site affiliation: Community seniors center Number of practices or physicians: Not applicable. Location: United States (California)	Voice-mail reminders vs no voice-mail reminders, and repeated verbal/posted announcements vs no exposure to repeated announcements Intervention aim: Improve vaccination rates QI agent: Community seniors center Group 1 Patient education / reminders: Patients received voice-mail messages, but were not exposed to announcements. Group 2 Patient education / reminders: Patients were exposed to repeated posted and verbal announcements about influenza vaccination at the seniors center. Group 3 Patient education / reminders: An auto-dialer computer called eligible individuals with a voice-mail reminder of the time, place, and cost of an upcoming influenza vaccination clinic. Additionally, patients were exposed to senior center announcements about the clinic. Control Usual care.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between voice-mail reminder and no-reminder groups * Odds ratio of receiving vaccination between announcement-exposed and un-exposed groups** Pneumococcal Not targeted. * Randomized comparison ** Non-random comparison – high risk of bias due to sampling from potentially different populations.	Influenza Follow-up Group 1: 8/68 (12%) Group 2: 2/27 (7%) Group 3: 9/24 (38%) Control: 1/65 (2%) Voicemail reminder vs no reminder* … Among patients with announcement exposure OR = 7.50 P < 0.01 … Among patients with no announcement exposure OR = 8.73 P < 0.025 Announcements vs no announcement exposure** … Among voice-mail reminder groups OR = 4.50 P < 0.01 … Among groups without voice-mail reminders OR = 5.12 P = 0.05 (NS) Pneumococcal Not targeted. * and ** notes: See previous column.	Voice-mail reminders increased adherence to influenza vaccinations at a scheduled vaccination clinic among community elderly individuals. Exposure to repeat posted and verbal announcements also improved vaccination rates. However, this conclusion is based on an observational comparison and should be taken with caution due to high risk of bias. Announcements did not significantly increase adherence among patients who did not receive a voice-mail reminder, but this is likely due to low sample size.	18
Lemelin et al. 2001 (270)	Design: Cluster-RCT Group allocation: Experimental study with general practices allocated to treatment and control groups	Number of patients: 2500 patient charts reviewed. Group 1 Number of patients: 2200 patient charts reviewed. Control group Number of patients: 2300	Number of sites: 56 private practices affiliated with Ontario Health Services Organizations Site affiliation: Private practices Number of practices or	Multifaceted QI facilitation in general practice vs usual care Intervention aim: Improve preventive care QI agent: Medical clinics Group 1	Influenza Proportion of eligible patients receiving vaccination, treated as a continuous performance score for each practice.	Influenza Baseline Group 1: 46.1% Control: 49.4% Follow-up – 18 months Group 1: 64.8% Control: 53.4%	A tailored multifaceted approach delivered by nurse facilitators can significantly improve the preventive care performance of capitated primary care physicians. The rate of improvement in preventive care performance (11.5%) was modest. However, the potential effect of a 11.5%	22

	Follow-up period: 18 months	patient charts reviewed. Eligibility criteria: Not reported.	physicians: 56 (23 in Group 1, 23 in Control) Location: Canada (Ontario)	Audit and feedback: Prevention facilitators presented baseline performance rates and performed mini-audits. CQI (or similar): Prevention facilitators, i.e.: trained community health nurses, attended study practices and enlisted practice physicians in a process of quality improvement. Practice physicians and facilitators reviewed baseline performance, identified goals, and developed practice policies and written plans. Facilitators visited each practice an average of 33 times over 18 months. Clinician education: Preventive care education in the form of seminars, guidelines, and a conference. Clinician reminders: No further detail provided. Patient reminders: No further detail provided. Control group Usual care.	Change in proportion of eligible patients receiving vaccination, treated as a continuous performance score for each practice. Mean between-group difference in change scores from baseline performance, treated as a continuous outcome for each pharmacy, *diff.* (mean (95% CI)). Pneumococcal Not targeted.	Follow-up – 18 months Change scores Group 1: 18.7% Control: 4.0% Follow-up – 18 months Difference: 14.7% ($p < 0.05$) Pneumococcal Not targeted.	improvement for 13 different interventions on an entire family practice panel may be considerable.	
Lennox et al. 2010 (271)	Design: Cluster-RCT Group allocation: Experimental study with patient households allocated to treatment and control groups Follow-up period: 1 year	Number of patients: 272 (242 at analysis) Group 1 Number of patients: 53 Female/male: 21/32 Age (mean(sd)): 33 (11) Group 2 Number of patients: 57 Female/male: 12/29 Age (mean(sd)): 37 (12) Group 3 Number of patients: 70 Female/male: 27/43 Age (mean(sd)): 39 (14)	Number of sites: Patients were recruited from 48 community organizations Site affiliation: Community support and advocacy organizations for adults with disabilities Number of practices or physicians: 140 general practitioners (35 general practices in each group) Location: Australia	Comprehensive health assessment tool vs health advocacy tool vs comprehensive health assessment tool and advocacy tool vs usual care Intervention aim: Improve preventive care QI agent: Medical clinic Group 1: Comprehensive health assessment tool Facilitated relay of clinical information: The comprehensive health assessment booklet elicited a thorough health history from patients and providers. Clinician reminders: The comprehensive	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups *	Influenza Baseline Group 1: 17/53 (32%) Group 2: 20/51 (39%) Group 3: 29/70 (41%) Control: 24/68 (35%) Follow-up – 1 year Group 1: 25/53 (47%) Group 2: 20/51 (39%) Group 3: 35/70 (50%) Control: 22/68 (32%) Follow-up – 1 year * Group 1 vs control OR = 1.87, p = 0.07 Group 2 vs control OR = 1.35, p = 0.28	The use of a comprehensive health assessment increased certain health promotion activities (e.g.: pneumococcal vaccinations, vision tests, but not influenza vaccinations) in adults with intellectual disabilities living in the community. In contrast, the use of a health advocacy tool did not improve measured health care activities.	24

		Control group Number of patients: 68 Female/male: 34/34 Age (mean(sd)): 34 (11) Eligibility criteria: Adults with an intellectual disability, living in a private residence with family, alone, or with other individuals in a shared arrangement. Exclusions: Adults living with 24-hour support, participation in a previous trial.		health assessment booklet prompted providers to review patients' histories, perform a guided assessment of patients' health, and provide care for commonly missed health conditions. Group 2: Health advocacy tool Patient education / reminders: The health advocacy tool was a diary designed for ongoing use in all medical consultations. The diary was composed of four sections. An "all about me" section contained a record of personal details. "Health advocacy tips" provided advice on how patients should prepare for visits to the doctor and contained pages for charting symptoms over time. A "Fort eh Doctor" section prompted clinicians with checklists of health problems. A "medical records" section included diagnoses, operations, medications, and other medical details. Clinician reminders: The health advocacy tool contained a section of reminder checklists of common health problems faced by patients with intellectual disabilities. Group 3: Comprehensive health assessment tool and health advocacy tool Patient education / reminders: As in group 2. Facilitated relay of clinical information: As in group 1. Clinician reminders: As in groups 1 and 2. Control group Usual care.	 Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups *	Group 3 vs control OR = 2.09, p = 0.03 Pneumococcal Baseline Group 1: 4/53 (8%) Group 2: 2/51 (4%) Group 3: 18/70 (26%) Control: 7/68 (10%) Follow-up – 1 year Group 1: 6/53 (11%) Group 2: 2/51 (4%) Group 3: 8/70 (11%) Control: 0/68 (0%) Follow-up – 1 year *, ** Group 1 vs control OR = 17.36, p = 0.006 Group 2 vs control OR = 5.55, p = 0.18 Group 3 vs control OR = 17.55, p = 0.004 * Unit of analysis error. ** Odds ratio calculated by substituting 0.5 for zero.		
Lobach et al. (1997) (272)	Design: Cluster-RCT	Number of patients: 359 Group 1	Number of sites: 1 family medicine clinic	Computer-assisted management vs usual care	Influenza Proportion of eligible encounters in which vaccination is provided,	Influenza Follow-up Group 1: 29.2%	The computer-assisted management protocol was not associated with a statistically	21

	Group allocation: Primary care clinicians were randomly allocated to treatment and control groups. Follow-up period: Unclear	Number of patients: Not reported. Control group Number of patients: Not reported. Eligibility criteria: Physicians were included if they practiced at the study clinic and saw at least 6 different diabetic patients over at least 12 clinical encounters during the study period.	Site affiliation: University Number of practices or physicians: 30 primary care clinicians (family physician faculty members and family medicine residents)* Location: United States (North Carolina) * 16 and 14 clinicians were allocated to treatment and control groups, respectively.	Intervention aim: Improve care of diabetes QI agent: Medical clinic Group 1 Clinician reminders: A computer program automatically generated a diabetes-specific clinical encounter form based on data from the patients' electronic medical record. The form included care recommendations advising the clinician on procedures and studies that should be ordered. Control group Usual care.	taken as a continuous performance score per physician (median) Pneumococcal Proportion of eligible encounters in which vaccination is provided, taken as a continuous performance score per physician (median)	Control: 22.7% Test of significance P > 0.1 (Wilconxon rank sum test) Pneumococcal Follow-up Group 1: 19.8% Control: 0.0% Test of significance P > 0.1 (Wilconxon rank sum test)	significant rise in vaccination rates. However, performance rates improved significantly for 3 of 8 diabetes care guidelines tested.	
Lukasik et al. 1987 (273)	Design: CCT Group allocation: Patients were randomly allocated to treatment and control groups. Follow-up period: 1 year	Number of patients: 243 Age and gender distributions not reported. Group 1 Number of patients: 120 Control group Number of patients: 123 Eligibility criteria: Active registered patient in the practice, aged 65 years or older. Exclusions: Chronically hospitalized, nursing home patients, and housebound patients, and patients unable to communicate by telephone.	Number of sites: 1 academic family medical practice Site affiliation: University Number of practices or physicians: 1 attending physician, 2 residents, 2 nursing staff Location: Canada (Ontario)	Telephone patient outreach vs vaccination prompting at usual visits only Intervention aim: Improve vaccination rates QI agent: Medical clinics Group 1 Patient education / reminders: Clinical staff telephoned patients. Patients were told that the influenza vaccine was available and that they could receive it during a regular appointment, or during a nurse-led vaccination clinic. Staff were provided with a list of 5 patients per week, which could be increased if all patients had been telephoned. Control group Patient education / reminders: All patients attending the practice, including intervention group patients, were informed by nursing staff that the vaccine was available. Physicians followed up on vaccinations during each visit.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Baseline - 1983 Group 1: 9/92 (10%) Control: 8/98 (8%) Baseline – 1984 Group 1: 8/109 (7%) Control: 5/111 (5%) Follow-up Group 1: 61/120 (51%) Control: 33/123 (27%) Follow-up OR = 2.82 P = 0.0002 Pneumococcal Not targeted.	A practice immunization policy combined with a simple telephone outreach program improved vaccination rates in primary care.	20

Maljanian et al., 2005 (274)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period: 12 months	Number of patients: 507 (336 patients were available at analysis, enumerated below.) <u>Group 1</u> Number of patients: 176 Female/male: 99/77 Age (mean(sd)): 57.0 (12.1) years <u>Control group</u> Number of patients: 160 Female/male: 80/80 Age (mean(sd)): 59.2 (13.4) years <u>Eligibility criteria:</u> Patients with type 1 or type 2 diabetes referred to the hospital-based disease management program. Individuals without telephones, or who were unable to complete interviews or surveys in English or Spanish were excluded.	Number of sites: 1 hospital-based disease management program Site affiliation: Private disease management organization Number of practices or physicians: Not reported Location: United States (Connecticut)	<u>Disease management program with intensive telephone education and follow-up versus disease management program alone</u> Intervention aim: Improve diabetes care QI agent: Disease management program <u>Group 1</u> Patient education: Three 4-hr educational classes covering diverse diabetes health promotion topics were provided to patients. Intervention group patients received a series of 12 weekly phone calls to reinforce education and self-management skills. Calls were delivered by a trained research nurse, and focused on glycemic control, prevention of complications, and exacerbation of co morbidities. Calls were 5-7 minutes each, excepting the first call, which was 15-20 minutes in length. Team change: Patients had individual visits with a registered nurse and nutritionist. Case management: Diabetes team members provided written evaluations and recommendations to the patient's primary care provider, and scheduled follow-up as needed. <u>Control group</u> Team change and case management, as above. Patient education: As above, without the telephone component.	<u>Influenza</u> Proportion of eligible patients receiving vaccination during influenza season Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination during influenza season Odds ratio of receiving vaccination between treatment and control groups * * Calculated by logistic regression adjusting for baseline BMI, glycemic control, and vaccination status.	<u>Influenza</u> Baseline Not reported 3 months* Group 1: 33/62 (53%) Control: 37/91 (41%) No significant differences. 12 months* Group 1: 95/176 (36%) Control: 75/160 (47%) No significant differences. 12 months OR = 1.33 P = 0.23 <u>Pneumococcal</u> Baseline Not reported 3 months Group 1: 28/106 (26%) Control: 10/97 (10%) P < 0.005 12 months Group 1: 42/106 (40%) Control: 23/97 (24%) P < 0.02 3 months OR = 2.74 P < 0.015 12 months OR =1.96 P < 0.039 * Denominators at 3 months were comprised of patients attending an office visit during the influenza season. Denominators at 12 months were "cumulative", comprised of all patients remaining in the study.	This study examined the incremental effect of an intensive telephone intervention added on to a hospital-based diabetes disease management program already known to promote glycemic control. The addition of the telephone intervention improved adherence for foot and eye exams, and for pneumonia vaccinations, but did not result in additional improvements in other ADA guidelines, in glycemic control, HRQoL, diabetes QoL, depression symptoms, or in patient satisfaction.	21

