

Evidence:

Does clinical coordination improve quality and save money?

Volume 2: A detailed review of the evidence
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Abstract

There is growing evidence that lack of coordination is the most common indirect or contributing cause of poor-quality outcomes. This review of research presents evidence of the costs of under-coordination, the effectiveness and cost of interventions to improve coordination, and evidence of savings or losses to different parties. It also presents an analysis of the implications of the evidence for different parties and for future research.

The review found that different ways of coordinating clinical care were reported in the research, but there were no comprehensive categorisations of these approaches, or of the different types of interventions designed to improve coordination. Research reports evidence of poor coordination, but there is little research into how much this may cost. It is possible that under-coordination most severely affects the poor and vulnerable, but there is little research into this subject.

Research provides some evidence that better coordination of providers' care can save money and improve quality for patients. But it depends on which way is used to coordinate, and how this is implemented in a local setting. Savings depend on whose perspective is taken and on how providers are paid. Sometimes a provider spending money to improve coordination does not make savings, but others save money from that provider's spending. There is a need for a mechanism to spread the spending and savings fairly.

Many changes for better care coordination have not been well evaluated, so it is important to consider promising as well as proven changes. Also, a change found to have little effect in one place may work somewhere else. The lack of evidence does not mean that a change might not save money and raise quality, so promising and proven changes to coordination need local testing as part of implementation.

There is also evidence that better coordination combined with other changes can save money and raise quality for particular patients. These include: some methods for improving patient handover and transfers, and some models of care to prevent hospital admissions (for example, some disease management, case management, and multidisciplinary team-based approaches) and other chronic care and illness prevention models. The most cost-effective are those which identify and target the patients most likely to benefit.

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Foreword

The need to increase value in healthcare by improving quality (and in particular the quality of patient outcomes) while reducing costs is a challenge facing health services around the world. The double benefit of higher quality and lower costs can unite professionals, managers, commissioners and patients to give the time and energy which to date has not been committed for quality improvement on its own. This is the crucial challenge for the NHS; to cope with a period of very small increase, or flat budgets, over the period of the next three to four years, while demand on services continues to increase to cope with a both growing and ageing population.

As healthcare resources become fewer, providers will tend to focus more on their own tasks, and less on passing-on information and adjusting their work around the total care for the patient. Without coordination, adverse events and poor quality can increase, adding costs and then leading to bureaucracy to enforce procedures which do not solve the problems of under-coordination.

The Health Foundation's earlier publication by the same author 'Does improving quality save money?' has been hugely influential in showing the lack of evidence to date to demonstrate this and in stimulating debate about the costs of improvement interventions in healthcare and the benefits in terms of cost savings. It also identified other areas where further review of the evidence would be helpful. One of the most crucial areas identified for study was the role that clinical coordination can play in reducing waste, improving patient outcomes and delivering these at lower costs.

Improving coordination is about relationships between people, which is why it is difficult. Changes affect relationships between professionals, who often have set views about other care providers in the healthcare system. The changes demand extra time when time is at a premium, and when professionals might not believe the change will benefit either them or patients.

One of the most important messages from this review is that there are models of care that improve clinical coordination and have been shown to reduce cost, but attempts to replicate these need very careful consideration. By its nature, coordination is dependent upon the local context, so the opportunities and costs will vary in each different healthcare system and in different settings within the system.

The review summarises and grades the strength of the evidence, so that it is clear which approaches are the most robustly evaluated. However, there are also many good ideas here for better clinical coordination which could be effective, especially if used in conjunction with other approaches to improving care, such as disease management and self-care programmes. The strength of the evidence is low, as many changes tried to improve coordination have not been well evaluated. The final section of the report suggests how patients, health service providers, commissioners, regulators and professional organisations could all take some responsibility for improving clinical coordination and thus reducing duplication, waste and thus the overall costs of healthcare.

This review highlights areas we need to know more about in order to target our improvement efforts, especially to identify which patients are most affected by poor coordination and the factors which are most influential in determining the effectiveness of interventions. Under-coordination is a symptom of volume-cost healthcare based on discrete care items provided by individual professionals and services in separate buildings, working on a piece-work basis.

A vision of future healthcare is as a value improvement system, which makes the whole healthcare outcome for the patient greater than the sum of the help which each professional provides, and which supports a patient to be independently healthy or more active in their care.

We hope that this work will add to the evidence base to support changes in health services as they address the challenge of continuing to improve quality for patients in a demanding financial climate.

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**Introduction,
concepts
and methods**

1

Chapter 1

Introduction and focus of this review

1.1 Introduction

The first part of this report is divided into three chapters: the introduction, concepts and terms, and methods. The second part of the report presents the review findings. The third part gives practical recommendations and the conclusions arising from the review.

This report presents evidence about the costs of under-coordination, the effectiveness and costs of interventions to improve coordination, and evidence of savings. The assumption is that research evidence can reveal to decision makers where the problems are, and which changes are most effective. In addition, that this will help decision makers invest scarce resources in the changes that will be of most benefit to patients, and most cost effective.

However, evidence from research does not guarantee that local implementation will achieve similar results to those found where the research was carried out, even if they are able to make the same changes. Therefore, the report also highlights the extra assessments that decision makers need to make in order to judge whether local coordination changes could make savings and improve quality.

This review arises from findings from an earlier research review (Øvretveit 2009b). This found some evidence of adverse events and quality problems that were caused wholly or partially by incomplete communication and collaboration between caregivers. The volume and significance of quality problems led the review to argue that under-coordination was as serious as the three other categories reported by the USA Institute of Medicine: overuse, misuse and underuse (Chassin and Galvin 1998). However, the brief for this earlier review did not allow further investigation.

The review presented in this report carried out this further investigation and searched, summarised and synthesised the evidence about under-coordination and its costs. The review also found evidence of solutions and their 'spend costs', and some evidence of savings or losses for organisations investing in solutions. The methods, findings and practical implications of this review are presented in this report. Volume 1 of *Evidence: Does clinical coordination improve quality and save money?* provides a summary and implications and is available at www.health.org.uk (Øvretveit 2011a).

1.2 Questions addressed by the research review

The main question addressed in the review was ‘Does clinical coordination improve quality and save money?’

Both the author of this review and the Health Foundation, which commissioned this study, believe that decision makers are interested in:

- which changes produce positive results (higher quality and lower costs) that are worth the costs of the change, and are more beneficial than any negative consequences?
- in which situations could such results be anticipated, beyond those where the research was undertaken, and what would be needed to implement the changes?

To answer the main question, answers to the following sub-questions were sought:

- What is under-coordination, and how is it different from overuse, underuse or misuse of treatment or diagnostic interventions to patients?
- Is there evidence of adverse events or poor quality resulting from under-coordination of practitioners and services?
- Is there evidence of the costs of under-coordination and, if so, who pays these costs?
- For which conditions and patient needs are coordination improvements most necessary?
- What are the different types of coordination (between practitioners and services) that have been used to improve patient care?
- Which coordination methods are effective?
- What is the cost of coordination improvements, and do they save money?
- Is any evidence strong enough to provide evidence-based guidance or recommendations for improvements?

The review aimed to search for evidence of changes that both reduce costs and result in higher-quality care, or ‘value improvements’ (Øvretveit 2009b and 2009c). One reason for this choice was the belief that this combined outcome was more likely to secure the unity of support from professionals, managers and purchasers. This collective support is necessary in order to carry out the difficult cross-profession and service changes that are needed, and to work out ways to share fairly the investment costs and the savings between the parties in financially challenging times with considerable pressures on staff.

The review also aimed to ensure a patient focus by identifying patient conditions (including common multiple morbidities) where more than one professional or caregiver was needed to meet the patients’ needs. For such patients, failure of professionals to exchange information or collaborate is likely to harm the patient or provide sub-optimal care, as well as wasting time and other resources. This applies to patients in hospital, patients moving between hospital and other services, and patients in the community with chronic conditions.

