

Organisational interventions:: a structured review

**Organizational interventions to implement improvements in patient care:**

**a structured review of the research evidence**

Michel Wensing (1)

5 Hub Wollersheim (1)

Richard Grol (1)

(1) Centre for Quality of Care Research (WOK), Radboud University Nijmegen Medical Centre

10 Mail address: P.O. Box 9101, 6500 HB, Nijmegen, The Netherlands

Fax: ++ 31 24 3540166

Email: M.Wensing@kwazo.umcn.nl

**Word count (main text): 3303**

15 **Number of Tables: 6**

**Number of references: 44**

**Organizational changes to improve professional performance and patient outcomes: a review of systematic reviews**

20

20 **Abstract**

**Background** Changing the organization of patient care promises to contribute to improved patient outcomes as functioning of clinical teams and organizational structures are important enablers for improvement.

25

**Objective** To provide a insight into the research evidence on effects of organizational strategies to implement improvements in patient care.

**Design** Structured review of published reviews of rigorous evaluations.

30

**Data sources** To identify published reviews of studies on organizational interventions we searched in data-bases (Pubmed, Cochrane Library) and in selected journals. Reviews were included, if these were based on a systematic search, focused on rigorous evaluations of organizational changes, and were published between 1995 and 2003.

35

**Review methods** Two investigators independently extracted information from the reviews regarding their clinical focus, methodological quality and main quantitative findings. The reviews were too heterogeneous for quantitative synthesis.

40

**Results** A total of 36 reviews were included, but not all were high-quality reviews (HQR). None of the strategies produced consistent effects, but the overall picture was as follows. Professional performance were mostly improved by revision of professional roles (n=5 HQR) and computer systems for knowledge management (n=5 HQR). Patient outcomes were mostly improved by multidisciplinary teams (n=1 HQR), integrated care services (n=5 HQR), and computer systems. Cost

45 savings were reported regarding integrated care services. The benefits of quality management (n=0  
HQR) remained uncertain.

**Conclusions** There is a growing evidence base of rigorous evaluations of organizational strategies,  
but the evidence underlying some strategies is limited and the effects of neither of the strategies can  
50 be predicted with high certainty.

**Key words:** quality assurance, provider behavior change, organization of healthcare, guidelines,  
systematic reviews

## **Introduction**

55

Numerous studies have shown that at least 40% of the patients do not receive high-quality medical care <sup>1</sup>. So far, strategies to implement best evidence to improve clinical practice have been mainly targeted at improving the knowledge, attitudes and behaviors of healthcare workers <sup>2</sup>. Examples of these strategies are audit and feedback, reminder systems, educational meetings and educational outreach visits. These strategies appear to achieve a maximum of 10% absolute change of professional performance <sup>3</sup>. While this change may be clinically and economically relevant, further improvements are needed. Many patient outcomes are not only influenced by the performance of individual care providers, but also by the functioning of clinical teams for patient care and by organizational and financial structures. Context factors, such as a high burden of work and poor coordination mechanisms, can be important barriers for wide-scale and sustainable improvement <sup>4</sup>. Organizational changes could therefore provide important incentives for quality improvement. Claims on the effectiveness of organizational strategies for improving the quality of care should be based on evidence from rigorous evaluations. While a number of reviews of specific organizational strategies have been published, a broad overview of research evidence on organizational strategies is not available. This paper focuses on organizational strategies which could improve professional practice and health outcomes (box 1). Decision makers need an overview of the evidence for their organizational measures in order to choose effective interventions and avoid ineffective interventions, yet the research literature on these strategies is scattered over a large number of journals. This paper aims to provide a structured review of the research evidence from systematic literature reviews regarding a number of organizational interventions with respect to their effects on professional performance, patient outcomes and costs.

60

65

70

75

## Methods

### 80 *Data sources*

We performed searches in Pubmed (1994-2003) and the Cochrane Library (accessed in January 2004). The search strategy in Pubmed combined the MeSH terms ‘review literature’ and ‘meta-analysis’ with the MeSH term ‘healthcare quality’. The search in the Cochrane Library focused on reviews of the Cochrane Effective Practice and Organization of Care Group (EPOC). We checked  
85 references in identified papers in previous overviews of systematic reviews in this field, which were based on extensive systematic searches<sup>5-7</sup>. Authors’ personal literature collections were also examined; these were partly based on manual searching in health services research journals over the last 10 years. Only papers written in English were included. Our search was not designed to be comprehensive, but to provide a reasonably broad overview of the available research evidence.