Margolis et al. 1988 (275)	Design: Cluster RCS Group allocation: Outcomes in patients at a general medicine clinic that had implemented the study intervention were compared with those among patients attending non-intervention sub-specialty clinics during the study period. Follow-up period: 1 month	Number of patients: 218 Age and gender distributions not reported. Group 1 Number of patients: 101 Control group Number of patients: 117 Eligibility criteria: Patients aged 65 years or older, attending the study clinics between November 15 and December 15, 1986.	Number of sites: 1 VA medical centre Site affiliation: Veterans Affairs Number of practices or physicians: 1 general medicine clinic and an unreported number of sub-specialty clinics* Location: United States (Minnesota) * Patients at the general medicine clinic were compared with those attending the sub-specialty clinics	Standing orders policy vs usual care Intervention aim: Improve vaccination rates QI agent: Medical center Group 1 Team change: Clinic nurses identified and immunized eligible patients prior to each physician visit. Control group Usual care.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up* Group 1: 43/97 (44%) Control: 18/106 (17%) Follow-up OR = 3.89 P < 0.001 Pneumococcal Not targeted. * Number of patients vaccinated at a study site during the study period – 10% to 25% of patients had received influenza vaccinations elsewhere.	An organization standing orders intervention resulted in substantial improvement in the influenza vaccine ordering rate, and in the proportion of patients vaccinated at the study sites. This study may suffer from vaccination status ascertainment bias. Intervention site nurses may have been more vigilant at inquiring for and recording vaccination status, since more patients in the treatment group were recorded as having received vaccine elsewhere.	17
Margolis et al. 1992 (276)	Design: CBA Group allocation: Experimental study with medical clinics chosen by investigators for similarity between treatment and control sites. Follow-up period: 1 year	Number of patients: 600 Age (mean(sd)): 72 (sd not reported) Group 1 Number of patients: 300 Control group Number of patients: 300 Eligibility criteria: Patients aged >65 years	Number of sites: 1 staff model non-profit private HMO Site affiliation: Private managed care organization Number of practices or physicians: 4 primary care clinics* Location: United States (Minnesota) * Clinics were allocated to treatment (2 clinics) and control (2 clinics) groups.	Multi-component strategy vs usual care Intervention aim: Improve vaccination rates QI agent: Medical clinics Group 1 Team change: Hospital policy was adjusted to allow nurses to vaccinate without a signed physician's orders. Clinician reminders: Nurses were prompted to vaccinate by stamped reminders on clinic progress notes. Nurses were trained during in-service education sessions. Patient education / reminder: An informational letter was mailed to all eligible patients. Clinician education: In-service education sessions were held to train nurse vaccinators. Control group	Influenza Proportion of eligible patients receiving vaccination (95% CI) Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted	Influenza Baseline Overall* Group 1: 125/180 (69%) Control: 124/215 (58%) Follow-up Overall* ** Group 1: 199/281 (71%) Control: 157/276 (57%) Follow-up** Overall OR = 1.84 P < 0.001 Pneumococcal Not targeted. * Calculated by present reviewers. ** Heterogeneity present between study sites.	A multi-component vaccination strategy stressing organizational change, and nurse- and patient-oriented education successfully increased vaccination rates. This strategy, originally deployed in an academic Veterans Affairs setting, was successfully generalized to the community setting.	19

				Usual care.				
McCaul et al. 2002 (277)	Design: Cluster RCT Group allocation: Experimental study with state counties randomly allocated to treatment and control groups, and patients allocated within select state counties. Follow-up period: 6 months	Number of patients: 23733 <u>Group 1s 1, 2, 3, and 4</u> Number of patients: 15837 Female/male: 9107/6730 Age (mean(sd)): Not reported <u>Control group</u> Number of patients: 7896 Female/male: 4476/3420 Age (mean(sd)): Not reported <u>Eligibility criteria:</u> Patients aged 65 years and older, who had not billed Medicare for influenza vaccination the year before. Study investigators excluded patients for whom the intervention mailings were returned undelivered.	Number of sites: 1 Medicare peer review organization for the state of North Dakota Site affiliation: State-wide public payer Number of practices or physicians: 49 state counties* Location: United States (North Dakota) * Counties were randomized to Groups 1, 2, and 3 (17 counties); Group 4 (12 counties); and controls (20 counties)	<u>Reminder letters vs reminder letters with a gain-framed educational component vs reminder letters with a loss-framed educational component vs action letters vs usual care</u> Intervention aim: Improve vaccination rates QI agent: State Medicare peer review organization <u>Group 1 (Reminder only)</u> Patient education / reminders: A letter was sent to eligible patients reminding patients that they should receive the flu shot, the flu shot is safe, and that Medicare will pay for the flu shot. <u>Group 2 (Reminder + gain-framed education)</u> Patient education / reminders: The reminder letter was accompanied by an insert, featuring the picture and testimonial of a woman who had received a flue shot the previous year and not gotten the flu. The insert described the benefits of vaccination. <u>Group 3 (Reminder + loss-framed education)</u> Patient education / reminders: The reminder letter was accompanied by the picture and testimonial of a woman who had not received a flu shot the previous year and had spent several days in bed, sick with the flu. The insert described the risks of not getting vaccinated. <u>Group 4 (Action letters)</u> Patient education / reminders: Patients received a letter indicating the times and places during which health units would be holding flu shot clinics.	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Not targeted.	<u>Influenza</u> Follow-up Group 1: 798/3258 (25%) Group 2: 766/3260 (24%) Group 3: 799/3262 (25%) Group 4: 1708/657 (28%) Control: 1548/7896 (20%) Follow-up Group 1 OR = 1.33, $p < 0.001$ Group 2 OR = 1.26, $p < 0.001$ Group 3 OR = 1.33, $p < 0.001$ Reminder mailings (Groups 1, 2, and 3) vs control OR = 1.31 $P < 0.01$* Action mailings (Group 4) vs control OR = 1.61 $P < 0.01$* <u>Pneumococcal</u> Not targeted. * Unit of analysis was accounted for in secondary sensitivity analyses and found not to differ from the results presented here.	Neither the gain-framed message nor the loss-framed message improved vaccination rates compared with the brief reminder. The action-plan approach was very effective, producing significantly higher vaccination rate than the no-treatment control condition.	20

				Control group Usual care.				
McDonald et al. 1984 (278) Supplemented with data from McDonald et al. 1992 (136).	Design: Cluster RCT Group allocation: Experimental study with physicians randomly allocated to treatment and control groups. Follow-up period: 3 years	Number of patients: 4555* Group 1 Number of patients: 2319* Control group Number of patients: 2236* Eligibility criteria: All patients attending a general medicine clinic. Pneumococcal and influenza vaccinations were indicated for patients aged 65 years or older, chronic lung disease, asthma, diabetes mellitus, congestive heart failure, or severe renal or hepatic failure. Patients were eligible for pneumococcal vaccination if they did not have a previously recorded vaccination. * Reported from McDonald et al. 1992 (136)	Number of sites: 1 general medicine teaching clinic Site affiliation: University Number of practices or physicians: 115 residents, 11 faculty, and 4 nurse-practitioners* Location: United States (Indiana) * Clinician teams were randomly assigned to study groups, numbers not reported.	Computer generated reminders vs usual care Intervention aim: Improve preventive care QI agent: General medicine service at a large teaching hospital Group 1 Clinician reminders: Patient specific reminders were generated, by computer, from each patient's EMR and attached to patient charts prior to each visit. Control group Usual care	Influenza Proportion of eligible patients receiving vaccination, taken as a continuous performance score for each provider (mean(sd))* Proportion of eligible patients receiving vaccination, considering only patients who attended the clinic in the Fall, when vaccination had become available ** Odds ratio of receiving vaccination between treatment and control groups ** Pneumococcal Proportion of eligible patients receiving vaccination, taken as a continuous performance score for each provider (mean(sd))* Proportion of eligible patients receiving vaccination **	Influenza Follow-up Group 1: 44%(27%) Control: 20% (22%) Test of significance P < 0.0005 Follow-up year 1 Group 1: 469/2319 (20%) Control: 225/2236 (10%) Follow-up year 2 Group 1: 457/2319 (20%) Control: 267/2236 (12%) Follow-up year 3 Group 1: 388/2319 (17%) Control: 193/2236 (9%) Follow-up year 1 OR = 2.27, P < 0.0001 Follow-up year 2 OR = 1.81, P < 0.0001 Follow-up year 3 OR = 2.13, P < 0.0001 Pneumococcal Follow-up Group 1: 50% (31%) Control: 11% (19%) Test of significance P < 0.0005 Follow-up year 1 Group 1: 861/2319 (37%) Control: 225/2236 (10%) Follow-up year 2 Group 1: 1203/2319 (52%) Control: 392/2236 (18%)	The usage of preventive care was at least twofold greater among physicians in the study group than among control group physicians. Neither the number of years of training nor a faculty assessment of clinical ability predicted resident response rates. Attitudes about the reminder system and the degree to which residents read reminder reports were correlated, and predictive of preventive care response rates. Computer reminder messages had no overall effect on measures of patient morbidity. However, a follow-up study (McDonald et al. 1992 (136)) showed an association between the study intervention and a reduction in Winter morbidity. After having tested alternative explanations for this association, the authors attributed the improvement to increased influenza vaccination rates among intervention-group patients.	23

					Odds ratio of receiving vaccination between treatment and control groups ** * Visually extracted from a graph in McDonald et al. 1984 (278). ** Data from McDonald et al. 1992 (136). These data are not adjusted for a potential unit of analysis error.	Follow-up year 3 1373/2319 (59%) Control: 496/2236 (22%) Follow-up year 1 OR = 5.28, P < 0.0001 Follow-up year 2 OR = 5.07, P < 0.0001 Follow-up year 3 OR = 5.09, P < 0.0001		
McDowell et al. 1986 (279) Supplemented with data from McDowell et al. 1990 (138)	Design: CCT Group allocation: Experimental study with patients' families randomly allocated to treatment and control groups. Follow-up period: 3 months	Number of patients: 1420 Age and gender distributions not reported for each study group <u>Group 1</u> Number of patients: 265 <u>Group 2</u> Number of patients: 226 <u>Group 3</u> Number of patients: 218 <u>Control group</u> Number of patients: 230 <u>Non-participants</u> Number of patients: 481 <u>Eligibility criteria:</u> Patients aged 65 years or older.	Number of sites: 1 academic family medicine centre Site affiliation: University Number of practices or physicians: 6 practices* Location: Canada (Ontario) * 4 of 6 practices participated in this study. The two non-participant practices contributed "non-contaminated" outcome data.	<u>Patient reminder letters vs patient reminder telephone calls from a nurse vs clinician reminder prompts vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical practices <u>Group 1</u> Patient education / reminders: Patients were sent a single letter encouraging them to receiving the vaccine. The letter was computer generated and customized from the EMR, and signed by the patient's physician and the practice nurse. <u>Group 2</u> Patient education / reminders: Patients were called by the practice nurse and informed that they should obtain an influenza vaccination. <u>Group 3</u> Clinician reminders: Computer generated reminders were generated and attached to each patient's visit chart. <u>Control group</u>	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Influenza – Post-intervention (Reminders had ceased)</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving	<u>Influenza</u> Follow-up – Intervention year Group 1:84/265 (35%) Group 2: 77/226 (37%) Group 3: 46/218 (23%) Control: 21/230 (10%) Non-participants: 17/481 (4%) Follow-up – Intervention year OR compared to controls Group 1: 4.62, p < 0.001 Group 2: 5.14, p < 0.001 Group 3: 2.66, p = 0.001 Test of significance for control vs non-participant patients P < 0.005 <u>Influenza – Post-intervention (Reminders had ceased)</u> Follow-up – Post-intervention year* Experimental groups: 116/622 (19%) Control groups: 100/564 (18%) OR = 1.09	All three approaches to reminding patients were effective in significantly improving the rates achieved without a reminder. Personal reminders by the physician and telephone reminders by the nurse were more effective than reminders by letter. Despite the reminders, influenza vaccination rates remained low. Telephone and physician reminders were more cost-effective than mailings at lower physician and nursing salaries. In a follow-up study, McDowell et al. (138) analyzed patterns of immunization uptake among individual patients over the pre-intervention year, the intervention year, and an additional post-intervention year. They found that the intervention effect was short-lived, and also detected a decrease in immunization rates among patients who had been previously immunized. McDowell et al. suggest that this may be evidence of an adverse dependence on technology, and	22

				Usual care. Non-participant characteristics: Usual care.	vaccination between treatment and control groups Pneumococcal Not targeted.	P = 0.60 Pneumococcal Not targeted. * See next column, at right.	that use of clinician reminders must be careful to educate and support self-management. * From previous column: Results from the follow-up study reported in McDowell et al. 1990 (138). This study included patients remaining after an addition year of data collection and analysis, when the intervention had been ceased.	
Moran et al. 1992 (280)	Design: CCT Group allocation: Experimental study with random allocation of patients to treatment and control groups. Follow-up period: 3 months	Number of patients: 409 Female/male: not reported Group 1 Number of patients: 135 Age (>65): 66 (49%) Group 2 Number of patients: 138 Age (>65): 68 (49%) Control group Number of patients: 136 Age (>65): 68 (50%) Eligibility criteria: Patients aged >65 years or those with a diagnosis of chronic disease recorded in the clinic EMR.	Number of sites: 1 urban health center Site affiliation: Unclear Number of practices or physicians: Not reported Location: United States (State unclear)	Single patient reminder letter vs two sequential patient reminder letters vs usual care Intervention aim: Improve vaccination rates QI agent: Health clinic Group 1 Patient education / reminders: Patients were mailed a single letter saying that immunization was medically indicated, did not cause influenza, could result in minor side effects, and was free and available without an appointment. Group 2 As above, except patients were mailed a second identical letter 1 month later. Control group Usual care.	Influenza Proportion of eligible patients receiving vaccination at follow-up Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up Group 1: 54/135 (40%) Group 2: 41/138 (30%) Control: 52/136 (38%) Follow-up Group 1 vs Control OR = 1.08 P = 0.80 Group 2 vs Control OR =0.68 P = 0.33 Group 1 vs Group 2 OR = 1.58 P = 0.23 Overall test of significance P > 0.10 (NS) Pneumococcal Not targeted.	The majority of high-risk patients identified by the electronic patient registry failed to seek influenza in response to reminder letters, even when immunization was free. Immunizations proportions in the intervention groups were not significantly different from the control group. There is no evidence of a “dose response” to two sequential reminders. Patients with appointments were more likely to receive immunization than patients seen on a walk-in basis or during “health fairs”.	20
Moran et al. 1996 (281)	Design: CCT Group allocation: Experimental study, with patients randomly allocated to treatment and control groups.	Number of patients: 797 Group 1 Number of patients: 198 Female/male: 128/70 Age (mean(sd)): 65 (15.9) Group 2 Number of patients: 198	Number of sites: 1 adult medicine service at an urban community health center Site affiliation: Private community delivery system, university/teaching	Mailed education brochure vs lottery-type patient incentive vs mailed education brochure and lottery-type patient incentive vs usual care Intervention aim: Improve vaccination rates QI agent: Medical clinic	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment	Influenza Baseline* Group 1: 25/79 (32%) Group 2: 38/82 (46%) Group 3: 27/70 (39%) Control: 37/97 (38%) Follow-up All patients	The odds of immunization for patients in the group mailed the educational brochure were almost twice as great as those of control patients, while the odds of immunization for those mailed the lottery incentive were approximately one and one half times as great.	23