1.3 A real example illustrating different types of coordination and why we need improvement

This real example illustrates failures in coordination. The text following each vignette gives comments to highlight different types of coordination.

Mary, 82 years old and living alone, fell and broke her hip at 10:00hrs on Friday. Mary arrived at the hospital accident and emergency (A&E) department at 13:00 and by 14:30 she was in radiology, returned to A&E to wait and was admitted to a general medical ward at 17:00.

Over these seven hours, many health personnel and others helped Mary, but they also had asked others to help, and told them about what they knew of Mary's needs so others could get their work started more quickly and safely.

Clinical care communication is one aspect of care coordination shown in the example. It covers asking colleagues for help or making a referral, telling other staff patient details and outcomes of patient assessments, and listening to their views. Communication can be of varying quality. Sometimes people communicate but receive no response, or do not hear what someone else is trying to say.

A second aspect of care coordination is clinical care accommodation or adjustment – altering what one does to fit in with what others do, in order to provide greater patient benefit. The radiology department was busy, but the team put Mary ahead in the line because they heard from A&E that a quick x-ray was necessary in order to admit her, and to get the bed in the medical ward.

At 16:00 the radiology team confirmed that Mary had a fracture and A&E contacted surgery to see if an operation was possible before the weekend.

A&E received no response and, as the hospital did not operate over the weekend, they opted for plan B and transferred Mary to the medical ward.

Because there were no arrangements to transfer hip-fracture patients to other hospitals that did operate over the weekend, Mary's care pathway was, in effect, put on hold. Clinical care coordination between hospitals (inter-organisational coordination) was lacking,

as was internal coordination within individual hospitals (intra-organisational coordination). Subsequent events showed further deficiencies in coordination between the hospital and rehabilitation, primary care and social services.

On Monday there was no operation because the surgeons were informed late, and it was only by Tuesday afternoon that Mary received a new hip and was returned to the general medical unit. Meanwhile the medication she received for chronic obstructive airways disease and heart failure were changed from her usual doses – the nursing unit had discovered that she had these problems but were not able to find out her usual medications, which included digoxin and diuretics.

information passed to primary healthcare or social services. For some reason she was not referred to the rehabilitation unit. Four days later a neighbour called primary healthcare because they were concerned about her, and two days later a nurse visited and tried to treat the pneumonia and open wound from which Mary was suffering.

Mary was discharged home early on Thursday because of pressure on admissions, with no

Three days later, Mary was admitted as an emergency to the same hospital with acute pneumonia and an MRSA wound infection. She had lost 8kg in weight since the day of the fracture.

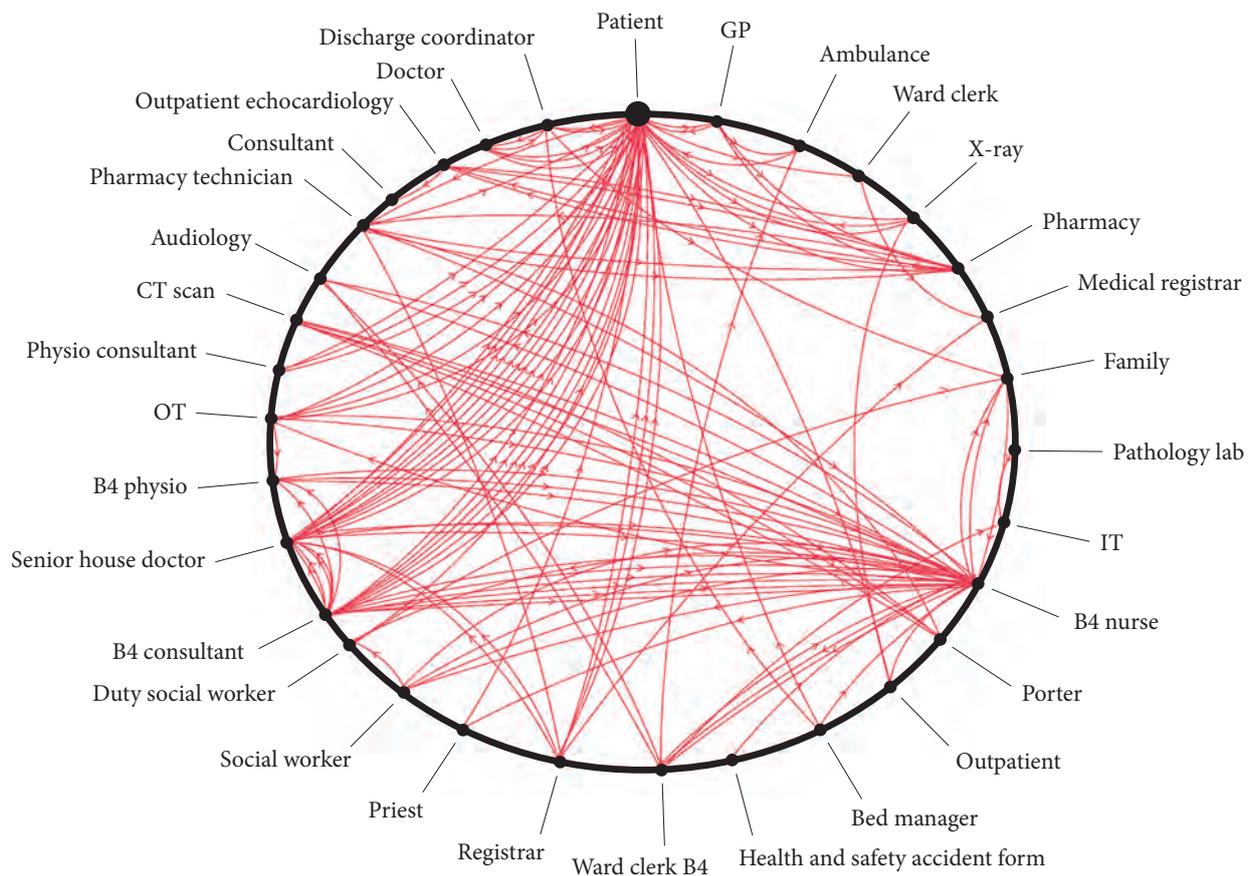
This example, from a UK NHS hospital, identifies some aspects of clinical care coordination that did take place, and others that did not. Some of the questions raised include:

- How common were some of the coordination deficiencies, and what were their costs?
- Are there effective solutions to these deficiencies, and how much do they cost?
- Would the hospital, or anyone, save money by investing in a solution?

These are some of the questions which this study seeks to answer, by reviewing the answers to be found in research, for cases like Mary, but also for many other types of patients.

The following also illustrates the potential problem, and raises the question of how much direct evidence of harm is needed before action should be taken. Jones and Mitchell (2006) report one study at Bolton Hospital, which found 250 communications hand-offs between personnel to discharge one patient with complex care needs: figure 1 below.

Figure 1: Communications hand-off between personnel to discharge one patient with complex care needs



Chapter 2

Concepts and definitions

2.1 Concepts of clinical coordination

Many different concepts are used in the literature – one study lists 40 (McDonald et al 2007). The following is how the concept was defined for the search for evidence made for this review:

‘Co’-‘ordinate’ is, together, to order the care which different providers give to a patient, so that the results are greater than the sum of each provider’s care.

Clinical care coordination is where two or more providers – individuals or organisations – communicate or collaborate with each other and the patient to provide care that takes account of other’s actions.

‘Under-coordination’ is incomplete communication or collaboration between two or more providers, or between a care-giver and a patient, and which results in poor quality, unsafe care and waste. The scope of this review is limited to coordination between formal care givers.

Coordination is viewed in this review as requiring communication and collaboration – the latter being where caregivers co-labour to adjust or accommodate their activities to complement those of other caregivers.