90

### *Study selection*

Systematic reviews of organizational strategies to improve patient care were included. Organizational strategies were defined as planned re-arrangements of one or more aspects of the organization of patient care. A review was included if it reported on its search strategy, if it focused (at least partly)  
95 on rigorous evaluations of organizational strategies, and if it was published in 1995 or later. Rigorous evaluations comprised randomized trials, controlled before-and-after studies, interrupted time-series, and prospective comparative observational studies. Some reviews also included studies on non-organizational strategies or non-rigorous studies; these sections in the reviews were not used. We did not include reallocation of services from hospital to primary care settings.

100

Organisational interventions:: a structured review

*Data extraction*

A taxonomy of organizational strategies to improve patient care was developed to organize the results, which appeared to be consistent with the list of organizational interventions provided by the EPOC (box 1). Two researchers extracted information from the reviews regarding their focus, methodological quality, and main results. The number of studies reported in the table refers to the number of rigorous evaluations of organizational interventions, which may be lower than the total number of studies in the review as we focused only on rigorous studies of organizational interventions. Two authors independently assessed the methodological quality of the review, using a previously used 9-item scale <sup>7</sup>. We recorded how many items were fully positively scored (0=poor, 9=excellent) and considered a score of 7 or higher as indication for good methodological quality. The methodological quality of the review does not refer to the quality of the included studies. The summaries of the main results regarding effects on professional practice, patient outcomes and costs were based on the text in the original papers, derived from the abstract, results section or discussion section, focusing on quantitative summaries when available.

115

*Data synthesis*

It was anticipated that the data would be too heterogeneous to be combined statistically in a meta-analysis. We expressed effects in terms of average effect size (AES), standardized mean difference (SMD), weighted mean difference (WMD), adjusted odds ratio's (AOR), adjusted relative risk (ARR), median net change (MNC) or percentage studies with improvements (PSI). If a meta-analysis had been performed, we also recorded whether the effect was significant (S) or not (NS). If quantitative summary measures of effectiveness were not used, the range of effects across studies was used. If this was not available, the authors' main qualitative conclusions were copied.

125

125 **Results**

*Description of studies*

A total of 36 reviews were included <sup>8-44</sup>, of which 21 had good methodological quality. The reviews with lower scores for methodological quality had not used optimal procedures for data-extraction and  
130 data-analysis.

*Revision of professional roles*

Nine reviews focused on revision of professional roles, of which five had good methodological quality. All focused on revised roles for non-physicians.  
135 An older review identified 13 (quasi-) randomized trials which compared nurse practitioners to physicians in primary care <sup>13</sup>. It found that quality of care, resolution of pathological conditions and functional status were not affected, while number of tests ordered and patient satisfaction increased. Similar findings were reported in a more recent review <sup>19</sup>. Also, the latter review reported that nurse practitioners had longer consultations, while prescriptions, return consultations and referrals did not  
140 differ. A review that focused on the effect of specialist nurses in diabetes found that glycosylated hemoglobin was not different from usual care over a 12 month period <sup>2</sup>. Outreach nursing in patients with chronic obstructive pulmonary disease did not change patient outcomes, but it increased the use of hospital services <sup>35</sup>.

A broad review on quality improvement in hospitals identified 13 studies on improvement strategies,  
145 which comprised the component of revision of professional roles <sup>15</sup>. This component significantly contributed to improved professional performance in a meta-regression analysis. A review on adult immunization and cancer screening found 20 trials, which included a component of organizational change – mainly designation of specific prevention responsibilities to nonphysician staff <sup>37</sup>. The meta-regression analysis showed that changing roles was one of the most effective intervention components  
150 at increasing use of the clinical and preventive services (e.g. compared to educational approaches, feedback and reminding strategies).

Organisational interventions:: a structured review

A review on enlarged roles of outpatient pharmacists (15 randomized trials, one controlled trial)

showed that delivery of pharmacist services influenced the use of services, prescribing patterns, and

patient outcomes <sup>11</sup>. Effects on costs were uncertain. Mental health workers replacing primary care

155 providers did not consistently change psychotropic prescribing, consultation rates or mental health

referrals <sup>12</sup>. There was some evidence that consultation to primary care providers by mental health

workers had a direct effect on prescribing behavior when used as part of complex, multifaceted

interventions <sup>12</sup>. A review of advice given by dietitians showed that dietitians did not effect blood

cholesterol more than self-help resources <sup>39</sup>.

160 We conclude that revision of professional roles can improve professional performance, while positive

effects on patient outcomes remain uncertain. It seemed especially effective in preventive care. The

role of specialized nurses in primary care is still unresolved.

#### *Multidisciplinary teams*

165 Five papers reviewed studies on various interventions to enhance multidisciplinary collaboration, of

which one had good methodological quality <sup>44</sup>.

In a review on palliative teams four of the five randomized trials found that the co-coordinated

specialist approach resulted in similar or improved outcomes in terms of patient and family

satisfaction, anxiety, pain and symptom control <sup>18</sup>. Those studies which examined costs showed a

170 tendency to reduce hospital days and equal or lower costs.