	Follow-up period: 3 months	Female/male: 129/69 Age (mean(sd)): 65 (17.2) Group 3 Number of patients: 199 Female/male: 133/66 Age (mean(sd)): 68 (15.2) Control group Number of patients: 202 Female/male: 134/68 Age (mean(sd)): 66 (16.6) Eligibility criteria: Ambulatory patients, aged 65 years or older, or patients with chronic diseases; seen within the preceding 5 months. Pneumococcal vaccination outcomes measure among all patients regardless of previous vaccination status.	Number of practices or physicians: 9 physicians Location: United States (Massachusetts)	Group 1 Patient education / reminders: Educational brochures were mailed to patients. Brochure content emphasized the seriousness of influenza, provided information about important decision factors, and contained information about where and when the vaccination could be obtained. Group 2 Financial incentive – patients: A lottery notice was sent to patients, informing them that patients receiving immunization would be eligible to win one of three grocery store gift certificates. Group 3 Patient education / reminders *and* patient financial incentives, as above. Control group Usual care	and control groups Pneumococcal Not targeted.	Group 1: 71/198 (36%) Group 2: 57/198 (29%) Group 3:52/199 (26%) Control: 41/202 (20%) Diabetic patients Group 1: 11/28 (39%) Group 2: 11/24 (45%) Group 3: 5/17 (29%) Control: 9/25 (36%) Follow-up All patients** Group 1 OR = 2.29, P = 0.0004 Group 2 OR = 1.68, P = 0.0308 Group 3 OR = 1.41, P = 0.1527 Patients with known previous vaccination history*** Group 1 OR = 3.95, P<0.001 Group 2 OR = 1.59, P = 0.2113 Group 3 OR = 1.56, P = 0.2460 Pneumococcal Not targeted. *, *, *** - See next column for notes.	Surprisingly, patients in the group mailed both interventions were less likely to be immunized than those in the single intervention groups. Additionally, patients expressed reservations and suspicion about the incentive. An adverse interaction between incentive and education based interventions may be at play. The marginal cost effectiveness of the educational brochure was less than $4 per additional immunization over those in the control group. * Previous vaccination history available only for a smaller subset of patients. ** Adjusted for age, pulmonary disease, and diabetes. *** Adjusted for previous vaccination history and history of alcoholism.	
Morrissey et al. 1995 (282)	Design: RCT Group allocation: Patients were randomly allocated to treatment and control groups. Follow-up period: 2 years	Number of patients: 1914 Group 1 Number of patients: 954 Female/male: 589/365 Age (>/= 75): 379 Control group Number of patients: 960 Female/male: 581/379 Age (>/= 75): 383 Eligibility criteria: Active	Number of sites: 10 primary care practices, 3 of which were audited for vaccination outcomes.* Site affiliation: University, private community delivery system, private practices Number of practices or physicians: 19 physicians practiced at the 3 audit	Financial and office systems intervention vs usual care Intervention aim: Improve preventive care QI agent: Medicare / HCFA Group 1 Financial incentive – clinicians: Physicians received an annual capitated payment from HCFA of $53 for a preventive care visit, and $47 for a	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Influenza Baseline Group 1: 48% Control: 45% Follow-up Group 1: 72% Control: 52% Follow-up OR = 2.37 P < 0.001	A financial and office system intervention improved the proportion of patients receiving preventive care.	23

		patients at a study site (i.e.: received medical service in the previous 2 years), aged 65 years or older. Patients were enrolled in Medicare Part A and Part B coverage, were community living, and were not enrolled in an HMO.	sites Location: United States (North Carolina) * Sites included academic and community practices staffed by general internists and family physicians.	health promotion counseling visit. The preventive care package included influenza vaccination, FOBT, and depression screening, among other services. The health promotion package featured nurse counseling in a variety of health and wellness areas. Financial incentive – patients: Services under the capitated packages were provided free of charge to patients. Clinician reminders: Practices were prompted monthly by the research team to schedule special prevention appointments for patients who were "due" for preventive services. Team change: Nurses carried out most of the preventive care procedures, including vaccinations. Control group Usual care.	Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Pneumococcal Baseline Group 1: 33% Control: 29% Follow-up* Group 1: 80% Control: 35% Follow-up * OR = 7.43 P < 0.001 * This value may include previously vaccinated patients.		
Mullooly et al. (1987) (283)	Design: CCT Group allocation: Experimental study with patient randomly allocated to treatment and control groups. Follow-up period: 8 months	Number of patients: 2217 Group 1 Number of patients: 1105 Female/male: 531/574 Age (mean(sd)): Not reported Control group Number of patients: 1112 Female/male: 586/526 Age (mean(sd)): Not reported Eligibility criteria: Patients aged 65 or older, discharged from hospital with chronic disease. Exclusion: None reported	Number of sites: 1 large HMO Site affiliation: Private MCO Number of practices or physicians: Not reported Location: United States (numerous states in the Northwest region)	Mailed patient reminder letters vs usual care Intervention aim: Improve vaccination rates QI agent: Private MCO Group 1 Patient education / reminders: Patients received a personalized letter stressing the importance of influenza vaccination for high-risk elderly individuals who had been hospitalized during the past year. Control group Usual care	Influenza Proportion of eligible patients receiving vaccination Risk difference between treatment and control groups Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up Group 1: 430/1105 (39%) Control: 335/1112 (30%) Follow-up Diff: 8.9% 95% CI = [4.9, 12.7] Follow-up OR = 1.48 Pneumococcal Not targeted.	A single mailed cue increased the vaccination among high-risk elderly by 28 percent. However, the majority of patients were not vaccinated.	21
Nexoe et al. 1997 (284)	Design: CCT Group allocation:	Number of patients: 585 Age and gender distribution not reported	Number of sites: 13 general practices Site affiliation: Private	Mailed patient reminder cards and free vaccination vs mailed patient reminder cards and patient-pay vaccinations vs usual care	Influenza Proportion of eligible patients receiving vaccination	Influenza Follow-up Group 1: 140/195 (72%) Group 2: 95/195 (49%)	"Spontaneous" influenza vaccination rates were low in the studied high-risk population. Postal invitations improved the	21

	Experimental study with patients randomly allocated to treatment and control groups. Follow-up period: Approximately 3.5 months	Group 1 Number of patients: 195 Group 1 Number of patients: 195 Control group Number of patients: 195 Eligibility criteria: Patients aged 65 years or older, or patients with a chronic disease. Patient group may have included nursing home residents, number not reported.	practices Number of practices or physicians: As above. Location: Denmark	Intervention aim: Improve vaccination rates QI agent: Medical practices Group 1 Patient education / reminders: Mailed reminders were sent to patients inviting them to receiving influenza vaccination. Reminders were personalized with the patient's name and the GP's signature. Patient financial incentive: Influenza vaccination provided for free. Group 2 Patient education / reminders as above, except *without* patient financial incentive – patients paid the usual GP vaccination fee of US $40-60. Control group Usual care – no patient reminders. Patients paid US $40-60 for each vaccination.	Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Control: 48/195 (25%) Follow-up Group 1 OR = 7.80 P < 0.001 Group 2 OR = 2.91 P < 0.001 Pneumococcal Not targeted.	rates, and full reimbursement improved the rates further.	
Nichol et al. 1990 (285)	Design: Cluster PCS Group allocation: A Veterans Affairs Medical Center (VAMC) implementing the intervention was compared to similar VAMCs during the study period. Follow-up period: 1 year	Number of patients: 1375 (Number of patients responding to the outcome survey out of 1893 sampled. Survey responders enumerated below.) Group 1 Number of patients: 378 Age (mean(sd)): 60.2 (27.2) Control group Number of patients: 997 Age (mean(sd)): Mean age ranged from 56.4 to 59.1 at the 3 comparison sites. Eligibility criteria: Patients on the study site outpatient rosters. All patients, regardless of high-risk status, were targeted for	Number of sites: 4 VA medical centers* Site affiliation: University, Veterans Affairs Number of practices or physicians: Not reported. Location: United States (Midwestern region) * 1 VAMC comprised the intervention site. The other 3 VAMCs comprised the concurrent comparison sites.	Multifactoral intervention with nurse-led vaccination clinics vs usual care Intervention aim: Improve vaccination rates QI agent: Medical center Group 1 Team change: Nurses gave influenza vaccinations to outpatients without a signed physician's order. Nurses were asked to offer vaccination to *all* patients regardless of risk status. In addition to staffing a vaccination station during regular clinic hours, nurses held a 2-week walk-in vaccination clinic. Clinician reminders: Nurses were reminded to offer patients influenza	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment	Influenza Follow-up … … among patients aged 65 years or older Group 1: 108/176 (61%) Control: 132/377 (35%) … Among patients with diabetes Group 1: 28/45 (62%) Control: 41/129 (31%) … Among any patient with a "high risk" indication for vaccination Group 1: 28/45 (62.2%) Control: 41/129 (31.8%) Follow-up … … Among patients aged 65	A multifactoral intervention centered around expanded roles for clinic nurses in promoting vaccinations improved vaccination rates compared to comparison clinics that had implemented little or no programs to improve vaccinations. Study investigators decided not to direct interventions toward physicians due to perceived ceiling effects related to physician receptivity. A large proportion of vaccinated patients received their vaccinations at an outside community site (36% in the intervention group vs 46% in the control sites, p = 0.05).	17

		vaccination at the intervention site. Analyses were stratified by vaccination indication.		vaccination by stamps placed on progress notes by clinic clerks. Patient education / reminders: All outpatients received a letter encouraging them to receive influenza vaccination if they fell into a high risk category. The letter advertised the dates, hours, and locations of the nurse-led walk-in vaccination clinic. <u>Control group</u> Usual care, with publicity provided through clinic posters and waiting room materials. At one control site, a brief reminder was mailed to select high-risk outpatients, and an influenza vaccination clinic was held for patients with appointments several hours each day.	and control groups <u>Pneumococcal</u> Not targeted.	years or older OR = 2.95* P < 0.005 … Among patients with diabetes OR = 3.55* P < 0.005 … Among any patient with a "high risk" indication for vaccination ORs ranged from 3.05 to 3.52 depending on the comparison site. Comparisons were reported as statistically significant, with p < 0.00001. <u>Pneumococcal</u> Not targeted.		
Nowalk et al. 2010 (286)	Design: Cluster-RCT Group allocation: Experimental study with employers randomly allocated to treatment and control groups Follow-up period: Unclear (approximately 4 months)	Number of patients: 12222 <u>Group 1</u> Number of patients: 3757 Female/male: 39.2% (18.6%)* Age (proportion of employees aged 18-49): 72.7% (12.2%)* <u>Group 2</u> Number of patients: 4387 Female/male: 49.8% (17.6%)* Age (proportion of employees aged 18-49): 75.1% (12.4%)* <u>Control group</u> Number of patients: 4078 Female/male: 39.4% (18.1%)* Age (proportion of employees aged 18-49): 75.1% (11.0%)* <u>Eligibility criteria:</u> Employer sites were those having previously hosted a vaccination clinic, delivered by a single third-party health care services consultant, in which	Number of sites: 54 employers * Site affiliation: Employers in non-health related sectors, with a previous relationship to a particular health care services contract organization Number of practices or physicians: Not reported. Location: United States (Various states) * 18 employer sites in each group.	<u>Workplace vaccination clinics with "Choice" sites offering intra-nasal live-attenuated vaccine (LAV) vs "Choice-plus" sites offering LAV with increased employee outreach and $5 financial incentives vs usual care with trivalent vaccine (TIV)</u> Intervention aim: Improve vaccination rates QI agent: Employers <u>Group 1: "Choice" sites with intra-nasal LAV</u> Patient education / reminders: Implemented an e-mail/voicemail script, and disseminated posters and fliers that clearly stated the availability of both trivalent vaccine and live attenuated (intra-nasal) vaccine. Delivery site change: Worksite seasonal influenza vaccination clinics targeting employees aged 18-49. <u>Group 2: "Choice-plus" sites with intra-</u>	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Employees aged 18-49 Baseline Group 1: 38.6% Group 2: 36.4% Control: 34.8% Follow-up – 4 months Group 1: 40.9% Group 2: 46.1% Control: 38.5% Employees aged 50+ Baseline Group 1: 47.9% Group 2: 49.3% Group 3: 48.1% Follow-up – 4 months Group 1: 57.2% Group 2: 70.4% Control: 54.5% Follow-up – 4 months* All ages Group 1 vs control OR = 1.05 (95% CI [0.70,	An incentive for vaccination, an intensified advertising campaign, and offering a choice of influenza vaccines improved vaccination rates in the workplace and may be used across a variety of non-healthcare business types and sizes.	26

		less than 5% of the influenza vaccine previously given was of the intranasal form. Those eligible to receive vaccine were workers aged 18-49 (live-attenuated vaccine) or workers of any age. Exclusions: Employer sites unable to provide data on number of employees and influenza vaccinations from the previous season, employers in the health care sector, sites at which the baseline vaccination rate. * Mean proportion per employer (sd).		nasal LAV, increased employee outreach, and a small financial incentive. Patient education / reminders: As for group 1, except with increased numbers of fliers and E-mails according to a standardized plan. Financial incentives – patients: All vaccinated employees received a $5 gift card. Delivery site change: As in Group 1. Control group: Regular worksite immunization clinic, with LAV only for those patients specifically requesting it. Patient education / reminders: Regular promotional materials, without LAV-specific advertising. Deliver site change: As in Group 1.	 Pneumococcal Not targeted.	1.57]), p = 0.808. Group 2 vs control OR = 1.40 (95% CI [1.02, 1.94]), p = 0.041. Pneumococcal Not targeted. * ORs reported from hierarchical logistic regression, adjusted for employee gender and age; and employer intervention compliance and other characteristics, including vaccination rate during the previous year.		
Nuttall et al. 2003 (287)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period: 11 months	Number of patients: 90 Age and gender distributions not reported. Group 1 Number of patients: 30 Age (% >/= 72 years) = 50%* Group 2 Number of patients: 30 Age (% >/= 72 years) = 50%* Control group Number of patients: 30 Age (% >/= 72 years) = 50%* Eligibility criteria: Patients aged 65-90 years in a single GP practice, who had failed to attend the practice for influenza vaccination the previous year. Confused patients, and patients with egg allergy were excluded.	Number of sites: 1 GP practice Site affiliation: Private practice Number of practices or physicians: Not reported Location: United Kingdom (East Lancashire)	Mailed reminder letters vs patient reminder letters and educational leaflets vs patient reminder letters and home visits from a vaccination advocate Intervention aim: Improve vaccination rates QI agent: Medical clinic Group 1 Patient education/ reminders: Patients received a letter from the East Lancashire Health Authority inviting them to attend their GP practice for influenza vaccination. Patients also received a leaflet entitled “Flu Jab – Beat Flu, Use a Jab”, published by the UK Department of Health. Group 2 Patient education / reminders: Patients received a reminder letter, as above. Patients also received a visit from a	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Follow-up Group 1: 7/30 (23%) Group 2: 12/30 (40%) Control: 8/30 (27%) Overall test of significance P = 0.329 Follow-up Group 1 OR = 0.84 P = 1.00 Group 2 OR = 1.83 P = 0.61 Pneumococcal Not targeted.	The three modalities (reminder only, reminder and education, reminder and visit) are not different in their effect on influenza vaccination rates. An analysis of patients within age strata (aged <72 years, aged >/= 72 years) was performed. Uptake appeared higher in patients aged >/= 72 years who received a personal visit (Group 3) vs patients receiving a reminder letter only or a reminder letter and a leaflet (Groups 1 and 2). However, this finding was not statistically significant.	22