Often patients make the connections for themselves, but a system can add value by connecting providers. Care coordination is needed:

- between professionals and services helping one patient, within the boundaries of one organisation, such as a hospital
- across the boundaries of organisations – when a patient is transferred physically from one organisation to another, but also when professionals in one organisation need patient information, such as test results, held by another organisation
- for patients living in the community with chronic illnesses, who may remain relatively independent if the right care and expertise is available at the right time to support them.

Sequential and parallel coordination

Øvretveit (1993 and 2009a) distinguished between sequential coordination (hand-over), and parallel coordination (collaboration) as follows:

Sequential coordination of care

This type of coordination often involves the transfer of responsibility for care. It takes place:

- between work shifts of single professions in one service – for example, handover or hand-offs between nursing shifts, or between doctors
- between two professions or specialists in the same profession in one service – for example, handover or referral from family – or GP to oncologist

- between services within one organisation, or between facilities run by different organisations. For example, patient transfer or discharge from hospital to nursing home or to rehabilitation.

It is likely that the chances of error and the challenges of coordination increase with the number of handovers, the number of professions involved, the length of the episode of care, and the number of service boundaries to be crossed.

Parallel coordination of care

This is where each profession or service retains responsibility for their care to the patient while working with others who are also seeing the patient. In some cases there is a care coordinator who is responsible for coordinating care as well as, or instead of, their profession-specific responsibilities. This type of care coordination takes place between:

- **same-profession specialists**, whether one is consulting another or both are providing parallel care (for example, a doctor specialising in internal medicine may request a cardiologist's assessment, or both professionals may carry out separate interventions)
- **different professions** for example, a nurse, a psychiatrist and a clinical psychologist in a multidisciplinary team may provide parallel treatment for a patient with mental health problems
- **different services or facilities** for example, radiotherapy, oncology and a nursing home may provide cancer outpatient treatment for a patient living in residential care.

When responsibility for care is assumed rather than being explicit, there is great potential for adverse events and wasted time. In multidisciplinary teams and other situations, sequential and parallel coordination often take place simultaneously, with changes for a single patient taking place as often as once an hour (the Cleveland Clinic in the USA estimated 1.6m handovers every year). Calling a group a team does not in itself ensure coordination, and does not necessarily mean that arrangements are clear. Specific interventions and support are needed to create and maintain teams in fast-changing healthcare environments (Øvretveit 1993).

Adverse events and wasted time are more likely with extended episodes of care that involve a succession of hand-offs or transfers between practitioners. In this situation, many practitioners and services are coordinated over a longer period of time – or permanently, for people with chronic long-term conditions or co-morbidities such as heart failure, diabetes and addiction.

For safety and efficiency, arrangements are needed to enable a variety of practitioners caring for one patient to:

- recognise when one or more of the practitioners transfers responsibility to a new practitioner or network
- have access only to critical information that affects their care, such as through registration on an electronic medical record or hand-off system (Henderson et al 2010).

Integration

Integration is a closely related term, especially 'clinical integration' and is often used synonymously with 'care coordination'. This review distinguishes between:

- **Clinical-level arrangements or interventions** that result directly in better care coordination, and that address active, primary and direct causes of poor quality.
- **Secondary influences on coordination** such as provider structures, regulation, finance or policy directives that specifically target care coordination, and that address latent, contributing causes of poor quality.

The review uses 'integration' to refer to changes to bring together different facilities, structures or services, which may then make it easier to improve coordination. This management level integration does not itself directly result in better clinical care coordination.

Continuity

Continuity is another concept that overlaps with coordination but has a slightly different meaning. Here, continuity is defined as the patient's experience of a consistent approach to care, often as a result of a continuing relationship with the same healthcare professional (Jee and Cabana 2006, Disease Management Association of America 2010, Joint Commission 2010). Some continuity studies also provide evidence that was relevant to this review (Baker et al 2006). In this review, improved continuity can be one outcome of better coordination, but it can also result from other changes, such as reducing staff turnover.

2.2 Concepts of quality and cost

As well as the concepts relating to clinical coordination described above, the decision about which evidence to include in the review depended on the definitions of quality and cost used by the researchers.

Quality

An assessment of whether improved quality is achieved by a change depends on which aspect of a service is assessed, notably whether it is a process quality aspect such as availability of patient information at the time of consultation, or patient outcome quality such as better quality of life.

The general principle followed in this review was to find any study that reported a change in any aspect of quality, according to the definition or measure used within that study. The review then noted which other aspects of quality were not reported but which others considered to form part of the quality of a service. For example, some studies reported clinical outcomes but not patient experience or satisfaction levels, or considerations of management quality. (Management quality refers to optimal use of resources and no waste, as well as following regulations.)

The general definition used in this review covers the three dimensions of quality (patient, professional and management).

Quality care is defined as a satisfied patient experience, clinical outcomes or practices equal to or higher than accepted standards, and minimum waste and costs within legal and policy requirements. Poor quality care is experiences, outcomes or costs below accepted standards and norms. (Øvretveit 1992)

This definition of quality incorporates process and outcome quality alike, as well as minimum waste and costs. The definition of poor quality includes adverse events, as well as outcomes that are below expected levels while not resulting in harm. Poor process quality refers to provider actions or omissions that are likely to result in poor outcomes, or that diverge from accepted good practice.

Cost

The title of this report asks not only whether clinical coordination improves quality, but also whether it saves money. The answer to this second part of the question also depends on definitions. The general concepts used in the review are:

1. The cost of the quality problem. This includes:
 - wasted time and resources (for example, the resources used to treat an avoidable infection, usually expressed in time or money terms, which include provider resources and resources of other parties)
 - who loses money as a result of the problem, and when.
2. The 'spend cost' of a solution. This includes:
 - the amount of resources used to provide a partial or entire solution to the problem (usually expressed in money terms)
 - who spends the resources, and when.
3. Savings, losses, or extra income. This is how much the cost of the problem is greater or smaller than the spend cost of the solution, over time. This may be a theoretical saving or it may be a cash saving. To make a cash saving, requires a second 'cash change', such as redeploying staff to reduce costs. A 'cash change' can also be by treating more patients with the saved time.

2.3 Definition of under-coordination

The term ‘under-coordination’ is used in this review to refer to incomplete communication or collaboration between two or more providers or services that results in poor-quality or unsafe care and waste. This definition captures the main elements of other definitions. It is patient focused, and is simple enough to be useful.

The scope of this review was limited to coordination between providers (defined as individuals and organisations providing health or health-supporting social services). It did not consider the potentially high-value improvement that could be achieved through better patient–provider coordination. For example, an estimated 50% of effective treatments prescribed are not followed by the patients, so interventions that improve patient–provider communication and collaboration would improve quality and save more than they cost (Institute of Medicine 2008).

Under-coordination differs from the following related concepts (as defined by Chassin and Galvin 1998, and used in the US Institute of Medicine Roundtable on Quality of Care to categorise threats to quality):

- Overuse receiving treatment of no value.
- Underuse failing to receive needed treatment.
- Misuse errors and defects in treatment.

Under-coordination differs from these concepts in that it refers not to a treatment, but to organisational or practice arrangements that directly affect treatment.

Many other organisational or practice arrangements affect treatment too. However, the evidence and theory suggests that coordination (or the lack of it) is the feature of organisational practice that has the highest direct and significant effect on patient outcome and costs. The term ‘under-coordination’ serves to highlight this.

One part of the definition is ‘incomplete’, which can be specified or measured in different ways. Another is how certain we are that poor quality care is caused by the incomplete communication or collaboration. If quality is assessed by a process or intermediate indicator (for example, provider compliance with a guideline) then there is a relatively short pathway between this indicator and the presence or absence of a coordinating action by the provider – causality may be clear or direct. However, if the only indicator is patient outcome, then there are many more influences which could cause any observed changes in outcome, apart from the change to coordination.