The involvement of a primary care practitioner in a specialist team was examined in a review, which

identified seven randomized trials on programs for chronic or complex conditions <sup>28</sup>. There were

mixed effects for patient outcomes, but improved clinical performance of primary care providers,

higher patient knowledge and higher patient satisfaction. Two studies examined costs, which showed

175 mixed effects. Only two randomized trials were found in a review on interventions to promote

collaboration between nurses and doctors <sup>44</sup>. These two studies showed reduced hospital stay without

change of mortality.

The review on multidisciplinary teams for congestive heart failure patients identified two randomized trials, which showed similar or improved outcomes<sup>31</sup>. Results regarding use of hospital care were  
180 inconsistent. The review on multidisciplinary teams for rheumatoid arthritis patients comprised 15 controlled trials (nine of which were randomized)<sup>40</sup>. The six trials of inpatient teams compared with regular outpatient care showed greater improvements in disease activity and in functional status immediately after treatment, which diminished over time. Five of the six trials on outpatient teams showed improvements on various patient outcomes compared with regular outpatient care.  
185 It can be concluded that multidisciplinary teams can improve patient outcomes. They have primarily been tested in highly prevalent chronic diseases.

#### *Integrated care services*

Eight reviews focused on integrated services, of which five had good methodological quality.  
190 A review on stroke considered organized in-patient care, including both dedicated stroke units and mixed assessment/rehabilitation units. It examined 19 trials (12 randomized), which showed favorable effects of stroke care<sup>38</sup>. A second review on stroke focused on in-hospital pathways, which were described as protocols for well-organized multidisciplinary care<sup>21</sup>. It identified three randomized trials and seven other studies, which showed no differences regarding objective outcomes, but  
195 deterioration of patient reported outcomes.

A review on ambulatory patients with heart failure (11 randomized trials) found that these reduced hospitalization but not all-cause mortality<sup>25</sup>. The programs were cost saving in most studies that reported cost data. The review on secondary prevention programs in coronary heart disease (12 randomized trials) found largely the same results, although only three studies examined costs<sup>26</sup>. There  
200 were several studies which showed improved quality of life and functional status in patients from disease management groups.

A review on diabetes care showed improved glycated hemoglobin levels in both disease management (17 studies in meta-analysis) and case management (11 studies)<sup>29</sup>. The improvement was similar when case management was delivered in addition. Disease management in rheumatoid arthritis had a

Organisational interventions:: a structured review  
205 small non-significant overall effect on functional status <sup>8</sup>. Longer programs or programs with more components were not consistently more effective.

A review on case management programs in primary care (nine randomized trials) focused on comprehensive programs and various conditions, including asthma, congestive heart failure, diabetes, and geriatric conditions <sup>16</sup>. Positive impact was found on patient-centered and clinical outcomes, but  
210 not on use of resources. The review on asthma <sup>32</sup> identified only one randomized trial, which showed some improvements in health outcomes.

An extensive review of controlled trials regarding disease management in chronic illness examined the effects of interventions, used within disease management programs <sup>43</sup>. The programs included a wide variety of interventions. While the interventions themselves were not organizational, only  
215 applications in the context of organized care for chronic illness were considered. It showed that both provider directed interventions and patient intervention were associated with effects on provider adherence to guidelines and disease control.

In conclusion integrated care systems can improve patient outcomes and save costs. They have been extensively tested in highly prevalent chronic conditions.

220

### *Knowledge management*

A broad range of computerized services was examined in six reviews, of which all but one were of good methodological quality. None of the reviews had a specific disease focus.

A large review on various computerized information services identified 100 randomized trials, mainly  
225 in outpatient care settings <sup>9</sup>. Some interventions focused on providers, such as reminders and computer-assisted treatment planning, while others focused on patients, such as computer-assisted interactive education and patient reminders. Most types of interventions showed positive effects, mainly related to specific a process of care, such as diagnostic test use, preventive services, and number of drug prescriptions. Ten of the fourteen studies that reported on patient outcomes found  
230 positive effects.

A later review by partly the same authors identified 40 randomized trials of computerized knowledge management in diabetes care <sup>10</sup>. It showed that computerized prompting (9 studies) led to improved overall guideline adherence. Meta-analysis of studies using home glucose records in insulin dose adjustment (16 studies) documented a decrease in glycated hemoglobin and a decrease in blood  
235 glucose. Several computerized patient-education programs improved diet and indicators regarding metabolic control.

Computerized physician order entry and clinical decision support systems were found to have effects on medication error rates and prescribing behaviors <sup>21</sup>. The review by Walton et al <sup>42</sup> focused particularly on computerized support for determining drug dose. It identified 23 comparative studies,  
240 of which 16 were randomized trials. Seven of 11 studies on drug doses used found reductions, but the overall reduction was not significant in a meta-analysis. Six studies measured unwanted effects of drugs and four found significant reductions. Five of six studies on patient outcomes showed benefits. Only two studies considered costs and one study found cost savings, which resulted largely from reduced hospital stay.