		* Randomization was stratified on age <72 years and >/= 72 years.		researcher. At patient visits, facts taken from the "Flu Jab – Beat Flu, Use a Jab" leaflet were provided in a one-on-one basis. Control group Patient education / reminders: Patients received a letter from the East Lancashire Health Authority inviting them to attend their GP practice for influenza vaccination.				
Ohmit et al. 1995 (288)	Design: Cluster RCT Group allocation: Experimental study with seven Michigan state counties randomly allocated to treatment and control groups. Follow-up period: 2 years	Number of patients: 4211* Group 1 Not reported Control group Not reported Eligibility criteria: The intervention was targeted to patients aged 65 years or older. Effectiveness of the intervention was measured in a study sample consisting of patients presenting to hospital with pneumonia and a matched set of 2 community subjects per pneumonia patient. * Number of patient responding to the outcomes survey. Response rates were 75 to 84%. Intervention and control group breakdowns not reported. Patients were sampled from pneumonia hospitalization, and community subjects matched to hospitalized patients on age.	Site description: Study was run with the cooperation of the Michigan state Department of Health Site affiliation: Government, Medicare Number of sites: 7 counties in Michigan* Number of practices or physicians: Not reported Location: Unites States (Michigan) * Sites were randomly allocated to treatment (4 counties) or control (3 counties) groups.	Clinician education, patient reminder, mass media campaign, and vaccination clinic outreach vs usual care Intervention aim: Improve vaccination rates QI agent: State Department of Health Group 1 Clinician education: Physicians were supplied with education al materials about the importance of providing vaccine to high-risk patients. Patient education / reminders: Post cards were sent to patients, reminding them to make appointments for their influenza vaccinations. A promotional letter was sent to Medicare beneficiaries. Mass media campaigns were also organized. Delivery site changes: Immunization clinics were organized in shopping malls and other locations in which elderly subjects lived or congregated. Control group Usual care.	Influenza Odds ratio of receiving vaccination associated with living in an intervention region Pneumococcal Not targeted.	Influenza Follow-up – 1990-91 Patients from the community OR = 2.02 P<0.001* Patients previously hospitalized for pneumonia OR = 1.28 P<0.165* Follow-up – 1991-92 Patients from the community OR = 1.87 P<0.001* Patients previously hospitalized for pneumonia OR = 2.06 P<0.001* Pneumococcal Not targeted.	The community intervention program had a significant and important impact on increasing the likelihood of immunization among elderly persons living in the targeted area.	18
Puech et al. 1998 (289)	Design: RCT Group allocation: Experimental	Number of patients: 325 Group 1 Number of patients: 154 Female/male: 96/58	Number of sites: 1 three-partner bulk billing general practice Site affiliation: Private	Mailed patient reminder postcard vs usual care Intervention aim: Improve vaccination rates	Influenza Proportion of eligible patients receiving vaccination	Influenza Baseline Males Group 1: 22/58 (38%) Control: 29/67 (43%)	After adjusting for baseline vaccination status, the postcard reminder significantly increased influenza vaccination rates in men but not in women.	24

	study, with patients randomly allocated to treatment and control groups. Follow-up period: 8 months	Age (mean(sd)): Not reported Control group Number of patients: 171 Female/male: 104/67 Age (mean(sd)): Not reported Eligibility criteria: Patients aged 65 years or older at a single general practice. Patients had attended the practice at least 3 times, and at least once in the previous 2 years. Nursing home patients; and patients who had already received influenza vaccination, were allergic to egg, were previously known to decline vaccination, had severe or terminal illness, dementia or unstable psychiatric conditions were excluded.	practice Number of practices or physicians: 1 (as above) Location: Australia (New South Wales)	QI agent: Medical clinic Group 1 Patient education / reminders: Patients were mailed a postcard encouraging them to attend the practice for an influenza vaccination. The text stressed the seriousness of influenza as opposed to the effectiveness and safety of the vaccination, and provided availability and const information. Control group Usual care	Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Females Group 1: 28/96 (29%) Control: 36/104 (35%) Follow-up Males Group 1: 37/58 (64%) Control: 31/67 (46%) Females Group 1: 47/96 (49%) Control: 46/104 (44%) Follow-up Males OR = 3.0* P = 0.01 Females OR = 1.5* P = 0.24 Pneumococcal Not targeted. * See next column, at right.	The reason for the sex-linked difference in intervention-attributable vaccination rates is not clear. * Odd ratios adjusted for baseline vaccination status by logistic regression.	
Quinley et al. 2004 (290)	Design: Cluster RCT Group allocation: Experimental study with medical practices allocated to treatment and control groups. Follow-up period: 1 year	Number of patients: Not reported Group 1 Number of patients: Not reported Control group Number of patients: Not reported Eligibility criteria: Medicare patients aged 65 years or older seen by the physician for at least one outpatient visit during 1999. Physicians had a cumulative pneumococcal vaccination rate of 40% or lower, and were either "high-volume" (>/= 200 Medicare patients in 1999) or	Number of sites: The state designated Medicare quality improvement organization conducted a large scale QI project. Site affiliation: Government, Medicare Number of practices or physicians: 950 medical practices*, with 1118 physicians** Location: United States (New York) * Medical practices were	Audit and feedback toolkit with telephone GP outreach vs audit and feedback toolkit alone Intervention aim: Improve vaccination rates QI agent: Medicare quality improvement organization Group 1 Audit and feedback: Physicians received a mailing describing the proportion of the physician's pneumococcal vaccine-eligible patient panel receiving vaccination. A list of eligible patients was also provided. Practices also received a package with chart reminder stickers and patient educational materials, however, less than 50% of practices chose to deploy these	Influenza Not targeted. Pneumococcal * Proportion of eligible patients receiving vaccination Change from baseline performance, treated as a	Influenza Not targeted. Pneumococcal * Baseline AA practices Group 1: 19% Control: 18% HV practices with baseline vaccination rate >30% Group 1: 36% Control: 35% HV practices with baseline vaccination rate <30% Group 1: 21% Control: 21% Follow-up AA practices	The use of a simple telephone reminder to physician practices was able to significantly increase pneumococcal immunization rates among physicians receiving Medicare claims based feedback on their performance. However, this conclusion is borne out by the analysis *only* for low-performing high-volume practices.	23

		"African-American servicing" (>/= 30 Medicare-enrolled African American patients, comprising >/= 20% of the physician's Medicare panel). Exclusions: Managed care plan enrollment.	allocated to treatment and control, stratified by high volume practices (HV) and African-American servicing practices (AA), as below: Tx Control AA 118 100 HV 582 150 ** Includes physicians in a non-randomized arm, results of which are not reproduced here.	interventions. CQI (or similar): The quality improvement organization telephoned clinicians receiving the mailed intervention package to confirm receipt of the mailings, determine the practice's own opinion regarding practice improvement, and discuss potential methods for improving performance. <u>Control group</u> Audit and feedback, as above.	continuous outcome for each practice Proportion of physician practices improving >5% from baseline * Outcomes for the HV practices without stratification by baseline performance are available as well. Numerous outcomes were tested, few were significant.	Group 1: +4.45% Control: +2.36% P = 0.068 HV practices with baseline vaccination rate >30% Group 1: +2.51% Control: +2.55% P = 0.943 HV practices with baseline vaccination rate <30% Group 1: +3.86% Control: +2.21% P = 0.007 Follow-up AA practices Group 1: 33.9% Control: 22.0% P = 0.052 HV practices with baseline vaccination rate >30% Group 1: 25.0% Control: 21.8% P = 0.554 HV practices with baseline vaccination rate <30% Group 1: 29.0% Control: 11.1% P = 0.002 * See previous column notes.		
Satterthwaite et al. 1997 (291)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period: Unclear.	Number of patients: 2791 Age and gender not reported. <u>Group 1</u> Number of patients: 931 <u>Group 2</u> Number of patients: 930 <u>Control group</u> Number of patients: 930	Site description: General practices Site affiliation: Private practices Number of sites: 16 general practices Number of practices or physicians: See above.	<u>Personalized patient reminder letters vs patient reminder letters with free vaccinations vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical clinics <u>Group 1</u> Patient education / reminders: A personalized invitation was sent to	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Follow-up Group 1: 247/931 (27%) Group 2: 422/930 (45%) Control: 159/930 (17%) Follow-up Group 1 OR = 1.75 P < 0.001 Group 2:	In Australia, patients, or their private insurers, typically pay $20 for influenza vaccination. The study provides evidence that: - General practitioners should be recommended to routinely invite patients aged 65 years or more to have a flu vaccine. - At the level of the Ministry of Health,	21

		Eligibility criteria: Patients aged 65 years or more, attending a participating general practitioner.	Location: New Zealand (Auckland)	eligible patients recommending that they visit their general practitioner to receive a flu vaccination. Group 2 Patient education / reminders: As above. Financial incentives – patients: Patients received the flu vaccination from their general practitioner at no cost. Control group Usual care	Pneumococcal Not targeted.	OR = 4.02 P < 0.001 Pneumococcal Not targeted.	serious consideration should be given to making the vaccine available at no cost to this age group.	
Schensul et al. 2009 (292)	Design: Cluster-CBA Group allocation: Public housing buildings were allocated to treatment and control arms by study investigators. Follow-up period: 7 months	Number of patients: 180 Group 1 Number of patients: 107 Female/male: 35%/65% Age (mean(sd)): 57 Control group Number of patients: 73 Female/male: 44%/56% Age (mean(sd)): 62 Eligibility criteria Resident of one of the study sites – i.e.: public housing residents aged 62 years or older, or younger individuals with disabilities. Residents were excluded if they were under 18 years of age, under conservatorship, unable to understand or answer questions in English or Spanish, or initiation of building residency after the first flu campaign. * The number of tenants exposed to the intervention is not reported. A serial cross sectional design was employed, with survey data on 180 tenants at baseline, and 189 tenants at 4 months. Numbers of survey	Number of sites: Two public housing buildings home to low-income, ethnically diverse seniors, as well as younger disabled adults* Site affiliation: State/municipal public housing Number of practices or physicians: Not applicable Location: United States (Connecticut) *1 intervention building, 1 control building.	Community engagement for improving influenza vaccination vs no intervention Intervention aim: Improve vaccination rates QI agent: Tenants of the public housing building, with help from study researchers and a stakeholder advisory body Group 1 Community engagement: The Vaccinate for Influenza Prevention (VIP) Committee was composed of 9 building residents. Researchers facilitated an engagement process, which empowered VIP Committee members to promote building-wide pro-vaccination culture and practices. The VIP committee was supported by an advisory board of collaborating agencies. The goal of the multi-layered engagement strategy was to carry out a vaccination campaign and improve vaccination rates among building residents. Delivery site change: Vaccination clinics for tenants were held in the building. Patient education / reminders: Posters and flyers were produced. A 3-hour long Flu Fair was held, involving Q & A	Influenza Proportion of eligible patients receiving vaccination Change in proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Baseline Group 1: 36/107 (30%) Control: Not reported Follow-up Group 1: 73/103 (71%) Control: Not reported Follow-up Group 1: +41% Control: +18% P = 0.10* Follow-up OR = 2.90** P = 0.022 Pneumococcal Not targeted. * Method of testing the difference between increases in intervention and control buildings unclear. ** From the logistic regression coefficient for intervention building status, adjusting for initial vaccination rates, patient age, income, and beliefs about the flu.	The VIP project embodied a multi-level approach that engaged older low income African American and Latino adults, enabling them to integrate their own knowledge with scientific knowledge about influenza and vaccination, and to convey their understandings through creative campaigns with and for their peers. This intervention significantly increased levels of pro-vaccination knowledge, beliefs, and norms, and resulted in improved vaccination rates. Due to the emphasis on capacity building and multi-level engagement, the intervention appears to have been sustained with little ongoing support from the research team.	20