Chapter 3

Methods, review framework and presenting the evidence

3.1 The review framework

The framework below was used to help the search for and presentation of the evidence (table 1), as this framework had proven useful for the earlier review of costs and savings of improvements (Øvretveit 2009b). It is illustrated in table 1 by considering the cost-spend-savings or loss for different stakeholders of a better hospital discharge system in the example given of Mary's case in chapter one.

The review focused on studies that identified savings for providers, but it also noted costs and savings to others. It noted the potential for provider savings if other changes were made within the wider context – for example, if a change was made to start quality-related provider payment, or the way that quality data was publicised.

Table 1: The stakeholder cost-spend-saving/loss table

Stakeholder	Cost	Spend	Saving or loss
Provider	<i>Example:</i> Cost to a hospital of treating a patient discharged two days earlier (under a no pay for early unplanned readmission payment system)	<i>Example:</i> How much the hospital will have to spend to develop and implement a patient discharge system to ensure effective transfer to primary health care	Does the hospital save or lose money by spending on the discharge system?
Purchaser	<i>Example:</i> Cost to purchaser of readmission due to poor hospital discharge and transfer	<i>Example:</i> Any spend cost to purchaser for the discharge system	Does the purchaser save or lose money, given its costs and any spend on this intervention?
Other public services	<i>Example:</i> Cost to other services of readmission due to poor hospital discharge and transfer	<i>Example:</i> Any spend cost to other services for the discharge system	Do any other services save or lose money, given their costs and any spend on this intervention?
Patient/relatives	<i>Example:</i> Cost to patient or relative of readmission due to poor hospital discharge and transfer	<i>Example:</i> Unlikely the patient or relative would have to pay any spend costs as part of the discharge system	Does the patient or relative save or lose money, given their costs?

3.2 Searching, grading and presenting the evidence

Because the research was spread across many different databases, and used many different research designs providing different types of evidence about an ill-defined subject, an iterative management research review method was used. This is described in Øvretveit (2009b, 2005a, 2005b and 2003b), Greenhalgh et al (2004), and Greenhalgh and Peacock (2005). The steps were as follows:

1. **Broad scan.** Define objectives and search terms, find and note the various literature on the subject.
2. **Narrow the focus on previous reviews.** Identify and select previous reviews, assess these for answers to the review questions.
3. **Open out inclusion.** Bring in high-quality individual studies in order to provide additional evidence to answer the review questions, noting the strength of evidence of the findings and assigning a grade score.
4. **Open inclusion more widely.** Add other research (of acceptable evidence strength) to fill in the evidence for the questions, noting that the evidence at this level is weaker, using a snowball approach to identify relevant studies (Greenhalgh and Peacock 2005).
5. **Review and synthesise.** Combine the evidence in order to answer the questions, noting the degree of certainty (through the grading system). Identify unanswered questions and priorities for research, and provide any recommendations that are supported by the evidence.

Search, selection and abstraction

One part of the search strategy was to find studies about poor quality caused by under-coordination, along with any assessments of the cost of this. Another was to identify studies that looked at how changes to coordination arrangements had affected process or outcome variables. The search looked for systematic reviews of research that sought to evaluate care coordination, as well as primary studies that reported evaluations of care-coordination improvements or improvements that included care coordination as a primary element.

Searches were carried out, first for reviews of research in the DARE database (104 summarised), then for health economics studies in the NHS economic evaluations database (few providing costings were found), then in the Cochrane Library (165 RCTs), EPOC data base, EMBASE, CINAHL and the NLM gateway, for 1995 to July 2010 with the search terms clinical coordination, care coordination, disease management, case or care management, handover, hand-offs, care transition, discharge planning, and clinical integration.

The identification, exclusion and assessment followed the following method:

1. Listing of reviews or primary studies delivered by search (n=6,121, (PUBMED = 4,456).
2. Exclusion of studies, which on further investigation, were not clinical care coordination or empirical evaluations (n excluded = 4,352).
3. Exclusion of studies below the threshold of evidence level grade E4 (see grading below), or which were not reviews of evaluations (remaining n = 126).
4. Identification of studies with costing and quality information (n = 23 reviews, 28 primary studies).
5. Final selection of studies for abstraction and summarizing (n= 37 reviews, 68 primary studies).

This review also followed up references in some studies which referred to other research which had not been identified in the formal search, and looked for unpublished or early findings presented at conferences and in the 'grey literature'.

Grading the evidence

A grading system was chosen which would give a simple indication to readers of the degree of certainty of statements in this review, based on an assessment of the strength of evidence of the study finding reported according to the design and conduct of the study. This was based on a combination of a modified GRADE evidence scale (Grade working group 2004) and a grading system used in earlier reviews of health management subjects (Øvretveit 2003b, and by Greenhalgh et al 2004).

The criteria used to grade evidence as E1, E2, E3, E4 were:

E1: Strong evidence of results: consistent findings of results in two or more randomised controlled trials.

- This corresponds to the GRADE scale A: ‘Several high-quality studies with consistent results. Further research is very unlikely to change our confidence in the estimate of effect.’

E2: Moderate evidence: consistent findings of results in two or more scientific studies of acceptable quality (non-randomised control trial and before-after design, no control).

- Corresponds to GRADE scale B: ‘One high-quality study or several studies with some limitations. Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.’

E3: Limited evidence: only one study giving results, or inconsistent findings of results of several studies. Studies of results showing perceptions are graded E3 if they were collected and analyzed according to accepted scientific methods using an appropriate design.

- Corresponds to GRADE scale C: ‘One high-quality study. Several studies with some limitations. Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.’

E4: Very low strength of evidence: Any estimate of effect is very uncertain. One or more studies with very severe limitations. Expert opinion. No direct research evidence.

Synthesis and presentation

After studies were selected, graded and organised in tables and summarised, the first draft outline was made with headings for the main questions to be answered. A first draft was written, drawing on the study summaries and tables to find evidence to answer the questions, and to identify which papers would need more detailed analysis for possible evidence to answer the questions.

3.3 Considering the strength of evidence

The phrase ‘strength of evidence’ has a number of different meanings. In order to assess whether the label ‘strong evidence’ indicates that the same results are likely to be achieved in a local setting, and are generalisable from the research, decision makers need to be clear which meaning is being used.

Meanings may include:

- accuracy
- strength of effect in one study
- strength of effect in a study where other explanations are excluded
- predominant aggregated effect from summation of many studies (for example, some with no effect, some with large effect)
- a consistent pattern of the same findings across many studies.

Sometimes the term ‘strong evidence’ may refer not to outcomes but to the level of confidence that the reviewer has that the researchers’ description of the intervention is accurate, or that they have reduced bias in documenting and describing the coordination changes that were made and the way in which these were implemented. This is important in implementation research, where the focus is less on end outcomes and more on how and what was implemented.

Descriptions of the intervention

Good descriptions are essential in order to know which type of intervention was being evaluated. Reviews of research often do not give sufficient details of the different interventions, and assume the same label in one study means the same thing in another.

Intervention descriptions are needed when considering coordination interventions. The review uses different terms to describe categories of interventions such as ‘handover’. But within the category there are many different interventions, and the variation in results which is often observed in reviews may be due to the variation in interventions, in their contexts and/or in how well the same intervention was implemented.

This review used a recent distinction between clinical intervention, implementation intervention, and implementation-enabling intervention each at different levels :

- Clinical intervention: a change in how patients are treated (for example, antibiotics before surgery, or a new way of coordinating care).
- Implementation intervention: actions taken to change provider behaviour or organisation to use the clinical intervention (for example, training, computer prompts).
- Implementation-enabling intervention: changes to encourage and support implementation (for example, changes to finance, or regulations, or a national support programme or infrastructure).