245 A review on computerized record systems in primary care identified 61 studies, of which 39 randomized trials focused on professional performance and 11 randomized trials on patient outcomes <sup>27</sup>. Immunization rates improved in nine studies, which mainly focused on reminder systems.

Performance of preventive tasks improved. Four studies found improvements in diabetes management. A number of studies showed that computer support improved prescribing and reduced  
250 test ordering, which implied cost savings. Use of computers increased the number of patients with reduced diastolic blood pressure in three studies, but did not consistently improve outcomes of anticoagulation therapy in two other studies. Five studies showed that consultation length increased.

A review on nursing care record systems identified eight trials, which suggested that documentation was improved but that process or outcomes of care were not influenced <sup>14</sup>. The reviewers concluded  
255 that no evidence was found regarding effects on performance attributable to changes in the record systems.

Organisational interventions:: a structured review

We conclude that professional performance and patient outcomes can be improved by the implementation of computers in clinical practice settings.

260 *Quality management*

Two reviews on quality management were found; both were of moderate methodological quality. A large review reported on 55 studies on the impact of continuous quality improvement, but only three were randomized trials<sup>34</sup>. Notably, these found no effects. A second review focused on nursing homes<sup>41</sup>. It identified four controlled trials of heterogeneous interventions (two of these appeared to  
265 comprise professional education). It concluded qualitatively that specific components of quality management were particularly effective, such as specific training, assessment procedures, quality assessment cycles and the assistance of a quality consultant. The effects of quality management on professional performance and patient outcomes remain uncertain.

270 *Mixed interventions*

Seven reviews, which were all but one of good methodological quality, combined various organizational interventions (such as described in box 1) into one group for the analysis and interpretation.

A comprehensive review on implementation of preventive services in primary care found four  
275 controlled trials on organizational interventions, such as involvement of nurses and a different way of booking appointments<sup>20</sup>. All showed intended effects. A review on improving breast cancer screening identified three randomized trials on changed administrative office systems, which all showed increased use of mammography screening<sup>24</sup>. Discharge planning prior to leaving the hospital resulted in a small reduction in hospital length of stay for elderly medical patients, mixed effects on re-  
280 admission, while no effects on patient outcomes were found<sup>30</sup>. A review on interventions to improve physicians' use of diagnostic tests found that 'enabling interventions' (administrative structure of test

ordering) led to change in a majority of the studies if used alone and in most studies when used in combination with predisposing or reinforcing interventions <sup>36</sup>.

285 A review on interventions to implement guidelines in hospitals found 15 trials, which included an organizational component (other than revision of professional roles) <sup>15</sup>. A meta-regression analysis showed that this component did not contribute to effects on process measures.

290 A review on interventions to improve the management of diabetes mellitus in primary care and outpatient settings identified nine trials <sup>33</sup>. These interventions focused on change in the medical record system, arrangements for follow-up, involvement of a pharmacist, and multidisciplinary collaboration. The authors conclude that regular prompted recall and review of patients improve diabetes management. Higher treatment adherence and patient recovery, and lower costs, was achieved in patients with depression by "collaborative care", a comprehensive package of interventions which included educational and organizational strategies <sup>17</sup>.

295

## **Discussion**

This paper examined the evidence on a broad range of organizational changes in patient care regarding effects on professional performance, patient outcomes, and costs. We found evidence that 300 professional performance can be improved by enlargement of professional roles of non-physicians (nurses, pharmacists, etc.) and by computer systems for reminding and decision support. Patient outcomes can be improved by multidisciplinary teams for patient care, integrated care services, and computer support. Few studies considered costs, but cost savings were reported regarding integrated care services and not consistently regarding other organizational changes. There was little evidence 305 from systematic reviews regarding the effectiveness of quality management.

We have not searched comprehensively so it is possible that we have missed relevant reviews. The conclusions need to be regarded as tentative. A previous review regarding organizational changes concluded that the available evidence was difficult to locate, even for expert researchers, and may

Organisational interventions:: a structured review

therefore be largely inaccessible to health care managers <sup>7</sup>. There is a range of organizational

310 approaches to improvement that were not explicitly covered by this paper, such as leadership, process redesign, breakthrough series, organizational culture interventions, and organizational learning <sup>2</sup>. We found no systematic reviews particularly focused on these strategies.

This paper showed that a considerable number of rigorous evaluations of organizational changes has been performed, including many controlled trials. While further studies are needed, there is some

315 research evidence to guide decisions. We found that particularly integrated care services are promising. Their effectiveness may be based on the fact that these are in fact multifaceted interventions, which comprise various organizational changes such as revised professional roles, multidisciplinary teams, use of computers systems, and components of quality management.