		responders at baseline are reported here.		sessions with influenza/vaccine experts, flu related games, a film screening, and testimony by VIP Committee members. The Flu Fair followed the philosophy of fostering a "constructivist dialogue for informed decision-making". Control group No intervention				
Shah et al. 2006 (293)	Design: Cluster PCS Group allocation: Observational study with geographic regions served by two emergency medical services agencies allocated to treatment and control groups. Follow-up period: 2 weeks	Number of patients: 401 Group 1 Number of patients: 149 Female/male: 80/69 Age (mean(sd)): 79 (sd not reported) Control group Number of patients: 96 Female/male: 56/40 Age (mean(sd)): 77 (sd not reported) Eligibility criteria: Patients aged 65 years or older, residing in one of the study counties, cared for by one of the study EMS agencies. Exclusion: Non-English speakers, previously included in the study, institutionalized. * 401 eligible patients entered into the study. Results are reported only for 247 patients completing a follow-up survey.	Number of sites: 2 Regional emergency medical services (EMS) agencies Site affiliation: Site affiliation: Government/ public sector Number of practices or physicians: Not reported. Location: United States (New York)	EMS preventive screening program for elderly patients vs usual care Intervention aim: Improve elder care QI agent: Regional EMS agency Group 1 Team change: EMTs screened community-dwelling patients aged 65 years or older during emergency responses to evaluate the risk of falling, need for pneumococcal vaccination, and need for influenza vaccination. Patient education: EMTs provided patients with influenza and pneumococcal vaccination informational materials produced by the CDC after screening for eligibility. Clinician reminders: The emergency medical services agency notified patients' primary care physicians if patients had screened positive on any item. Control group Usual care	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Influenza Baseline Group 1: 29/45 (64%) Control: 18/33 (55%) Follow-up Group 1: 4/16 (25%) Control: 5/15 (33%) Follow-up OR = 0.67 P = 0.70* Pneumococcal Baseline Group 1: 102/149 (68%) Control: 63/96 (66%) Follow-up Group 1: 10/47 (21%) Control: 1/33 (3%) Follow-up OR = 8.65 P = 0.02 * Reported in this study as P = 1.0. The P-value was recalculated by one reviewer using Fisher's exact test.	This program resulted in statistically and clinically significant greater pneumococcal vaccination rates than in the control group, although no differences were observed in influenza vaccination rates. Additionally, a high rate of EMS screening demonstrated the feasibility of an EMS preventive screening program for older adults.	21
Shenson et al. 2001 (294)	Design: Cluster PCS Group allocation: Observation study	Number of patients: 24033 Age and gender distributions not reported Group 1	Number of sites: 1 community engaged action-research initiative, led by a community steering committee.	Community-organized social media campaign vs usual care Intervention aim: Improve vaccination rates	Influenza Not targeted. Pneumococcal Proportion of eligible patients	Influenza Not targeted. Pneumococcal Baseline	It is possible to significantly increase the use of pneumococcal immunizations by linking their delivery to community-based flu clinics and by developing a	16

	with geographic regions allocated to treatment and control. Follow-up period: 1 year	Number of patients: 5541* <u>Control group</u> Number of patients: 18492* <u>Eligibility criteria:</u> Medicare beneficiaries aged 65 years or older. Pneumococcal vaccination was provided to patients with no previous history of vaccination. * At post-intervention cross-sectional measurement.	Site affiliation: Community non-profit organizations, government, private or academic practices Number of practices or physicians: Not reported Location: United States (New York)	QI agent: Community steering committee <u>Group 1</u> Community engagement: The intervention and research was directed by a steering committee comprised of the department of health representatives, care providers, consumers, the county chapter of the AARP, and a local church representatives. Patient education / reminders: A mailed letter signed by the county health commissioner and a well-known physician urged elders to obtain an annual flu shot and pneumococcal vaccination. A list of local organizations endorsing the initiative was printed on the sidebar of the letter. Content focused on the availability of the flu shot in the community setting. Additionally, a mass media campaign was organized. This consisted of a call-in radio show, paid television and radio advertisements, and press kits. <u>Control group</u> Usual care, likely subject to routine New York state vaccination outreach.	receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Group 1: 421/5542 (8%) Control: 1220/18492 (7%) Follow-up Group 1: 833/5111 (16%) Control: 2116/17342 (12%) Follow-up OR = 1.40 P < 0.001* * Not reported in original study. Calculated by present reviewers.	broad-based outreach campaign to market the benefits and availability of adult immunizations. Researchers observed a shift in immunizations from private medical clinics to local department of health vaccination clinics in intervention regions. Control regions experienced a shift in the opposite direction.	
Siebers et al. 1985 (295)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period: 1 year	Number of patients: 243* <u>Group 1</u> Number of patients: 163* Age and sex distribution not reported. <u>Control group</u> Number of patients: 80* Age and sex distribution not reported <u>Eligibility criteria:</u> Patients aged 65 years or older. Patients with missing charts, recorded refusal of vaccination,	Number of sites: 1 academic general internal medicine clinic Site affiliation: University Number of practices or physicians: Not reported Location: United States (Wisconsin)	<u>Patient reminder letters vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical clinic <u>Group 1</u> Patient education / reminders: Each patient received a letter encouraging pneumococcal vaccination. Clinician education: A didactic seminar on the pneumococcal vaccine was presented to clinic staff.	<u>Influenza</u> Not targeted. <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Not targeted. <u>Pneumococcal</u> Follow-up Group 1: 20/72 (28%) Control: 3/39 (8%) Follow-up OR = 4.62 P < 0.05	Sending letters to patients produces significant improvement in the pneumococcal vaccination rate.	19

		or contraindications to vaccination were excluded. * Sample at randomization included patients with previous pneumococcal vaccinations. Only the subgroup of patients without previous vaccination was analyzed.		Control group Usual care.				
Siriwardena et al. 2002 (296)	Design: Cluster RCT Group allocation: Experimental study with random allocation of general practices to treatment and control groups. Follow-up period: 6 months	Number of patients: Total number of patients not reported (6207 patients with cardiovascular disease, 4327 patients with diabetes, 169 patients with splenectomy, and 27580 patients aged 65 years or older; Categories may not be mutually exclusive) Group 1 Age (>65): 16.1% Female/male: Not reported. Control group Age (>65): 15.9% Female/male: Not reported. Eligibility criteria: Patients aged 65 years or older, or patients with diabetes, cardiovascular disease, or splenectomy.	Site description: General practices involved in participating practice networks Site affiliation: Private practices Number of sites: 2 (1 Primary Care Trust and 1 Collaborative Research Network) Number of practices or physicians: 30* Location: United Kingdom (West Lincolnshire and Trent) * GP practices were allocated to treatment (15 practices) and control (15 practices) groups. Practice-level covariates provided. Significant differences were detected in number of dispensing practices; differences in number of partners and list size seem apparent, despite statistical non-significance.	Practice care team education outreach visit with discussion of barriers and solutions vs usual care with baseline performance feedback Intervention aim: Improve vaccination rates QI agent: Medical clinics Group 1 CQI or similar: Practice care teams received education and feedback of practice vaccination rates to the practice team, followed by a discussion about current practice policy and potential solutions. Clinician education: A GP provided evidence-based information, framed around a dialogue about perceived barriers to vaccination within the organization, to the practice-care team. Patient education / reminders: Poster campaigns, waiting room brochures, and reminder/recall were implemented by some practices. Clinician reminders: Vaccination prompts and chart templates were implemented by some practices. Audit and feedback: All study providers received baseline information about their vaccination rates after the educational session. Control group	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment	Influenza Baseline Patents aged >/= 65 Group 1: 48.6% Control: 44.7% Diabetic patients Group 1: 58.9% Control: 58.2% Cardiovascular disease patients Group 1: 58.0% Control: 59.4% Splenectomy patients Group 1: 64.5% Control: 55.1% Follow-up Patents aged >/= 65 Group 1: 69.3% Control: 70.1% Diabetic patients Group 1: 74.4% Control: 70.2% Cardiovascular disease patients Group 1: 76.1% Control: 72.5% Splenectomy patients Group 1: 80.6% Control: 58.0% Follow-up Patents aged >/= 65	An educational outreach to primary care teams, addressing areas relevant to practice and using audit, feedback, and discussion of barriers to change and how to overcome these, improved pneumococcal vaccination rates in coronary and diabetic patients in this trial. The study did not demonstrate an improvement in influenza vaccination rates.	26

				Audit and feedback, as above.	and control groups*	OR = 0.99, P = 0.42 Diabetic patients OR = 1.07, P = 0.08 Cardiovascular disease patients OR = 1.06, P = 0.09 Splenectomy patients OR = 1.22, P = 0.38		
					<u>Pneumococcal</u> Proportion of eligible patients receiving vaccination	<u>Pneumococcal</u> Baseline Diabetic patients Group 1: 43.3% Control: 40.6% Cardiovascular disease patients Treatment: 30.6% Control: 33.2% Splenectomy patients Treatment: 79.0% Control: 86.0% Follow-up Diabetic patients Treatment: 58.8% Control: 47.4% Cardiovascular disease patients Treatment: 44.8% Control: 39.7% Splenectomy patients Treatment: 85.5% Control: 90.7%		
					Odds ratio of receiving vaccination between treatment and control groups* * Odds ratios adjusted for	Follow-up Diabetic patients OR = 1.18, P<0.001 Cardiovascular disease patients OR = 1.23, P<0.001		

					baseline vaccination status and clustering within practices.	Splenectomy patients OR = 0.96, P=0.83		
Smith et al. 1999 (297)	Design: RCT Group allocation: Experimental study with patients randomly allocated to treatment or control groups. Follow-up period: 3 months	Number of patients: 9011 <u>Group 1</u> Number of patients: 4508* Female/male: 2759/2749 Age (mean(sd)): 75.5 (sd not reported) <u>Control group</u> Number of patients: 4503* Female/male: 2787/1716 Age (mean(sd)): 75.4 (sd not reported) <u>Eligibility criteria:</u> Medicare beneficiaries aged 65 years or older, without evidence of having died, had billed a Medicare service in the previous year, and were not members of an HMO. <u>Exclusion</u>: * Outcomes survey returned by 3454 and 3487 intervention and control group patients, respectively.	Number of sites: 1 medical care foundation working with the HCFA conducted the trial was conducted in ten Indiana counties. Site affiliation: Government, Medicare, non-profit foundation Number of practices or physicians: Not reported Location: United States (Indiana)	<u>Mailed patient educational letters vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Non-profit foundation working with state Medicare authorities <u>Group 1</u> Patient education / reminders: Patients were sent a reminder letter adapted from the Health Belief Model. The letter also contained signatures from the principal investigator, the state health commissioner, and the medical director of Medicare for Indiana. An additional page of information about influenza and vaccination summarized from CDC materials was appended. <u>Control group</u> Usual care.	<u>Influenza</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups <u>Pneumococcal</u> Not targeted.	<u>Influenza</u> Follow-up * Group 1: 67.4% Control: 64.2% Follow-up OR = 1.22** 95% CI: [1.09, 1.37] OR = 1.20*** 95% CI: [1.06, 1.35] <u>Pneumococcal</u> Not targeted. * Approximately 25% patients did not respond to the outcomes survey. Outcomes for non-responders were imputed from outcomes from further telephone follow-up of randomly selected non-responders. **, *** Notes: See next column.	Both intervention and control groups achieved high immunization rates (>60%). Mailed reminders increased influenza immunization rates significantly. Those with heart disease and lung disease obtain immunization at higher rates than others in the >65 age group. ** Based on Medicare claims data (9011 patients), adjusting for age, county density, gender, and age-gender interaction. *** Based on survey data (6941 patients), adjusted for age, gender, comorbidities, age-gender interaction, density of county	22
Solberg et al. 2000 (298)	Design: Cluster RCT Group allocation: Experimental study with medical clinics randomly allocated to treatment and control groups. Follow-up period: 20 months	Number of patients: 7997 (6830 available for analysis, enumerated below.) <u>Group 1</u> Number of patients: 3379 Female/male: 2311/1068 Age (mean(sd)): 48.4 (1.3) <u>Control group</u> Number of patients: 3451 Female/male: 2371/1080 Age (mean(sd)): 48.6 (2.3) <u>Eligibility criteria:</u> Clinics were required to be part of a medical group contracting with one of the study HMOs.	Number of sites: 2 large HMOs Site affiliation: Private MCOs, private practices Number of practices or physicians: 44 clinics* Location: United States (Minnesota) * Clinics were randomly allocated to treatment (22 clinics, 6.7 +/- 4.2 adult primary care physicians	<u>Continuous quality improvement facilitation vs usual care</u> Intervention aim: Improve preventive care QI agent: HMO <u>Group 1</u> Continuous Quality Improvement (or similar): Each clinic's team leader/facilitator was provided with an initial 6 hour conference overview of CQI methods and systems, followed by six workshops over six months. Clinic leaders were taught a seven-step cycle – identify the problem, collect data, analyze the data to understand root	<u>Influenza</u> Proportion of eligible patients receiving vaccination <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination Change in proportion of eligible	<u>Influenza</u> Baseline Group 1: 62.1% Control: 62.5% Follow-up Results not reported. <u>Pneumococcal</u> Baseline Group 1: 30.3% Control: 28.6% Follow-up Group 1: 48% Control: 29% Follow-up*	Pneumococcal vaccination rates improved more in CQI than in control clinics. However, the intervention was generally considered a failure, since improvements were not different between groups for the other preventive health services targeted. This may have been due to ceiling effects or a-typicality of clinics. More likely, the CQI approach may have been ineffective. Process evaluations showed that teams did not complete or repeat the improvement cycle, were slow to	23