(Øvretveit 2011c)

Size of effect versus certainty of association

Most of the research reviewed in this study was about clinical coordination interventions – there was very little about the effectiveness of implementation interventions to carry out the clinical coordination change, nor about implementation-enabling interventions.

In evaluation research – the focus of this review – the term ‘strong evidence’ refers to certainty about whether outcomes really are outcomes of the change being evaluated and are not due to other causes (that is, attribution certainty, resulting from the internal validity of the study). It refers to a high certainty that a change to care coordination, in the study setting(s), was associated with a change to a measured outcome. Research rarely proves causality (see ‘Coordination and causality’, below).

For example, a medication reconciliation method is associated with fewer adverse drug events, or introducing disease management is associated with an observed change to hospital readmissions. Both these are studies looking at the efficacy of the intervention in one setting, while the effectiveness refers to whether the same results are found in many different settings. To use the research for local decisions, it is important to ask exactly which type of intervention the evidence is about, and which type of study it comes from.

An assertion that evidence is ‘strong’ can relate to the size of effect, or the certainty of association, although the two are often related. For example, the term could refer to:

- Strong certainty about an association between a coordination intervention and outcomes in one study, regardless of whether the outcomes are meagre or very great.
- A large effect, where the change in outcomes associated with coordination change is large (in one or many studies).
- A small or large effect where the same association is consistently observed across many studies or settings.

An assertion that evidence is ‘weak’ may refer to a small effect, or to a situation where a review identifies many different effects, including small, negative and some large, positive effects, but with one pattern of evidence predominating.

Types of study providing strong evidence

Four types of study may all provide strong evidence of the association between intervention and outcome, but the guidance that each gives for likely local results are quite different:

- A study of one intervention in one setting: one hospital introduces a medication reconciliation method (MedRec) and the study reports before and after changes in errors, or compares this with errors in another unit without MedRec. The evidence of association between the MedRec and outcomes is strong if no other explanations are likely (internal validity to the study), which depends on the study design. Whether others would get similar results (generalisability or external validity) depends on whether they can copy the MedRec method used and whether their hospital is similar in many respects. Often such studies are carried out in teaching hospitals or special sites which are different in many respects from other local sites.
- A review study of research into similar interventions in similar settings: strong evidence often means that a similar association between the care coordination method and the outcomes was found in many different studies.

The certainty is higher than for one study alone and the strength of evidence is higher than this would be found if similar interventions were made in a similar setting. It is more likely others would get similar results, but it depends if others' settings are similar to those in the research. The coordination change is efficacious in that setting, but is it effective?

- A review study of research into similar interventions in many different settings: some reviews draw on different research studies of the same intervention but which is carried out in many different settings. If similar association was consistently observed between the coordination intervention and outcomes in many different settings, then the evidence of association is strong and evidence of generalisability of results is also strong. It is likely others would get similar results in many different settings.
- A meta-analysis: this combines the data from many studies and assesses associations as if they were one large study with many patients. This can provide stronger evidence about the intervention than from each individual study if the interventions in each study contributing the data are very similar. But generalisation to a local service/area would depend on whether the source studies were all done in similar settings as well, or done in very different settings.

Weak evidence can mean a weak association between a coordination approach and a change to outcomes. This could be because the coordination approach did not change the outcomes. It could also mean that there was a large change in outcomes but it is not clear whether other influences apart from the coordination change worked to influence this large change in outcomes.

3.4 Coordination and causality

Most of the studies considered in this review aimed to establish whether a change to coordination really caused a change in quality and in the amount of resources used. However, many of the designs in the research reviewed could show only whether there is an association between an intervention and any change in resource and quality data that is significantly greater than random. In other words, they do not prove that the intervention directly causes the change (causality).

It is easier to determine the effects of a drug or surgery on patient quality and resource use than the effects of a new arrangement for coordination such as a hand-off system. Coordination may lead to different patient outcomes, through a pathway of influences that is not as direct as that of a drug or surgery on a patient, and the mechanisms through which it may have this influence are not as well understood. There are mediating influences which include people making choices about what to do. It is difficult to separate the effect of a change in coordination from other changes or influences that may occur around the same time, and that also influence patient quality or resource use.

If quality is assessed by a process or intermediate indicator (for example, by measuring the extent to which a provider complies with a guideline), then there is a relatively short pathway between this indicator and the presence (or absence) of a coordinating action by the provider. As a result, causality will be clear or direct.

However, if the only indicator is patient outcome, then there will be many more influences that could cause any observed changes in outcome, apart from the change to coordination. The ideal is a model that shows possible causal relations between the coordination change and the process and outcome indicators.

Causes of poor coordination

There are many causes of poor coordination, and these can differ from one service to the next. Even where the causes are the same in two services, the importance of each cause will be different. Effective solutions usually comprise of a combination of changes that address each cause, and this will need to differ from one service to the next, even if those changes follow the same general approach.

This poses a challenge not only to the researchers, but also to reviewers of the research. A reviewer needs to grade the degree of certainty of the findings and conclusions from each study in order to select studies for inclusion, and then to present this in his or her report to help readers with their decision making, as described in the grading system above. However, even this approach can offer only a rough guide to what might be expected from a similar change in another organisation.

Findings and possible solutions

2

Chapter 4

Under-coordination: evidence and problems found

4.1 Introduction

This chapter presents evidence under three headings:

- Poor quality as a result of under-coordination, including poor coordination process quality and poor outcomes as a result of under-coordination.
- The costs of under-coordination.
- Patient groups for whom improvements are most necessary.

4.2 Poor quality as a result of under-coordination

Most of the evidence of the link between poor quality and under-coordination is indirect, in the sense that the research shows that care coordination is associated with certain intermediate or process events, or with process quality. An example might be a hospital failing to pass on information about prescribed medications to a family practitioner or GP. This, then, is thought to lead to poor clinical outcomes and waste – especially wasted time, which can be quantified in money terms, and which is another type of outcome.

There is less evidence showing an association between under-coordination and poor-quality end outcomes. An example of this might be a child who experiences an allergy-related adverse drug reaction because, although the parent has informed an A&E nurse about the child's allergies, the nurse fails to pass this on to the A&E doctor, or to enter the details in the electronic medical record (EMR).

Nevertheless, there is considerable evidence, both from research and from different analyses of adverse events or poor-quality incidents (Joint Commission 2007b), that lack of coordination is the most common indirect or contributing cause of poor-quality outcomes.

The remainder of this chapter details some of the evidence found in the search, using the grading system of E1-4 described in section 3.2 in Part 1.

Poor coordination process quality

In hospitals

- 70% of analyses of reported hospital adverse events identified communication failure as the main or contributing cause (E4, Joint Commission 2007b).
- 28% of most US hospitals did not meet the Joint Commission's accreditation safety-goal standard of communicating a complete list of the patients' medications to the next provider (E3, Joint Commission 2007a).
- Key clinical information was not available one-third of the time, in either written or oral sign-outs (E4, Horwitz et al 2009).
- 59% of US surgical and medical residents reported that one or more patients had been harmed during their most recent clinical rotation because of poor hand-offs, and 12% reported that this harm had been major (response rate 68% of the 238 surveyed). The study notes that information was often missing, incomplete or inaccurate, and that 'many best-practice recommendations for handoffs are not observed,

although the extent to which improvement of these practices could reduce patient harm is not known' (E4, Kitch et al 2008).

- A UK study of trainee doctors and night nurses found that many considered that the patient handovers given by their colleagues on earlier shifts were inadequate, in terms of the information that they were given from their colleagues (E4, Cleland et al 2009).
- US doctors surveyed in 2003 reported that patient medical records, tests or other relevant medical information were 'not available at the time of patient visit 72% of the time', and only 34% reported receiving timely information about referrals (E4, Commonwealth Fund 2003).
- 5.6 communication errors was the median rate found for a postoperative hand-off to PICU for paediatric heart patients. These most commonly involved information about a patient's medical history or current surgical intervention (87 % of communication errors) (E3, Mistry et al 2009)

Between hospitals and primary care

(Note: many studies cited here are from small samples of US doctors and/or give their perceptions of adequacy of coordination).