Continued education of health professionals and patient education are usually components of these

320 integrated care services as well. In this way, they can address a wide range of potential barriers for change, which is likely to increase their effectiveness. Further work should focus on analysing the contributions of the specific components in integrated care services, which particularly contribute to their effectiveness.

To allow interpretation by decision-makers in various contexts which strategies to select it is

325 important to provide sufficient background information on the local context in published papers. For instance, it may be important whether an improvement is implemented in a small practice (with informal relationships) or in a large hospital department with formalized structures. Future research papers should provide this background information. It may be helpful to have a set of key factors for such descriptions, which are likely to influence change, such as physicians' attitudes regarding a

330 proposed change, organizational structures and financial incentives. Perhaps a 'reference case' for organizational changes should be developed, similar to economic evaluations of healthcare interventions.

## References

335

1 McGlynn EA, Asch SM, Adams J, et al. The quality of health care delivered to adults in the United States. *N Engl J Med.* 2003;348:2635-45.

340

2 Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet.* 2003;362:1225-30.

3 Grimshaw J, Thomas RE, Maclennan G, et al. Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technol Assess.* 2004;8(6).

345

4 Cabana MD, Rand CS, Power NR, et al. Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA.* 1999;282:1458-65.

5 Bero LA, Grilli R, Grimshaw JM et al. Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. *BMJ.* 1998;317:265-8.

350

6 Grimshaw JM, Shirran L, Thomas R, et al. Changing provider behavior. An overview of systematic reviews of interventions. *Med Care.* 2001;39:S2-45.

355

7 Sibbald B, Shen J, McBride A. Changing the skill-mix of the health care workforce. *J Health Serv Res Policy.* 2004;9:28-38.

8 Badamgarav E, Croft JD, Hohlbauch A, et al. Effects of disease management programs on functional status of patients with rheumatoid arthritis. *Arthritis & Rheumatism.* 2003;49:377-387.

360

9 Balas EA, Austin Boren S, Brown GD, et al. Effect of physician profiling on utilization. Meta-analysis of randomized clinical trials. *J Gen Intern Med.* 1996;11:584-90.

Organisational interventions:: a structured review

- 10 Balas EA, Krishna S, Kretschmer RA, Cheek TR, Lobach DF, Boren SA. Computerized knowledge management in diabetes care. *Med Care*. 2004;42:610-21.
- 365
- 11 Beney J, Bero LA, Bond C. Expanding the roles of outpatient pharmacists: effects on health services utilisation, costs, and patient outcomes. *Cochrane Library*. 2000:1.
- 12 Bower P, Sibbald B. On-site mental health workers in primary care: effects on professional practice. *Cochrane Library*. 2000:1.
- 370
- 13 Brown SA, Grimes DE. A meta-analysis of nurse practitioners and nurse midwives in primary care. *Nursing Res*. 1995;44:322-339.
- 14 Currell R, Urquhart C. Nursing record systems: effects on nursing practice and health care outcomes. *Cochrane Library*. 1999:3.
- 375
- 15 Dijkstra R, Wensing M, Thomas R, Akkermans J, Grimshaw J, Grol R. Relationship between organizational characteristics and the effect of clinical guidelines on medical performance at hospitals, a meta-analysis. Ph.D. thesis, University Nijmegen, 2004.
- 380
- 16 Ferguson JA, Weinberger M. Case management programs in primary care. *J Gen Int Med*. 1998;13:123-126.
- 17 Gilbody S, Whitty P, Grimshaw J, Thomas R. Educational and organizational interventions to improve the management of depression in primary care. A systematic review. *JAMA*. 2003;289:3145-51.
- 385
- 18 Hearn J, Higginson IJ. Do specialist palliative care teams improve outcomes for cancer patients? A systematic literature review. *Palliative Medicine*. 1998;12:317-32.
- 19 Horrocks S, Anderson E, Salisbury C. Systematic review of whether nurse practitioners working in primary care can provide equivalent care to doctors. *BMJ*. 2002;324:819-23.
- 390