		Patients were randomly selected from all those visiting participating clinics during the baseline and follow-up data collection periods. Patients > 64 years of age were targeted for influenza/pneumococcal vaccine.	each (mean +/- sd)) and control (22 clinics, 8.7 +/- 6.1 adult primary care physicians each) groups.	problems, develop solutions, generate recommendations, implement recommendations, and evaluate the process. Additionally, teams were provided with evidence for a systems approach to improving preventive services. Systems that teams could chose from included clinician reminders and team change – however the particular QI tactics deployed were not reported. Control group Usual care.	patients receiving vaccination	Group 1: +17.2% Control: +0.3% P = 0.003 * Adjusted for clustering.	implement changes, and usually implemented incomplete changes.	
Spaulding et al. 1991 (299)	Design: RCT Group allocation: Experimental study with patients allocated randomly to treatment or control groups. Follow-up period: 6 months	Number of patients: 1068 Group 1 Number of patients: 519 Female/male: 257/262 Age (>64): 116 (22%) Control group Number of patients: 549 Female/male: 238/311 Age (>64): 108 (20%) Eligibility criteria: Patients aged 65 or older, or patients with chronic disease, army personnel.	Number of sites: 1 department of family practice, at an army medical center Site affiliation: Military Number of practices or physicians: Not reported Location: United States (Washington)	Patient postcard reminders vs usual care Intervention aim: Improve vaccination rates QI agent: Department of Family Practice Group 1 Patient education / reminders: Patients were mailed a reminder postcard advising them that their physician had determined that they were at high risk of complications should they catch the "flu". Control group Usual care.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination	Influenza Follow-up Group 1: 131/519 (25%) Control: 50/549 (9.1%) Follow-up OR = 3.37 P < 0.001 Pneumococcal Not targeted.	The use of a reminder postcard was associated with higher influenza immunization rates. Vaccination rates were generally low. Enlisted (vs officer) rank and an age of 40 years or less were risk factors for not getting vaccinated.	23
Tang et al. 1999 (300)	Design: PCS Group allocation: Observational study with physicians allocated to treatment or control groups by personal choice. Follow-up period: 1 year	Number of patients: 347 to 629 from year to year. Age and gender distribution not reported. Group 1 Number of patients: 182 – 314 from year to year. Control group Number of patients: 165 – 315 from year to year. Eligibility criteria: Patients aged 65 years of over with a non-acute visit to the	Number of sites: 1 large university internal medicine clinic Site affiliation: University Number of practices or physicians: 23 physicians* Location: United States (Illinois)	Clinician reminders and EMR vs usual care with paper based records Intervention aim: Improve vaccination rates QI agent: General medicine clinic Group 1 Other: EMR implemented between the 1996-1997 reporting periods Clinician reminders: A pop-up window reminding physicians to provide influenza vaccinations appears when	Influenza Proportion of eligible visits resolved by guideline-concordant physician action	Influenza 1995 Group 1: 40% Control: 28% 1996 Group 1: 39% Control: 29% 1997 Group 1: 61%* Control: 37%* 1998 Group 1: 68%**	Both the introduction of an EMR and the subsequent introduction of an EMR-based clinician reminder system were associated with increases in physician compliance with influenza vaccination recommendations. Immunization rates in a group of physicians using paper based patient records with no reminder system fluctuated, but ultimately was not changed at study's end.	18

		study clinic during influenza season. Patients vaccinated in September, before influenza season began, were excluded.	* Physicians self-allocated to treatment (13 physicians) or control groups (10 physicians).	each eligible patient's EMR is opened. Reminders were implemented between the 1997-1998 reporting period. Control group Usual care with paper based records	Pneumococcal Not targeted.	Control: 31%*** Pneumococcal Not targeted. * , **, and *** notes: See next column. All findings unadjusted for potential unit of analysis effects.	* Significant increase compared to 1996 results, p=0.001 for the intervention group, p = 0.02 for the control group. ** Significant increase compared to 1997 results, p=0.02 for the intervention group. *** Non-significant compared with 1995 control group outcome, p=0.18	
Tape et al. 1993 (301)	Design: Cluster CBA Group allocation: Experimental study with block-alternating allocation of resident physicians to treatment or control groups. Follow-up period: 1 year	Number of patients: 384 Group 1 Number of patients: 212 Control group Number of patients: 172 Eligibility criteria: Practice patients eligible for influenza or pneumococcal vaccination – aged 65 years and older or history of diabetes, chronic respiratory, or heart disease. Patients were also eligible for pneumococcal vaccination if they were immuno-compromised, and were not eligible if there was a record of previous vaccination.	Number of sites: 1 academic internal medicine outpatient clinic Site affiliation: University Number of practices or physicians: 4 attending physicians-practices supervising numerous resident physicians Location: United States (Nebraska)	Computer-generated clinician reminders vs generic reminder sheets Intervention aim: Improve preventive care QI agent: Physician practices Group 1 Clinician reminders: Patient-specific clinician reminder page automatically generated from the EMR provided to physicians at each visit. Control group Clinician reminders: A generic reminder sheet was placed in each patient chart. No EMR was available.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination at 1 year Odds ratio of receiving vaccination between treatment and control groups	Influenza Follow-up Group 1: 62/212 (29%) Control: 37/172 (22%) Follow-up OR = 1.51 P = 0.05 Pneumococcal Follow-up Group 1: 35/310 (11%) Control: 13/274 (5%) Follow-up OR = 2.56 P = 0.003	Physicians using an EMR including preventive care reminders were more likely to recommend preventive care measures. However, compliance with preventive recommendations was generally low. The attending physician and level of training of the resident physician affected preventive care.	20
Terrell-Perica et al. 2001 (302)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period: 3 months	Number of patients: 6528 Female/male: 2872/3656 Age (median):65 Group-specific age and gender distributions not reported. Group 1 Number of patients: 2213 Group 2 Number of patients: 2171 Control group Number of patients: 2144 Eligibility criteria:	Number of sites: State-wide intervention delivered by the state health department. Site affiliation: Government / Medicare Number of practices or physicians: Not reported Location: United States (Hawaii)	Influenza vaccination reminder letters vs reminder letters for pneumococcal as well as influenza vaccinations vs usual care Intervention aim: Improve vaccination rates QI agent: State Health Department Group 1 – Influenza reminder Patient education / reminders: One-page influenza vaccination reminder letters were written on State of Hawaii Department of Health letterhead and signed by the state epidemiologist.	Influenza Proportion of eligible patients receiving vaccination Risk difference between treatment and control groups	Influenza Follow-up Group 1: 438/2213 (20%) Group 2: 454/2171 (21%) Control: 367/2144 (17%) Overall test of significance P = 0.03 Follow-up Group 1 Diff: 2.7% P = 0.023 Group 2 Diff: 3.8%	Mailing reminder letters for influenza or influenza and pneumococcal vaccination to new no-managed-care Medicare beneficiaries residing in Hawaii had a modest, but significant impact on improving influenza and pneumococcal vaccination levels. The addition of the pneumococcal reminder did not appear to detract from the influenza message in the combined reminder letter.	23

		Medicare beneficiaries newly enrolled during an 11 month period of time. Exclusions: Receipt of influenza and/or pneumococcal vaccination the year before the intervention.		Content consisted of simple bullets emphasizing that "Medicare covers FLU shots!" All patients were additionally exposed to routine State of Hawaii Department of Health promotional activities for influenza vaccination, including a mass media campaign. Delivery site change: Immunization clinics were held at pharmacies and retail stores. Clinician education: Pneumococcal education kits produced by the National Institute on Aging were mailed to physicians. Group 2 – Influenza and pneumococcal reminder Delivery site change, clinician education, and patient education / reminders, as above, except reminder letters also covered pneumococcal vaccinations. Control group Delivery site change, clinician education, and patient education / reminders, as above, except without reminder letters.	Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination Risk difference between study groups Odds ratio of receiving vaccination between treatment and control groups	P = 0.017 Follow-up Group 1 OR = 1.19 P = 0.02 Group 2 OR = 1.28 P = 0.002 Pneumococcal Follow-up Group 1: 60/2213 (3%) Group 2: 146/2171 (7%) Control: 68/2144 (3.2%) Overall test of significance P < 0.001 Follow-up Group 2 vs control Diff: 3.5% P < 0.001 Group 2 vs group 1 Diff: 4.0% P < 0.001 Follow-up Group 1 OR = 0.85 P > 0.05 Group 2 OR = 2.20 P < 0.001		
Thomas et al. 2003 (303)	Design: CCT Group allocation: Experimental study with patients allocated to treatment and control group by sequential order.	Number of patients: 558 Group 1 Number of patients: 189 Female/male: 144/45 Age (mean(sd)): 63.4 (12.7) Group 2 Number of patients: 187 Female/male: 140/47 Age (mean(sd)): 61.9 (12.7)	Number of sites: 1 Medical clinic of a large inner-city hospital serving a majority black population Site affiliation: University Number of practices or physicians: 17 primary care providers	Culturally tailored video modeling patient-physician communication about vaccination and vaccination educational brochure vs culturally tailored video only vs usual care Intervention aim: Improve vaccination rates QI agent: Medical clinic Group 1	Influenza Not targeted. Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment	Influenza Not targeted. Pneumococcal Follow-up Group 1: 44/189 (23%) Group 2: 19/187 (10%) Control: 12/182 (7%) Follow-up Group 1	Exposure to patient education tools represents an effective mechanism for increasing pneumococcal vaccination rates. A brief (<3 minutes), culturally appropriate videotape along with a low-literacy brochure about the pneumococcal vaccine increased vaccination rates more than threefold over the control group.	23

	Follow-up period: Unclear.	Control group Number of patients: 182 Female/male: 119/63 Age (mean(sd)): 63.3 (12.9) Eligibility criteria: Patients aged 65 years or older, or patients with heart disease, lung disease, or diabetes. Patients were eligible if they had not been previously vaccinated. Exclusions: Deafness; blindness; language barriers; dementia; and walk-in visits, first time visits, and medication refill visits in which patients did not see a primary care provider.	Location: United States (Georgia)	Patient education / reminders: Patients watched a 3 minute video tape featuring 3 black patients and 1 black physician modeling the desired behavior of a patient and a physician discussing the pneumococcal vaccine. Patients also received a low-literacy brochure providing minimal information about the vaccine, and prompting patients to ask their physicians about the pneumonia shot. Group 2 Patient education / reminders, as above, except without the brochure. Control Usual care.	and control groups	OR = 4.30 P < 0.001 Group 2 OR = 1.60 P = 0.26	However, while exposure to the videotape alone resulted in a significant increase in patient-physician discussion about vaccination, no significant increase in vaccination rates was observed. The videotape intervention did not appear to be effective on its own.	
Tierney et al. 1986 (304)	Design: Cluster RCT Group allocation: Experimental study with randomized allocation of physicians to treatment and control groups. Follow-up period: 7 months	Number of patients: 6045 Group 3 Number of patients: 1487 Group 2 Number of patients: 1606 Group 1 Number of patients: 1451 Control group Number of patients: 1501 Eligibility criteria: Patients attending an urban general medicine clinic. Pneumococcal vaccination was indicated for patients with chronic disease or alcohol abuse.	Number of sites: 1 general medicine clinic at an urban teaching hospital Site affiliation: University Number of practices or physicians: 135* Location: United States (Indiana) * Physicians were allocated to groups 1 (33 physicians), 2 (36 physicians), 3 (31 physicians), and control (35 physicians)	Clinician reminders and delayed feedback vs clinician reminders vs delayed feedback vs usual care Intervention aim: Improve preventive care QI agent: Medical clinic Group 3 Audit and feedback: Each month, the computer searched the EMRs of patients who had recently visited a study physician, generated reports for those who had an indication for, but did not receive, one or more preventive care actions. A report was generated requiring a physician response for each patient. Clinician reminders: Immediate preventive care reminders were given to physicians at the time of patient encounters. Group 2	Influenza Not targeted. Pneumococcal Proportion of eligible patients receiving vaccination, taken as a continuous performances score for each physician. Odds ratio of receiving vaccination between treatment and control groups	Influenza Not targeted. Pneumococcal Follow-up Group 3: 32% Group 2: 35% Group 1: 19% Control: 5% Follow-up Group 3 OR = 8.94 P < 0.001 No other test results reported.	Both immediate (clinician reminders) and delayed (audit and feedback) information identifying patients eligible for preventive care protocols can improve physician compliance with preventive care recommendations. Immediate reminders presented at the time of patient visits have a greater effect that delayed performance reports. No additive effect between the two interventions was observed. This may be because audit and feedback drilled down to the level of individual patients, and physicians often chose to generate a reminder for the next patient visit as a result of audit and feedback; or because audit and feedback may have occurred after physicians had already reviewed a patient reminder to provide preventive care. In both	19

				Clinician reminders, as above. <u>Group 1</u> Audit and feedback, as above. <u>Control group</u> Usual care.			cases, audit and feedback may not have generated new information.	
Tierney et al. 2003 (305)	Design: Cluster-RCT Group allocation: Half-day physician clinic "sessions" were randomly allocated to intervention groups. Follow-up period: 12 months	Number of patients: 870 <u>Group 1</u> Number of patients: 197 Female/male: 61%/39% Age (mean(sd)): 61(12) <u>Group 2</u> Number of patients: 158 Female/male: 68%/32% Age (mean(sd)): 57 (12) <u>Group 3</u> Number of patients: 170 Female/male: 65%/35% Age (mean(sd)): 60 (11) <u>Control</u> Number of patients: 181 Female/male: 66%/34% Age (mean(sd)): 60 (!3) <u>Eligibility criteria:</u> Eligible patients had heart failure or ischemic heart disease. Heart failure patients were included if they had objective evidence of left ventricular dysfunction. Ischemic heart disease patients were included if they had a diagnosis of CAD, angina, or MI; definitive diagnostic testing; or more than 2 prescriptions for long-acting nitrates.	Number of sites: 1 academic primary care center with 4 ambulatory clinic sites Site affiliation: University Number of practices or physicians: 32 half-day physician "sessions"* Location: United States (Indiana) * Physician sessions were comprised of faculty and residents assigned to provide outpatient care to a specified panel of patients during a specific half-day. Sessions were randomly split into two groups. The pharmacist intervention was then randomly allocated to half of the physicians in each group.	<u>Automated cardiac care reminders vs pharmacist-triggered cardiac care reminders vs both vs usual care</u> Intervention aim: Improve heart disease care QI agent: Medical clinics <u>Group 1</u> Clinician reminders: Evidence based recommendations were programmed into a locally developed decision support system. Physicians were exposed to this system via computer workstations that all physicians use to write outpatient orders. Recommendations were individualized based on data from patients' electronic medical record. <u>Group 2</u> Team change: The decision support system displayed heart care recommendations to study pharmacists when patients attended the outpatient pharmacy to receive medications. Pharmacists were free to fill the prescription as usual, discuss the suggestions with the patient, or remind the ordering physician by telephone or automated E-mail. <u>Group 3</u> Clinician reminders and team change, as above. <u>Control</u>	<u>Influenza</u> Not targeted. <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination. This value was treated as a continuous outcome score for each physician in hypothesis testing. Odds ratio of receiving vaccination between treatment and control groups (Crude values calculated by present reviewers)	<u>Influenza</u> Not targeted. <u>Pneumococcal</u> Follow-up Group 1: 10/104 (10%) Group 2: 7/82 (9%) Group 3: 7/87 (8%) Control: 1/82 (1%) Overall P = 0.09 (ANOVA) Follow-up Group 1 OR = 8.62, p = 0.02 Group 2 OR = 7.56, p = 0.06 Group 3 OR = 7.09, p = 0.07	The intervention had no measurable effect on either adherence to the evidence-based guidelines or any clinical or subjective patient outcome. The authors suggest that resident physicians may have "rebelled" at the notion of computer-guided patient management. Additionally, pressing the "escape" key could circumvent the reminders provided by the computer system. Reminders requiring mandatory acknowledgement may prove more successful.	24