- 3% of primary care physicians (PCPs, US general practitioners) were involved in discussions with hospital doctors about patients' discharge plans (E4, Kripalani et al 2007).
- 30% of US emergency department patients reported that their regular doctor had not been informed about the care they received there (E4, Schoen et al 2004).
- Information about the discharge plans and medications were found to be provided by the hospital to fewer than half of primary care physicians in one US study (E4, Moore et al 2003).
- In 49% of referrals to 122 US paediatricians, no information was sent to the specialist, and the referring doctor received feedback from the specialist only 55% of the time (E4, Forrest et al 2000).
- 28% of US primary care physicians and 43% of specialists were dissatisfied with the quality of information they received from each other. Four weeks after a specialty visit, 25% of specialists' assessments had not reached the primary care physician (E3, Gandhi 2005).
- In a US survey of adults with chronic illness or a recent acute illness who had been hospitalised in the previous two years, 33% of respondents reported that no follow-up arrangements had been made after hospital discharge (E4), Schoen et al (2005). In a later work (2007), Schoen et al detailed similar under-performance in other countries and other coordination evidence.
- In another US study, 10% of patients readmitted within 30 days were found not to have had any ambulatory visits before they were rehospitalised (E3, Jencks et al 2009).
- Vira et al (2006) found a 38% discrepancy between ambulatory and hospital medications records for newly hospitalised patients (E4), and in another study the figure was found to be over 50% (E4, Gleason et al 2004). Meanwhile 85% of current medications in the inpatient chart were found to be nonexistent or incorrect (E4, Rozich and Resar 2001), and 42% of patients had one or more errors in the discharge medication orders (E4, Moore et al 2003).
- 70% of UK GPs reported late discharge summaries 'often' or 'very often'. Of these 90% reported it 'compromised clinical care' and 68% reported it 'compromised patient safety'. One summary arrived 11 years late. Many were incorrect, illegible, with unknown acronyms, no patient name or diagnosis or changes in medication (E4, The 2007 NHS Alliance survey of 500 GPs).
- The 2008 survey was similar, but made more note of the financial costs, 'one doctor estimates she spends half a day a week chasing up information from the hospitals which was not provided... further costs are incurred due to readmissions.' Financial penalties are being introduced by purchasers for discharge summaries five or three days late with some using the summary with coding information included as a proxy invoice (E4).
- 15% of outpatient appointments were affected by missing clinical information, with 1.5% of patients having the whole medical record missing on average in seven UK NHS hospitals in one study (E3, Health Foundation 2010). In 20% of cases, doctors judged that patients were exposed to risks as a result. This extrapolates to exposure to risk in 2m appointments annually. There was large variation between the hospitals with one organisation having one record missing out of

411 in the study. Four other clinical systems studied were found to have an average failure rate of between 13%–19% with one organisation 37% and another 12%.

In primary care

- One authoritative NHS report asserted that 250,000 emergency admissions to UK hospitals could be prevented through a systematic approach to care for people with long-term conditions (E4, NHS Modernisation Agency 2004), but provided no strong supporting evidence.
- 30% of US primary care physicians were unaware of their patients having been hospitalised. Many frail, older patients reported problems following discharge. This was twice as likely to occur when the primary care physician was not aware of their hospitalisation (E3, Arora et al 2010).
- 60% of patients (n=63) had drug record discrepancies in their electronic medical records in an outpatient haemodialysis centre (E3, Manley et al 2003).
- 13% of records had complete medication documentation of the 76 % of patients with prescribed medications in a US ambulatory family practice. There were 26.3% discrepancies of charts of patients requesting prescription renewal. Of charts with discrepancies, 59% did not show medications listed in the electronic medical record medication list (E3. Ernst et al 2001).

4.3 The costs of under-coordination

There is less evidence about any costs of under-coordination. It is also less strong because most of the costings have been made in studies where the link between under coordination and patient outcomes is likely, but uncertain. Some evidence includes:

- US\$17.4bn in 2004, was the estimate of the cost of hospitalisations which may have been avoided by better coordination (out of US\$103bn Medicare hospital payments), in a study of rehospitalisation within 30 days for US Medicare (elderly) patients, 50% of which were thought to be preventable by better coordination (Jencks et al 2009).

- Kelley (2009) estimated that lack of care coordination accounts for 6% of healthcare waste in the USA (costing US\$25bn-\$50bn annually) from: inefficient communication between providers, including lack of access to medical records when specialists intervene, leads to duplication of tests and inappropriate treatments that cost. The overview also assessed inadequate care for preventable conditions to account for 6% of healthcare waste with US\$25bn-\$50bn spent annually on hospitalizations which are less costly to treat with better access to timely care.

Summary

There are a number of challenges facing researchers seeking to assess the percentage of adverse events or poor quality associated with under-coordination. However, the evidence cited earlier, and the effectiveness of coordination interventions presented in the next chapter, suggest that there is a high – but as yet unquantified – cost of failures such as:

- Under-coordination of medications between providers (failures in accurate transfer of medication information from one provider to another).
- Inadequate handovers, transfers and collaboration between shifts, professions and services – especially between primary care providers and specialists, and nursing homes and hospitals.
- Not providing service coordination and support to patients whose hospitalisation could be prevented by this.
- Under-coordination resulting in delay or lack of access to necessary services, resulting in higher emergency or acute-care costs – especially for poor and vulnerable people who are less able to find and obtain the preventative or primary care they need.

Although there is growing evidence of poor quality resulting from under-coordination, hardly any studies have sought to estimate the costs, and virtually none have carried out precise costings. None had estimated the costs to patients or carers of under-coordination.

Hypotheses about the possible cost consequences of these and other types of under-coordination formed by the author of this review based on the research suggests that the total could amount to 5% of total healthcare costs, about 3% could be reduced by interventions and new models of care, of which possibly 1% would pay for themselves.

4.4 Patient groups for whom improvements are most necessary

In surveys, many patients say that they experience poor coordination, and voice concerns that they have to work hard to connect different providers – and often purchasers as well – when they are least able to. Patients with long-term conditions, who often need input from a number of providers, say that coordination improvements are needed. There is a growing view that patients in the final stages of life could benefit from the option of coordinated help to die without pain and with support at home.

No research has considered this question comprehensively and systematically, by looking across the full range of patient groups and comparing which of these suffer most from under-coordination. There are some studies of under-coordination in specific services, or at service interfaces, and some that ask which patients are at highest risk of hospitalisation. Different types of coordination are needed for the patients in following groups:

- patients following hospitalisation
- patients who have many different specialists involved in their care
- patients with needs for long-term care coordination or prevention outside of hospital.

Patient groups most at risk

An overview of the literature included in this review suggests that the following groups of patients are most at risk of adverse events, or of sub-optimal outcomes from under-coordination.

There is evidence that significant numbers within these groups experience under-coordination in many health systems:

- **Acute life-threatening illness:** this group of patients experiences deterioration both in hospital, where help from a critical-care specialist or other specialist could avoid further deterioration, and outside of hospital, for certain undiagnosed but detectable cancers and other illnesses.
- **Chronic illness:** this group experiences single long-term conditions that often require specialist and general medical care as well as social care, either at the same time, or on separate occasions. It includes patients with heart failure, diabetes, asthma, chronic depression or psychosis, arthritis, and some cancers.
- **Multiple illnesses:** this group includes patients in hospital, and in the community, who have multiple conditions – especially older patients and mental health patients with one or more conditions, as well as those experiencing heart failure, diabetes, asthma and mental health or addiction problems.