- 20 Hulscher MEJL, Wensing M, Grol RPTM, et al. Interventions to improve the delivery of preventive services in primary care. *Am J Public Health*. 1999;89(5):737-46.
- 395
- 21 Kaushal R, Shojania KG, Bates DW. Effects of computerized physician order entry and clinical decision support systems on medication safety. A systematic review. *Arch Intern Med*. 2003;163:1409-16.
- 22 Kwan J, Sandercock P. In-hospital pathways for stroke. *Cochrane Library*. 2002:1.
- 400
- 23 Loveman E, Royle P, Waugh N. Specialist nurses in diabetes mellitus. *Cochrane Library*. 2003:1.
- 24 Mandelblatt J, Kanetsky PA. Effectiveness of interventions to enhance physician screening for breast cancer. *J Fam Pract*. 1995;40:162-171.
- 405
- 25 McAlister FA, Lawson FME, Teo KK, Armstrong PW. A systematic review of randomized trials of disease management programs in heart failure. *Am J Med*. 2001;110:378-84.
- 26 McAlister FA, Lawson FME, Teo KK, Armstrong. Randomized trials of secondary prevention programs in coronary heart disease: systematic review. *BMJ*. 2001;323:957-62.
- 410
- 27 Mitchell E, Sullivan F. A descriptive feast but an evaluative famine: systematic review of published articles on primary care computing during 1980-97. *BMJ*. 2001;322:279-82.
- 415
- 28 Mitchell G, Del Mar C, Francis D. Does primary medical practitioner involvement with a specialist team improve patient outcomes: a systematic review. *Br J Gen Pract*. 2002;52:934-939.
- 29 Norris SL, Nichols PJ, Caspersen CJ, et al. The effectiveness of disease and case management for people with diabetes. A systematic review. *Am J Prev Med*. 2002;22:15-38.
- 420
- 30 Parkes J, Sheppard S. Discharge planning from hospital to home. *Cochrane Library*. 2000:1.

Organisational interventions:: a structured review

31 Philbin EF. Comprehensive multidisciplinary programs for the management of patients with congestive heart failure. *J Gen Intern Med.* 1999;14:130-135.

425

32 Ram FSF, Jones A, Fay JK. Primary care based clinics for asthma. Cochrane Library. 2001;1.

33 Renders CM, Valk GD, Griffin S, Wagner EH, Van Eijk J Th, Assendelft WJJ. Interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings. Cochrane Library. 2000:1.

430

34 Shortell SM, Bennett CL, Byck GR. Assessing the impact of continuous quality improvement on clinical practice: what it will take to accelerate progress. *Milbank Q.* 1998;76:593-624.

35 Smith B, Appleton S, Adams R, Southcott A, Ruffin R. Home care by outreach nursing for chronic pulmonary disease. Cochrane Library. 2001;1.

435

36 Solomon DH, Hashimoto H, Daltroy L, Liang MH. Techniques to improve physicians' use of diagnostic tests. A new conceptual framework. *JAMA.* 1998;280:2020-27.

37 Stone EG, Morton SC, Hulscher ME, Maglione MA, Roth EA et al. Interventions that increase use of adult immunization and cancer screening services: a meta-analysis. *Ann Intern Med.* 2002;136:641-51.

440

38 Stroke Unit Trialist Collaboration. Collaborative systematic review of the randomized trials of organized inpatient (stroke unit) care after stroke. *BMJ.* 1997;314:1151-8.

445

39 Thompson RL, Summerbell CD, Hooper L, et al. Dietary advice given by a dietitian versus other health professional or self-help resources to reduce blood cholesterol. Cochrane Library. 2003;1.

40 Vliet Vlieland TP, Hazes JM. Efficacy of multidisciplinary team care programs in rheumatoid arthritis.

450 *Arthritis and Rheumatism.* 1997;27:110-122.

41 Wagner C, Van der Wal G, Groenewegen PP, De Bakker DH. The effectiveness of quality systems in nursing homes: a review. *Qual Health Care*. 2001;10:211-17.

455 42 Walton R, Dovey S, Harvey E, et al. Computer support for determining drug dose: systematic review and meta-analysis. *BMJ*. 1999;318:984-90.

43 Weingarten SR, Henning JM, Badamgarav E, et al. Interventions used in disease management programs for patients with chronic illness – which ones work? Meta-analysis of published reports. *BMJ*. 2002;325:925-33.

460

44 Zwarenstein M, Bryant W. Interventions to promote collaboration between nurses and doctors. *Cochrane Library*. 2000:4.

**Box 1: Organizational changes to improve patient care**

- 465 - Revision of professional roles: Change of tasks and responsibilities of health professionals, such as increased medical tasks to nurses and enlarging the tasks of pharmacists.
- Multidisciplinary teams: Clinical teams or collaborations of physicians, nurses and allied health professionals to improve professional performance and patient outcomes.
- 470 - Integrated care services: Organized systems for care delivery (also labeled as disease management programs or integrated care pathways) to patients with specific diseases, who receive care according to a protocol, which covers the spectrum from screening to education, treatment and monitoring. Case management is partly overlapping with disease management and has been included in the category.
- 475 - Knowledge management: Knowledge management is the optimal organization of knowledge in an organization. In practice, it mainly refers to the use of information and communication technology to support patient care, such as computerized medical record keeping.
- 480 - Quality management: Management approach, which focuses on customers, continuous efforts to improve, measurement and analysis of performance, and supportive leadership and organizational culture. Various approaches, such as total quality management, continuous quality improvement, and business redesign, have been included in this category.