				Usual care.				
Tierney et al. 2005 (306)	Design: Cluster-RCT Group allocation: Half-day physician clinic "sessions" were randomly allocated to two groups. Intervention pharmacists were also randomly allocated to half of the patients in each group, producing four randomly allocated assignments. Follow-up period: 12 months	Number of patients: 706 Group 1 Number of patients: 194 Female/male: 77%/23% Age (mean(sd)): 50 (14) Group 2 Number of patients: 161 Female/male: 68%/32% Age (mean(sd)): 51 (14) Group 3 Number of patients: 182 Female/male: 71%/29% Age (mean(sd)): 51 (14) Control Number of patients: 169 Female/male: 71%/29% Age (mean(sd)): 52 (13) Eligibility criteria: Patients were 18 years old; had attended a study clinic in the previous year; and had a diagnosis of asthma or COPD, emphysema as recorded on diagnostic imaging, or two more prescriptions for inhaled beta-agonists, corticosteroids, ipratorpium, cromolyn, or oral beta-agonists or theophylline.	Number of sites: 1 academic primary care center Site affiliation: University Number of practices or physicians: 32 half-day clinic sessions* at 4 ambulatory care locations. Location: United States (Indiana) * Each half-day clinic session was comprised of a set of faculty and resident physicians caring for a defined panel of patients.	Computer-generated care suggestions vs pharmacist-triggered care reminders vs both vs usual care Intervention aim: Improve care of chronic respiratory disease QI agent: Medical clinic Group 1 Clinician reminders: Evidence based recommendations were programmed into a locally developed decision support system. Physicians were exposed to this system via computer workstations that all physicians use to write outpatient orders, and on the bottom of the medication list in patients' paper charts. Recommendations were individualized based on data from patients' electronic medical record. Group 2 Team change: The decision support system displayed heart care recommendations to study pharmacists when patients attended the outpatient pharmacy to receive medications. Pharmacists were free to fill the prescription as usual, discuss the suggestions with the patient, or remind the ordering physician by telephone or automated E-mail. Group 3 Clinician reminders and team change as above. Control Usual care.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups (crude estimates calculated by present reviewers) Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups (crude estimates calculated by present reviewers)	Influenza Follow-up Group 1: 37/92 (40%) Group 2: 34/80 (43%) Group 3: 37/100 (37%) Control: 36/85 (42%) Text reports no significant differences.* Follow-up Group 1 OR = 0.92, p = 0.88 Group 2 OR = 1.01, p = 1.00 Group 3 OR = 0.80, p = 0.55 Pneumococcal Group 1: 7/89 (8%) Group 2: 6/76 (8%) Group 3: 15/95 (16%) Control: 7/78 (9%) Text reports no significant differences.* Follow-up Group 1 OR = 0.87, p = 1.00 Group 2 OR = 0.87, p = 1.00 Group 3 OR = 1.90, p = 0.25 * Tested by regression adjusting for physician-level clustering effects, no results provided.	The intervention had no consistent effect on either adherence to the evidence-based guidelines or any clinical or subjective patient outcome. The authors suggest that physicians may have been unwilling to accept computer advice regarding managing chronic illnesses. Indeed, physicians and pharmacists were able to avoid seeing the intervention reminders by pressing the "escape" key, which may have become routine practice.	22
Turner et al. 1990 (307)	Design: Cluster RCT	Number of patients: 423 Group 1	Number of sites: 1 general medicine clinic at an academic department of	Patient-held preventive care reminder card and clinician reminder prompts vs clinician reminder prompts only	Influenza Proportion of eligible patients receiving vaccination	Influenza Follow-up Group 1: 59/132 (47%)	A patient-held reminder card improved the performance of influenza vaccinations, physician	21

	Group allocation: Experimental study with randomized allocation of medical residents to treatment and control groups. Foll0w-up period: 9 months	Number of patients: 177 Age (>64): 65 Female/male: 112/65 Control group Number of patients: 246 Age (>64): 76 Female/male: 170/76 Eligibility criteria: Adult patients aged over 65, or younger patients with chronic disease. Patients with previous pneumococcal vaccination were excluded from pneumococcal vaccination rates.	medicine Site affiliation: University Number of practices or physicians: 24* Location: United States (North Carolina) * Physicians randomly allocated to treatment (12 medical residents) and control (12 medical residents) groups.	Intervention aim: Improve preventive care QI agent: Academic internal medicine clinic Group 1 Patient education/reminders: Wallet sized preventive care cards were given to patients. Patients were told to present the card to their physicians at each visit. Clinician reminders: Computer generated patient-specific preventive care reminder sheets were generated and attached to each patient's visit chart. Control group Clinician reminders, as above.	Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Control: 51/177 (29%) Follow-up OR = 2.00 P = 0.002 Pneumococcal Follow-up Group 1: 19/86 (22%) Control: 29/118 (24%) Follow-up OR = 0.870 P = 0.34	breast examinations, rectal examinations, fecal occult blood tests, and Pap smears; but not mammography or pneumococcal vaccinations.	
Turner et al. 1994 (308)	Design: Cluster RCT Group allocation: Experimental study with randomized allocation of physicians to treatment and control groups. Follow-up period: 8 months	Number of patients: 44 practices enrolled* Group 1 Number of practices: 15 ** Control group Number of practices: 22 ** Eligibility criteria: All adult patients in each practice. Influenza vaccinations were provided for patients >65 years or younger if suffering from a chronic disease. *Outcomes measured for cross sections of ten patients per practice before and after intervention. ** Number of practices remaining at follow-up reported.	Number of sites: 44 private medical practices Site affiliation: Private practices Number of practices or physicians: 44 Location: United States (North Carolina)	Generic clinician reminders sheet VS patient–held reminder card Intervention aim: Improve preventive care QI agent: Physician practices Group 1 Clinician reminder: A computer was used to generate generic preventive care prompt sheets which were fixed to patient charts. Control group Patient education / reminder: Patients received a wallet-sized card with preventive health service prompts. Patients were instructed to carry the cards with them and show them to their physician at each visit.	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Influenza Baseline Group 1: 17% Control: 20% 1 year Group 1: 24% Control: 26% 1 year OR = 1.11 p = 0.51 Pneumococcal Not targeted.	The results of the intervention were mixed, and in most cases small. Computer prompts increased performance of all preventive measures over time. The card group increased performance of influenza vaccination and mammography, but not other targeted measures.	19
Walter et al., 2008 (309)	Design: RCT / Cluster-CBA Patients in 15	Number of patients: 8912 Female/male: 5649/3236 Age (>65): 1071 (12%)*	Number of practices or physicians: 15 academic primary care practices	Postcard reminder with a safety statement and practice-level QI initiative vs regular postcard reminder and practice-level QI initiative vs post care	Influenza – Postcard with asthma-specific safety message vs regular postcard (RCT)	Influenza – Comparison of patient reminder postcards	Influenza vaccine coverage rates among asthmatic patients were not significantly affected by either adding a safety message to	18

	primary care practices were randomly allocated to postcard groups. Within randomized postcard groups, practices were allocated by researchers to "practice QI" or "no QI" groups. Follow-up period: 2 years	Group 1, 2, 3, and 4 Number of patients: Not reported. Eligibility criteria: Asthmatic patients. * This study included children. 3% of patients were aged 2 or younger, and 85% of patients were aged 3 to 65.	Site affiliation: University Number of sites: 1 university health system Location: United States (North Carolina) Description: Primary care practices, including internal medicine, family medicine, and pediatric clinics, belonging to a university health system.	reminder with a safety statement and no other QI initiative vs regular postcard reminder and no other QI initiative. QI agent: Primary care clinics Intervention aim: Improve vaccination rates Group 1 Patient education / reminders: A postcard reminder about influenza vaccination was mailed to patients. The postcard contained a safety statement, saying that a recent national study by the American Lung Association demonstrated that influenza vaccination did not worsen asthma symptoms. Continuous quality improvement (or similar): Practice staff attended small group meeting examining previous influenza vaccination performance and potential quality improvement strategies. Practices selected one or more strategies from a list of eight options. Practices implemented patient education (6/8 practices), mail or phone reminders (3 practices), expanded access (1 practice), and chart reminders (1 practice). Group 2 Patient education / reminders: A postcard reminder without a special safety message was mailed to patients. Continuous quality improvement (or similar): As above, for Group 1. Group 3 Patient education / reminders: A postcard reminder about influenza vaccination was mailed to patients. The postcard contained a safety statement for asthmatic patients. Group 4	Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Influenza – QI practices vs practices without QI initiatives other than patient reminder postcards (CBA) Change in practice vaccination proportions taken as continuous performance scores, influenza season 1 to influenza season 2 (mean change (sd)) Pneumococcal Not targeted.	Follow-up season 1 – Patient survey findings* Groups 1 and 3: 78% Groups 2 and 4: 77% Follow-up season 1 – Administrative database findings Groups 1 and 3: 22% Groups 2 and 4: 23% Follow-up season 2 – Patient survey findings* Groups 1 and 3: 76% Groups 2 and 4: 78% Follow-up season 2 – Administrative database findings Groups 1 and 3: 27% Groups 2 and 4: 26% Follow-up season 2 OR = 1.08 ** p = 0.17 95% CI = [0.97, 1.19] Influenza – QI intervention analysis Follow-up season 2 Groups 1 and 2: +4.5% (3.8%) Groups 3 and 4: +4.0% (4.6%) P = 0.55 Pneumococcal Not targeted. * Survey response rate was 26%. ** Estimate adjusted for age, health insurance, ethnicity, and gender by logistic regression.	the regular postcard reminder or by practice improvement interventions evaluated in the study. This study demonstrated that results are sensitive to the method of measuring receipt of vaccination. Analyses of primary care charts or clinical databases may underestimate results, since over 40% of those who received vaccine reported receiving vaccination at a place other than the primary care provider's office when surveyed by mail or by a computer survey of asthmatic patients attending the office.	

				Patient education / reminders: A postcard reminder without a special safety message was mailed to patients.				
Warner et al. 2004 (310)	Design: Cluster-CBA Group allocation: Experimental study with medical sites allocated to treatment and control sites by unreported means. Follow-up period: 1 year	Number of patients: 191* Age and gender distributions not reported. <u>Group 1</u> Number of patients: 93* <u>Control group</u> Number of patients: 98* <u>Eligibility criteria:</u> Patients aged 65 years or older who presented for a scheduled medical visit. Vaccinations were provided to consenting patients who had never been previously vaccinated. * variable between baseline, 6 month, and 1 year measurements. 1 year chart review numbers reported.	Number of sites: 2 hospital-based ambulatory family medical clinics Site affiliation: University Number of practices or physicians: Not reported Location: United States (Florida) * Care sites were allocated to treatment (1 site) and control (1 site).	<u>Clinician vaccination prompts affixed to patient charts vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical clinics <u>Group 1</u> Clinician education: An educational session covering the variety of illnesses associated with pneumococcal infection, the use of pneumococcal vaccination, and current recommendations for care was provided to staff. Clinician reminders: Reminders stickers were affixed to the chart of eligible patient-visits. A blue dot was placed on charts of patients for whom vaccination was given, had already been obtained, or declined. Reminder stickers were affixed by medical records staff. <u>Control group</u> Clinician education: An educational session covering the variety of illnesses associated with pneumococcal infection, the use of pneumococcal vaccination, and current recommendations for care was provided to staff.	<u>Influenza</u> Not targeted. <u>Pneumococcal</u> Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	<u>Influenza</u> Not targeted. <u>Pneumococcal</u> Baseline Group 1: 56% Control: 46% Follow-up – 6 months Group 1: 95/112 (85%) Control: 75/115 (65%) Follow-up – 12 months Group 1: 71/93 (76%) Control: 57/98 (58%) Follow-up– 6 months OR = 2.98 P < 0.005 Follow-up – 12 months OR = 2.32 P = 0.05	The simple and inexpensive method of placing selective reminders in charts for elderly patients was highly effective in increasing the pneumococcal vaccination rate.	18
Weaver et al. 2003 (311)	Design: Cluster CBA Group allocation: Study investigators allocated medical centers to treatment and control groups so that between-group	Number of patients: 2284 <u>Group 1</u> Number of patients: 962 Female/male: 32/930 Age (mean(sd)): 57.1 (sd not reported) <u>Control group</u> Number of patients: 1322	Number of sites: 8 VA spinal cord injury centers* Site affiliation: Veteran's Affairs Number of practices or physicians: Not reported Location: United States	<u>Patient education mailings, provider education, and clinical champions vs usual care</u> Intervention aim: Improve vaccination rates QI agent: Medical center <u>Intervention group</u>	<u>Influenza</u> Proportion of eligible patients receiving vaccination	<u>Influenza</u> Baseline Group 1: 6.3% to 20.7% from site to site. Control: 5.3% to 25.3% from site to site Follow-up* Group 1: 396/654 (61%) Control: 538/992 (54%)	This pilot study demonstrated significantly higher vaccination rates for patients receiving care at the intervention site.	18

	differences in site characteristics would be minimized Follow-up period: 5 months	Female/male: 30/1292 Age (mean(sd)): 54.6 (sd not reported) Eligibility criteria: Veterans with spinal cord injury (i.e.: those who received care at the study sites within 2 years prior to the study.)	(Multiple states) * Sites were allocated to treatment (4 SCI centers) and control (4 SCI centers) groups.	Patient education / reminders: Reminder letters and education fliers were mailed to veterans. The fliers emphasized the high risk of respiratory complications among individuals with spinal cord injury, and common misconceptions. The letter encouraged veterans to be vaccinated at any location,. Bright reminder posters were posted in clinic spaces. Clinician education: Posters were posted in clinic spaces. Letters of endorsement from the Paralyzed Veterans of America and the VA Spinal Cord Injury and Disease Strategic Healthcare Group were sent, along with literature on vaccination effectiveness and importance, to intervention providers. CQI (or similar): Clinical champions were selected among interested health care personnel. These champions included spinal cord injury chiefs, nurse managers, and spinal cord injury physicians with an interest in vaccination. Investigators worked with champions, via regular conference calls, to resolve problems as vaccination barriers were identified. Control characteristics: Usual care. One intervention site and two comparison sites report also having nurse standing orders for vaccination during the study period.	Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Not targeted.	Follow-up OR = 1.30 P = 0.01 Pneumococcal Not targeted. * Numerators and denominators estimated by present reviewers from other study data. Additionally, intervention patients were older, and had a higher prevalence of chronic illness.		
Wilkinson et al. 2002 (312)	Design: CCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period:	Number of patients: 277 Female/male: 19/258 Group-specific gender and age distributions not reported. Group 1 Number of patients: 141 Control group Number of patients: 136	Number of sites: 1 VA health center primary care clinic Site affiliation: Veteran's Affairs Number of practices or physicians: Not reported Location: United States	Patient pre-activation with an pre-appointment guidebook vs usual care Intervention aim: Improve preventive care QI agent: Medical clinics Group 1 Patient education / reminders: Patients were mailed an appointment guidebook	Influenza Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Pneumococcal Proportion of eligible patients	Influenza Follow-up* Group 1: 48/141 (34%) Control: 25/106 (24%) Follow-up OR = 1.67 P = 0.10 Pneumococcal Follow-up*	The primary hypothesis that patients pre-activated by an appointment guidebook would perceive primary care visits as more effective than patients not receiving a guidebook was supported. However, authors applied a liberal $p < 0.10$ standard of statistical significance.	15