Patient groups benefiting most from improved coordination

Overall, the evidence suggests that the patient groups that would benefit most from improved care coordination include:

- patients with multiple morbidities
- cancer patients
- those with chronic conditions such as heart disease, diabetes, asthma, arthritis, and chronic depression
- some older or mental health patients who require services from health, social and welfare sectors.

Stakeholder priorities

Views about which coordination improvements are most necessary differ according to stakeholder group, as follows:

- **Hospital managers or specialists** may consider that better coordination is the most important factor for fast discharge into post-hospital care, and for those patients where there are penalties for unplanned readmission.

-
- **Healthcare funders** may consider the most important coordination improvements to be those that reduce the overall costs – typically for people at risk of hospitalisation or of using other health service resources that could be avoided through better coordination. These include patients with heart failure, asthma, diabetes, serious mental health problems, and other conditions such as stroke – often in combination with low income and poor living conditions.
 - **Patients and carers and their associations** have their views about which coordination improvements are most necessary, but there appears to be less evidence, and less research, about which types of coordination improvements they want, and of the costs and benefits of interventions to improve these types of coordination.

4.5 Summary

This chapter presented the main evidence found in the search about the extent of under-coordination, its costs and who it most affects. The next chapter considers possible solutions, the evidence of their effectiveness, and the costs to introduce and sustain them.

Chapter 5

Improvements to coordination and evidence of effectiveness

5.1 Introduction

This chapter presents the main evidence found in the review about solutions to the problems of under-coordination described in chapter 4. First it summarises the different types of coordination which can be used to give better care, and then presents the evidence under these headings:

- **Coordination-only interventions:** these focus solely on improved coordination.
- **Coordination-plus interventions:** combined interventions that incorporate improved coordination alongside other changes.
- **Patient process redesign:** interventions that use a specific approach to improved coordination.
- **Large-scale programmes to implement and spread improvements:** incorporating strategies to scale up or spread successful interventions.

5.2 Different types of coordination used to give better care

A wide range of changes and interventions designed to improve coordination are reported in the research. Table 2 summarises these under different categories (which sometimes overlap), ranging from the simplest to the most complex. They are described in more detail in the remainder of this chapter.

Table 2 describes coordination inside one organisation such as a hospital (*intra-organisational*), and coordination between two or more organisations (*inter-organisational*). The left-hand column lists the different types of coordination that might be carried out in either of these contexts:

- **Sequential coordination**, commonly known as handover.
- **Parallel coordination**, often known as co-working.
- **Indirect influences on provider relations**, including interventions to encourage both internal and external coordination.

The activities listed within each coordination type (for example, education or communication changes) describe specific interventions that research has found results in effective improvement within the intra- or inter-organisational context. The third coordination type – indirect influences on provider relations – is presented in just one column, as it describes interventions designed to improve coordination both intra-organisationally and inter-organisationally.

Many interventions combine one or more of the changes identified in table 2, in a coordination-plus intervention, which often involve new types of treatment or self-care.

Table 2: Commonly used types of coordination changes

Coordination type	Intra-organisational	Inter-organisational
Sequential coordination	<ul style="list-style-type: none"> – Education: to develop more awareness of different provider roles, the need for coordination, and better ways to communicate. – Communication changes: especially standardisation and protocols; medication reconciliation; handover forms, checklists and computer systems; and electronic medical records. – Co-location: locating one part- or full-time professional near one or more others. – Multidisciplinary team: creating a group of practitioners for more effective co-working than would be possible without such a group, often for a specific patient group. – Process redesign, reengineering and lean manufacturing: instead of using a care coordinator role to link providers across existing structures, this approach changes the structures to create better patient flows and improve coordination, as a direct or indirect result of the process improvement. 	<ul style="list-style-type: none"> – Education. – Communication changes: especially discharge summaries and planning, standardisation and protocols, medication reconciliation, and electronic medical records. Some telemedicine for remote consultation falls into this category and overlaps with specialist outreach. – Specialist outreach: for example, a mental health worker in a primary care service. – Changing relations between primary and specialist care: for more appropriate or fewer referrals – especially between primary care physicians and specialists, and using different educational, organisational and financial interventions. – Multidisciplinary teams.
Parallel coordination	<ul style="list-style-type: none"> – Care coordination roles and systems: a named provider carries out coordination tasks (often supported by a care assessment and planning system), usually superimposed over existing structures such as case manager, care manager, key worker or care coordinator. – Multidisciplinary teams. 	<ul style="list-style-type: none"> – Care coordination roles and systems. – Multidisciplinary teams. – Multi-component disease management systems: combining some of the other types of coordination and involving supported self care and sometimes new types of treatment.
Indirect influences on provider relations	<ul style="list-style-type: none"> – Measurement to detect poor communication: this involves measuring compliance with communication or collaboration standards, or coordination-related events or outcomes (as in some quality or safety measurement systems) that may also be reported back to providers. – Limited financial incentives or penalties: for example, for actions to improve coordination, or for performance on coordination indicators. – Changes to financing system: this involves adding payments for extra time spent on coordination, or moving from ‘item of care’ payment to ‘episode of care’ or population-based payment, or to pooled budget, where funds for health and social care are combined. – Integrated care, services or programmes: this is the broadest of all the coordination categories, and often describes macro-structure integrations, such as managed care organisations. 	

5.3 Evidence of effective coordination methods

The rest of this chapter presents research organised into different categories of interventions and approaches to coordination. It emphasises reviews or meta-analyses (denoted ‘Rev’) of studies with both quality improvement and costing data, followed by those providing quality data only. The evidence is graded as E1, E2, E3, and E4, as described in the methods chapter (see section 3.2).

The interventions are presented under the following three headings, with details shown of whether cost data is included:

- **Coordination-only methods**, including handover, medication reconciliation and discharge.
- **Coordination-plus methods**, including multidisciplinary team, care management, disease management and other interventions.
- **Process and other improvement methods**, including patient pathway flow redesign and integrated pathway improvement.

Coordination-only interventions

Handover – no cost data

Many studies and reports describe the development of different systems to improve handover (see Wong *et al* 2008), but few describe patient outcomes, and none give cost data that would allow assessment of savings. None reached E1 or E2 level of evidence, and many did not qualify for the E4 level of evidence. No systematic reviews were found. Only those that reported outcomes are noted below:

- One early study, which was part of a larger RCT, describes a standard handover card for interns at a Mayo Clinic, USA (Lee *et al*, 1996). For this intervention, poor handover was reported on 5.8% of 1,385 patient care episodes over 92 days, vs. 14.9% in controls. 80% of the interns said the standard card helped them stay organised and improved patient care (E3).
- Webster's 1999 study of a nurse handover intervention was of various changes to help nurses use new tools for handover at the bedside. Results show higher interaction and satisfaction for both patients and staff (E4).
- A new handover approach to improve nursing 'bedside handover' in a US medical centre was described by Anderson & Mangino (2006), who present data showing it reduced the amount of overtime and was assessed positively by patients, nurses and physicians. Nurses reported better understanding of patient care and physicians reported better satisfaction. The intervention, however, was a resource intensive change programme (unquantified) with seven steps (E4).
- Another resource intensive intervention based on crew resource management and formula 1 team principles was reported by Catchpole *et al*, (2007) for a paediatric surgery medical team to handover to an ICU team in one UK hospital. The procedure developed had four steps: pre-handover, equipment and technology, information, discussion and plan and covers 11 safety topics. Findings showed information omission was reduced from 2.09 to 1.07, duration of handover reduced from 10.8 minutes to 9.4 minutes, and fewer technical errors (E3).
- Petersen *et al* (1998) evaluated a computerised based handover implementation to improve continuity of care. The analysis of self-reported adverse events showed a reduction to 2.4% adverse events from 3.9%, with a trend in reduction of preventable adverse events to 1.7% from 1.2%. Odds ratio of adverse event reduced from 5.2 to 1.5 post-intervention. It was popular with doctors and gave quite strong evidence of improved patient safety, but no costings were reported (E3).
- One UK hospital developed a simple computer word processor list for medical residents shift handover, covering: patient demographics, procedures and diagnosis, current treatment and potential problems, health status and tasks. The findings of the study by Harrison *et al* (2005) reported better documentation with a weekend plan and resuscitation decisions. User perceptions were that the form was straightforward and user friendly. But there was no improvement of weekend review or documentation of discharge date and some reduced detail about decisions regarding DVT prophylaxis was observed (E4).
- A computerised handover system for 14 medical inpatient resident teams was evaluated by van Eaton *et al* (2005) using a RCT cross-over study design. The findings were that the quality of handover was reported by residents to be better, reduced pre-rounding time on photocopying from 24% to 12%, reduced team rounds by 1.5 minutes per patient, and reduced the number of patients missed on resident rounds by half (5 to 2.5 patients/team/month) (E3).