**Table 1 Revision of professional roles**

Author, number of studies	Quality score	Focus	Main results
Beney 2000 N=16	7	Enlargement of the role of the public pharmacist	Changed use of healthcare services (PSI 6/6=100%). Improved patient outcomes (PSI 10/13=77%). Not changed: quality of life.
Bower 2000 N=38	9	Mental health workers in primary care: replacement of / consultation to primary care providers	*Replacement: lowered consultation rates (PSI 2/8=25%), short term reduction on psychotropic prescribing (PSI 4/11= 36%), long term changes psychotropic prescribing (PSI 3/6=50%), reduced mental health referrals (PSI 3/6=50%). *Consultation: more appropriate short term prescribing (PSI 3/6=50%). Not changed: consultation rates, referral patterns.
Brown 1995 N=13	4	Nurse practitioners in primary care	Improved laboratory testing (AES 0.20), resolution of pathological conditions (AES 0.28), patient satisfaction (AES 0.30). Not changed: quality of care, prescribing, functional status, consultation rates, use of emergency service.
Dijkstra 2004 N=13	7	Revision of professional roles for guideline implementation in hospitals	Improved professional performance (AOR 9.78 S).

Organisational interventions:: a structured review

**Table 1 Revision of professional roles (cont)**

Horrocks 2002 N=11	6	Nurse practitioners in primary care	Improved patient satisfaction (SMD 0.27), longer consultations (WMD 3.67 minutes), more investigations (OR 1.22).  Not changed: health status.
Loveman 2003 N=6	8	Specialist nurses in diabetes mellitus	Not changed: HbA1c, emergency admissions, quality of life.
Stone 2002 N=20	6	Organizational change (mainly involvement of nonphysician staff and clinics devoted to prevention) to improve adult immunization and cancer screening	Improved preventive activities (AOR range 2.74 - 17.6).
Smith 2001 N=4	7	Outreach nursing for chronic obstructive pulmonary disease	Increased hospital service utilization (PSI 2/2=100%).  Not changed: mortality, lung function, health related quality of life.
Thompson 2003 N=7	8	Dietary advice by dietitians compared to self-management materials.	Not changed: patient outcomes.

**Table 2 Multidisciplinary teams**

Author, number of studies	Quality score	Focus	Main results
Hearn 1998 N=5	5	Palliative care teams in advanced cancer	Improved patient and carer satisfaction (PSI 80%). Improved pain and symptom control (PSI 80%). Reduced hospital stay and overall costs (PSI 80%).
Mitchell 2002 N=7	6	Arrangements that linked family physicians to specialist practitioners	Improved clinical behavior (PSI 4/4=100%). Cost savings (PSI 1/2=50%). Not changed: health outcomes.
Philbin 1999 N=2	4	Multidisciplinary teams for patients with congestive heart failure	Improved quality of life (PSI 1/2=50%). Reduced use of medical care (PSI 1/2=50%).
Vliet Vlieland 1997 N=15	4	Multidisciplinary teams care for rheumatoid arthritis	Inpatient teams versus usual outpatient care: improved short-term disease activity (PSI 4/4=100%), increased costs (2/2=100%). Outpatient teams versus usual outpatient care: improved disease outcomes (PSI 2/5=40%).
Zwarenstein 2000 N=2	7	Interventions to promote collaboration between nurses and doctors	Reduced hospital stay (PSI 100%), reduced hospital costs (PSI=18%). Not changed: mortality.

**Table 3 Integrated care services**

Author, number of studies	Quality score	Focus	Main results
Badamgarav 2003 N=11	7	Rheumatoid arthritis	Improved functional status (AES 0.27 NS).
Ferguson 1998 N=9	4	Case management in different patient populations	Improved patient-centered outcomes (PSI 6/6=100%), improved clinical outcomes (PSI 2/2=100%), reduced health resource use PSI 2/7=29%).
Kwan 2001 N=10	9	In-hospital pathways for stroke	Fewer urinary tract infections (AOR 0.38 S). Fewer readmissions (AOR 0.11 S). More computer tomography brain scans (AOR 3.66 S). More carotid duplex studies (AOR 2.45 S). Reduced patient satisfaction (P=0.02). Reduced quality of life (P=0.005). Not changed: mortality, dependency, or discharge destination.
McAllister 2001 N=11	7	Disease management for heart failure in patients discharged from hospital	Decreased hospital use (ARR 0.87), cost savings (PSI 7/8=88%). Not changed: all-cause mortality.
McAllister 2001 (BMJ)	7	Secondary prevention of coronary heart disease in outpatients	Reduced hospital use (ARR 0.84 S), improved quality of life/functional status (PSI 5/8=63%), cost savings (PSI 2/3=67%). Not changed: all-cause

---

N=12

mortality, recurrent myocardial infarction.