	Unclear	Eligibility criteria: Patients scheduled for primary are team visits at the study health clinic.	(Arizona)	with instructions prior to a scheduled routine visit with their primary care provider. The ten page guidebook included an appointment list where patients could record upcoming appointments; suggestions for getting ready for the appointment, including spaces for writing down questions and concerns; instructions for the day of the appointment, including a place to list medications; sample phrases to assist in discussing issues with the provider; suggestions for completing the visit, including important follow-up issues and health promotion topics like influenza and pneumococcal vaccination; and a notes page. Control group Patients received reminder letters.	receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Group 1: 54/141 (38%) Control: 30/106 (28%) Follow-up OR = 1.57 P = 0.10 * Results provided for patients in whom chart data was available only (106 of 136 control patients).		
Winston et al. 2007 (313)	Design: RCT Group allocation: Experimental study with patients randomly allocated to treatment and control groups. Follow-up period: 6 months	Number of patients: 6106 Chronic disease Group 1 Number of patients: 1845 Female/male: 900/945 Age (mean(sd)): 53.8 (0.3) Control group Number of patients: 1866 Female/male: 972/894 Age (mean(sd)): 53.9 (0.3) Elderly Group 1 Number of patients: 1198 Female/male: 707/491 Age (mean(sd)): 72.0 (0.2) Control group Number of patients: 1197 Female/male: 725/472 Age (mean(sd)): 71.4 (0.2) Eligibility criteria: Patients aged 65 years or over, or patients with chronic	Number of sites: 1 Large managed care network Site affiliation: Private MCO Number of practices or physicians: 5 general medicine clinics Location: United States (Georgia)	Nursing telephone patient education calls vs usual care Intervention aim: Improve vaccination rates QI agent: Managed Care Organization Group 1 Patient education / reminders: Nurses telephoned eligible patients, inquired about previous pneumococcal vaccination and vaccination beliefs, and explained the vaccination. Team change: Nurses trained in pneumococcal vaccine indications and contraindications called eligible patients. Control group Patients were exposed to the usual preventive service reminders posted in medical clinics.	Influenza Not targeted. Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups Hazard ratio of time-to-vaccination for all patients in the intervention vs control groups	Influenza Not targeted. Pneumococcal Follow-up Chronic disease patients Group 1: 288/1845 (16%) Control: 111/1866 (6%) Elderly patients Group 1: 201/1198 (17%) Control: 100/1197 (8%) Follow-up Chronic disease patients OR = 2.21 P <0.001 Elderly patients OR = 2.92 P <0.001 Follow-up HR = 2.3 95% CI = [2.0, 2.7]	Randomized telephone intervention led to a greater than 2-fold increase in pneumococcal vaccination within 6 months compared with standard care in a diverse managed care population. Despite being effective, telephone reminder programs may be insufficient to eliminate racial/ethnic disparities if baseline disparities already exist and if disparities are not specifically targeted for intervention.	25

		diseases. Eligible patients had no record of having received pneumococcal vaccination.						
Yanagihara et al. 2005 (314)	Design: PCS Group allocation: Observational studies with patients allocated by health plan to treatment and control groups Follow-up period: 2 years	Number of patients: Not reported. Group 1 Number of patients: Not reported. Control group Number of patients: Not reported. Eligibility criteria: Patients aged 65 years or older enrolled in a Medicare cost contract or fee-for-service plan.	Number of sites: 1 large HMO Site affiliation: Private MCO Number of practices or physicians: Not reported Location: United States (Hawaii)	Health plan intervention with community outreach vs usual care Intervention aim: Improve vaccination rates QI agent: Private MCO Group 1 Patient education / reminders: Newsletter articles, magazine advertisements, and public service announcements were produced. Patients received reminder letters and educational materials. Reminder postcards, and mailing labels were provided to physicians to send to their patients. Posters were distributed across the state. Delivery site changes: Community vaccination clinics were held at 25 to 35 locations throughout the state. Clinician education: Primary care providers were sent print materials highlighting the importance of influenza and pneumococcal vaccinations. Control group Usual care.	Influenza Not targeted. Pneumococcal Proportion of eligible patients receiving vaccination Odds ratio of receiving vaccination between treatment and control groups	Influenza Not targeted. Pneumococcal Baseline Group 1: 13.3% Control: Not reported Follow-up – 1 year Group 1: 34.4% Control: 24.0% Follow-up – 2 years Group 1: 42.3% Control: Not reported Follow-up – 1 year OR = 1.66 95% CI = [1.58, 1.73]	A quality improvement program that addressed barriers to vaccination through a combination of strategies, including patient and physician reminders, education, a media campaign, and arrangement for vaccine administration at local retail stores, increased both awareness of the vaccine and rates of its administration. The observed intervention effect may be confounded by method of provider remuneration. The intervention cohort consisted of patients in a cost-contract Medicare plan, while the control cohort consisted of patients in a fee-for-service Medicare plan. Remuneration did not change during the trial, and the between group OR at follow-up (OR = 1.66) was different from that at baseline (OR = 0.98, 95% CI [0.88, 0.98]).	19

Exhibit A.6. Studies included in meta-analyses

First author	Year	Citation	Group	infl	ppv	Study arm included in meta-analyses of quality improvement strategies												
						Any	Audit and feedback	Case management	Clinician education	Clinician reminders	Community engagement	CQI (or similar)	Delivery site change	Financial incentives (clinician)	Financial incentives (patient)	Patient reminders	Team change	Visit structure change
Ahmed	2004	(211)	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Ahmed	2004	(211)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ahmed	2004	(211)	3	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Apkon	2005	(212)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Armstrong	1999	(213)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthur	2002	(214)	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	0
Baker	1998	(215)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Baker	1998	(215)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Baker	1998	(215)	3	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Barnas	1989	(216)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Barton	1990	(217)	1	1	0	1	0	0	0	1	0	0	0	0	0	1	0	0
Beck	1997	(218)	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Becker	1989	(219)	1	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0
Becker	1989	(219)	2	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Belcher	1990	(220)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belcher	1990	(220)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belcher	1990	(220)	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Berg	2005	(221)	1	1	1	1	0	0	0	1	0	0	0	0	0	1	1	0
Berg	2008	(222)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Berg	2008	(222)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0
Black	1993	(223)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0
Brimberry	1988	(224)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Brimberry	1988	(224)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Buchner	1987	(225)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Buffington	1991	(226)	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0

First author	Year	Citation	Group	infl	ppv	Study arm included in meta-analyses of quality improvement strategies												
						Any	Audit and feedback	Case management	Clinician education	Clinician reminders	Community engagement	CQI (or similar)	Delivery site change	Financial incentives (clinician)	Financial incentives (patient)	Patient reminders	Team change	Visit structure change
Buffington	1991	(226)	2	1	0	1	1	0	0	0	0	0	0	0	0	1	0	0
Cardozo	1998	(1)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carter	1986	(227)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CDC	1995	(228)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Chambers	1991	(229)	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Chambers	1991	(229)	2	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Chan	2002	(230)	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Cheney	1987	(231)	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Clayton	1999	(232)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Cohen	1982	(233)	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Cowan	1992	(234)	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Dalby	2000	(235)	1	1	0	1	0	1	0	0	0	0	0	0	0	0	1	0
Demakis	2000	(236)	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Dietrich	1989	(237)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fishbein	2006	(238)	1	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0
Frank	2004	(239)	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Garcia-Aymerich	2007	(240)	1	1	1	1	0	1	0	0	0	0	0	0	0	1	1	0
Goebel	2005	(241)	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Grabenstein	1993	(242)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grabenstein	2001	(243)	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Gutschi	1998	(244)	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Gutschi	1998	(244)	2	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Harari	2008	(245)	1	1	1	1	0	0	1	1	0	0	0	0	0	1	0	0
Harris	1990	(246)	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Harris	2009	(247)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herman	1994	(248)	1	1	1	1	0	0	1	0	0	0	0	0	0	1	1	0
Herman	1994	(248)	2	1	1	1	0	0	1	0	0	0	0	0	0	1	0	0

First author	Year	Citation	Group	infl	ppv	Study arm included in meta-analyses of quality improvement strategies												
						Any	Audit and feedback	Case management	Clinician education	Clinician reminders	Community engagement	CQI (or similar)	Delivery site change	Financial incentives (clinician)	Financial incentives (patient)	Patient reminders	Team change	Visit structure change
Hermiz	2002	(249)	1	1	1	1	0	1	0	0	0	0	0	0	0	1	1	0
Hoey	1982	(2)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hogg	1998	(250)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Hogg	1998	(250)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Hull	2002	(251)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Hutchison	1989	(252)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ives	1994	(253)	1	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0
Ives	1994	(253)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jacobson	1999	(254)	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0
Jans	2000	(255)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Johnson	2003	(256)	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0
Johnson	2003	(256)	2	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0
Johnson	2003	(256)	3	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0
Johnson	2005	(257)	1	1	1	1	0	1	0	1	0	0	0	0	0	0	1	0
Karuza	1995	(258)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kellerman	2000	(259)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kerse	1999	(260)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kiefe	2001	(261)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kim	1999	(262)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0
Korn	1988	(263)	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0
Kouides	1993	(264)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kouides	1998	(265)	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Krieger	2000	(266)	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0	0
Larson	1982	(267)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Larson	1982	(267)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Larson	1982	(267)	3	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Latessa	2000	(268)	1	0	1	1	0	0	0	1	0	1	0	0	0	1	0	0

First author	Year	Citation	Group	infl	ppv	Study arm included in meta-analyses of quality improvement strategies												
						Any	Audit and feedback	Case management	Clinician education	Clinician reminders	Community engagement	CQI (or similar)	Delivery site change	Financial incentives (clinician)	Financial incentives (patient)	Patient reminders	Team change	Visit structure change
Latessa	2000	(268)	2	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0
Leirer	1989	(269)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Leirer	1989	(269)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Leirer	1989	(269)	3	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Lemelin	2001	(270)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lennox	2010	(271)	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Lennox	2010	(271)	2	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0
Lennox	2010	(271)	3	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0
Lobach	1997	(272)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lukasik	1987	(273)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maljanian	2005	(274)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Margolis	1988	(275)	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Margolis	1992	(276)	1	1	0	1	0	0	1	1	0	0	0	0	0	1	1	0
McCaul	2002	(277)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
McCaul	2002	(277)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
McCaul	2002	(277)	3	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
McCaul	2002	(277)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
McDonald	1984	(278)	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
McDowell	1986	(279)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
McDowell	1986	(279)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
McDowell	1986	(279)	3	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Moran	1992	(280)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Moran	1992	(280)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Moran	1996	(281)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Moran	1996	(281)	2	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0
Moran	1996	(281)	3	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0
Morrissey	1995	(282)	1	1	1	1	0	0	0	1	0	0	0	1	0	0	1	0

First author	Year	Citation	Group	infl	ppv	Study arm included in meta-analyses of quality improvement strategies												
						Any	Audit and feedback	Case management	Clinician education	Clinician reminders	Community engagement	CQI (or similar)	Delivery site change	Financial incentives (clinician)	Financial incentives (patient)	Patient reminders	Team change	Visit structure change
Mullooly	1987	(283)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Nexoe	1997	(284)	1	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0
Nexoe	1997	(284)	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Nichol	1990	(285)	1	1	0	1	0	0	0	1	0	0	0	0	0	1	1	0
Nowalk	2010	(286)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nowalk	2010	(286)	2	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0
Nuttall	2003	(287)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nuttall	2003	(287)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ohmit	1995	(288)	1	1	0	1	0	0	1	0	0	0	1	0	0	1	0	0
Puech	1998	(289)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Quinley	2004	(290)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Satterthwaite	1997	(315)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Satterthwaite	1997	(315)	2	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0
Schensul	2009	(316)	1	1	0	1	0	0	0	0	1	0	1	0	0	1	0	0
Shah	2006	(293)	1	1	1	1	0	0	0	1	0	0	0	0	0	1	1	0
Shenson	2001	(294)	1	0	1	1	0	0	0	0	1	0	0	0	0	1	0	0
Siebers	1985	(295)	1	0	1	1	0	0	1	0	0	0	0	0	0	1	0	0
Siriwardena	2002	(296)	1	1	1	1	0	0	1	1	0	1	0	0	0	1	0	0
Smith	1999	(297)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Solberg	2000	(298)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spaulding	1991	(299)	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Tang	1999	(300)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tape	1993	(301)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terrell-Perica	2001	(302)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terrell-Perica	2001	(302)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thomas	2003	(303)	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0

First author	Year	Citation	Group	infl	ppv	Study arm included in meta-analyses of quality improvement strategies												
						Any	Audit and feedback	Case management	Clinician education	Clinician reminders	Community engagement	CQI (or similar)	Delivery site change	Financial incentives (clinician)	Financial incentives (patient)	Patient reminders	Team change	Visit structure change
Thomas	2003	(303)	2	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0
Tierney	1986	(304)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tierney	1986	(304)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tierney	1986	(304)	3	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0
Tierney	2003	(305)	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Tierney	2003	(305)	2	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0
Tierney	2003	(305)	3	0	1	1	0	0	0	1	0	0	0	0	0	0	1	0
Tierney	2005	(306)	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Tierney	2005	(306)	2	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0
Tierney	2005	(306)	3	1	1	1	0	0	0	1	0	0	0	0	0	0	1	0
Turner	1990	(307)	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0
Turner	1994	(308)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walter	2008	(309)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walter	2008	(309)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Warner	2004	(310)	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Weaver	2003	(311)	1	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0
Wilkinson	2002	(312)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Winston	2007	(313)	1	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0
Yanagihara	2005	(314)	1	0	1	1	0	0	1	0	0	0	1	0	0	1	0	0

Infl and *PPV* are indicators for the type of vaccination (i.e.: influenza and pneumococcal, respectively) for which the study contributed to meta-analyses.

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