---

**Table 3 Integrated care services (cont)**

---

Norris 2002 N=42	5	Disease management and case management in diabetes	Disease management: improved professional performance (SMD range 10-30%). Improved glycated hemoglobin (MNC -0.5% S). Case management: improved glycated hemoglobin (MNC -0.53% S).
Ram 2001 N=1	9	Asthma clinics in primary care	Improved peak flow scores and other patient outcomes (PSI=1/1=100%).
Stroke Unit Trialist Collaboration 1997 N=19	6	Organized inpatient care after stroke (rehabilitations, specialization, training and education)	Reduced mortality (AOR 0.83 S). Reduced dependency or mortality (AOR 0.69 S). Reduced institutionalization (AOR 0.75 S). Reduced length of hospital stay (ARR 0.92 S).
Weingartenn 2002 N=102	6	Disease management programs for patients with chronic illness: A. Provider education, feedback and reminders. B: Patient education, reminders and financial incentives.	A: provider adherence to guidelines (AES range: 0.44 – 0.61), patient disease control (AES range: 0.17 – 0.35). B: patient disease control (AES range: 0.24 – 0.40).

---

**Table 4 Knowledge management**

Author, number of studies	Quality score	Focus	Main results
Balas 1996 N=100	6	Computerized information services in different settings. A. provider prompt, B. provider feedback, C. computerized medical record, D. assisted treatment planning, E. computerized patient education.	Improved test ordering/prevention in A (PSI 14/16=88%), B (PSI 7/9=78%), and C (PSI 6/8=75%). Improved drug prescription in D (PSI 10/12=83%). Improved patient knowledge in E (PSI 8/9=89%).
Balas 2004 N=40	7	Computerized knowledge management in diabetes care. A. provider prompt, F. home glucose records	Improved guideline compliance in A (PSI 6/8=75%). Improved glycated hemoglobin (SMD -0.14 mmol/L,S) and blood glucose (SMD -0.33 mmol/L,S) in F.
Currell 1999 N=8	8	Nursing record systems	Not changed: patient care, patient outcomes. Some administrative benefits.



**Table 4 Knowledge management (cont)**

Kaushal 2003	8	Physician order entry and clinical decision support systems	<p>*Order entry: decrease in serious medication error (PSI 2/5=40%), improved in collorary orders (PSI 20%), improved prescribing behaviors (PSI 100%), improved nephrotoxic drug dose and frequency (PSI 20%).</p> <p>*Decision support: improved antibiotic-associated medication errors and adverse drug events (PSI 3/7=43%), improvement in theophylline-associated medication errors (PSI 1/7=14%).</p>
N=12			
Mitchell 2001	7	Computer systems in primary care	<p>Increased consultation length (SMD range 48-130 seconds). Improved immunization rates (ARR range 8-34%). Reduced test ordering (ARR range 6-75%). Improved patient outcomes (PSI 17/89=19%).</p>
N=61			
Walton 1999	8	Computerized decision support on medication prescribing	<p>Blood concentration of drug (AES 0.69 A), time to reach therapeutic concentration (AES - 0.44 A), patient outcomes (PSI=5/6=83%), cost savings (PSI 2/2=100%)</p>
N=15			



Organisational interventions:: a structured review

**Table 5 Quality management**

Author, number of studies	Quality score	Focus	Main results
Shortell 1998 N=3	3	Inpatient and outpatient settings	Not changed: all outcomes.
Wagner 2001 N=4	5	Nursing homes	Qualitative conclusions.

**Table 6 Mixed interventions**

Author, number of studies	Quality score	Focus	Main results
Dijkstra 2004 N=15	7	Organizational change to implement guidelines in hospitals	Improved professional performance (AOR 8.41 NS)
Gilbody 2003 N=?	7	Organizational interventions to improve depression management in primary care	Qualitative conclusions.
Hulscher 1999 N=4	6	Organizational interventions to improve preventive care in general practice	Improved professional performance (ARR range 3-30%, PSI 4/4=100%).
Mandelblatt 1995 N=3	7	Administrative office systems to enhance breast cancer screening	Increase screening rates (ARR range: 19-21%).
Parkes 2000 N=8	7	Discharge planning from hospital	Reduction in hospital length of stay (WMD 1.01), increased patient satisfaction (PSI 2/2=100%). Not changed: health outcomes, overall health costs
Renders 2000 N=9	8	Organizational interventions to improve diabetes care	Qualitative conclusions.
Solomon 1998	8	Enabling interventions to influence use of diagnostic	As single interventions: all improved outcomes (PSI 60%).

Organisational interventions:: a structured review

N=26

tests by physicians

As part of multifaceted interventions: all improved outcomes

(PSI range: 75-100%).