Handover – summary: Most studies are of more sophisticated interventions than just a new handover form, and most studies emphasise the need for a careful co-development of the system with users and for a number of interventions. Most studies were descriptive and presenting user satisfaction, self-reports or intermediate outcomes.

Medication reconciliation (MedRec) – no cost data

No costed studies were found of MedRec interventions but an indication of possible cost saving is provided by Rozich and Resar (2001). Their study reported decreased nursing time at transfer from the coronary care unit by 20 minutes per patient, and reduced pharmacy time at hospital discharge by more than 40 minutes with a MedRec system. Rozich et al (2004) reported that for each patient admission or transfer, nurses would sometimes spend over an hour attempting to identify what medications a patient had been receiving. This might involve obtaining a list of pre-admission medications from the patient or contacting the pharmacy or primary care physician.

There are a number of studies evaluating different paper and computer-based systems in different settings that have found significant reductions in medication errors or other process indicators – for example:

- **Community hospital** Kramer et al (2007), Coffey et al (2009), Wortman (2008).
- **Nursing home** Stock et al (2009), Bails et al (2008), Varkey et al (2007), Agrawal and Wu (2009), Delate et al (2008).
- **Other reports are provided by**, Rozich et al (2004), Rogers et al (2006), Vira et al (2006), Pronovost et al (2003), (2004), Paquette-Lamontagne et al (2002), DeCarolus et al (2005) Nassaralla et al (2007) and Varkey et al (2007).

Those with computer blocking (Agrawal and Wu 2009) or computer-based, but not electronic medical record-based, interventions (Wagner and Hogan 1996) were the most effective (Bails et al 2008, Pronovost et al 2003, 2004 (ICU)), but the cost-effectiveness of these is unknown. (All but one was E4 evidence strength).

In summary, medication reconciliation reduces errors, and is likely to reduce adverse drug events and to save the extra costs and suffering caused by such events, if it is carefully co-designed with users. In particular, specially designed computer-based systems appear more effective than electronic medical record add-ons.

Co-location – costed studies

Co-location does not in itself increase coordination, but it does make it easier to achieve, because one professional is located at the same site or building as others dealing with the same patient group. The most common co-location interventions are for a specialist health or social worker to be based part-time or full-time with a primary care provider:

- ‘Rev’: One Cochrane review of 38 co-location studies found three studies that considered costs, and found higher costs for some patient groups and lower costs for others, but that adding of a mental health worker to the primary care team overall did not have any significant effects on provider behaviour (E3, Bower 2000).

Specialist outreach clinics – costed studies

- ‘Rev’: One review of nine studies of different designs evaluated specialist outreach clinics where one or more specialists visited a primary care or rural setting in order to increase collaboration between primary care providers and specialists (E3) Gruen et al (2003). Two studies found this coordinative strategy to cost less per patient (71 pence, and AUD\$173). Two studies found it to be more expensive (US\$487 and US\$296 more per patient), but one study which considered health outcomes found the outreach to be 7% more cost-effective. The review found overall that specialist outreach clinics can improve access (decreased cost, distance and travel time for patients), attendance at clinics, quality of care (adherence to guidelines and to treatment) and health outcomes.

Shared care – no cost data

- ‘Rev’: One review considered arrangements where a GP and specialist communicated more than usual in providing care for patients (E4) Greenhalgh (1994) – see also NHSLN (2001). It found that care that is structured and supported by a liaison team of GPs and specialists can provide the same levels of care as that provided in hospitals. Successful schemes tended to have a trained, experienced liaison nurse responsible for coordinating, and a shared-care programme tailored to local needs and resources.

Changing referral – no cost data

- ‘Rev’: Two Cochrane reviews were made of RCT and other experimental studies of many types of interventions to improve referrals from primary care to specialists: education, organisational, and financial Grimshaw et al (2005), Akbari et al (2008). The conclusions of both were that two interventions were effective for improving appropriateness of referrals: guidelines for referrals distributed with standard forms with specialists involved in the education, or if a second opinion or enhanced services are provided before a referral (E2). There was not enough evidence to show which intervention was effective in linking primary care with specialist care or whether financial interventions changed referral rates, but ‘in-house’ second opinion and other intermediate primary care based alternatives to outpatient referral appear promising.
- One US study of relations between primary care physicians and specialists, carried out some years ago (Davidson et al 1992), assessed a change in doctor payment from a low-cost fee for service system to either a high-cost fee for service system or a capitation-based budgetary system. It found a reduction in the number of non-primary care referrals by providers receiving capitation-based remuneration, but little effect among those receiving increased fee for service. Quality outcomes were inadequately assessed (E3).

Nurse–doctor collaboration and practice-based multidisciplinary care interventions – no cost data

- ‘Rev’: Zwarenstein and Bryant (2000) (E4) conducted a Cochrane review of nurse – doctor collaboration interventions, but could not find studies that met traditional inclusion criteria. ‘Collaboration’ was defined as sharing information, coordinating work, and joint decision making about aspects of patient care. However, two of the studies considered showed some evidence that structured nurse – doctor collaborations could reduce length of stay without adversely affecting mortality.

- ‘Rev’: Zwarenstein et al (2009) conducted a review of five studies that evaluated the effects of practice-based interprofessional collaboration (IPC) interventions, such as multidisciplinary rounds, interprofessional meetings and externally facilitated interprofessional audit. Three of the studies found improvements in patient care such as drug use, length of hospital stay and total hospital charges (E4), while one showed no impact and one showed mixed outcomes. The review concluded that ‘practice-based IPC interventions can lead to positive changes in healthcare, but further studies are needed to have a better understanding of the range of possible interventions and their effectiveness, how they affect interprofessional collaboration and lead to changes in healthcare, and in what circumstances these interventions may be most useful’.

Interprofessional education - no cost data

- ‘Rev’: Three reviews considered evaluations of interprofessional education (IPE: giving training and education to professionals who learn together to improve the coordination of patient care by improving the way professionals collaborate with each other). Zwarenstein et al. 2001 found all the studies at that time did not meet their inclusion criteria for quality of design. Reeves 2001 considered IPE for personnel caring for people with mental health problems and used wider inclusion criteria to consider uncontrolled studies of various types, and concluded that the evidence was variable and not strong for different approaches to IPE (E4). Irajpour’s 2006 review was of IPE for better pain management which found IPE to have some effectiveness for improving pain management and coordination, but gave no real indication of the best approach (E4). Overall, IPE has the potential to improve coordination and pain management and care for patients with mental health problems, but there is no strong evidence of the costs of IPE or potential savings (E4).

Discharge planning only – costed studies

- ‘Rev’: Discharge planning and providing needs assessments to post discharge services is not very effective, but providing care plans as well is slightly more effective. This was the conclusion from a review of 20 RCTs of different interventions which aimed to influence access to health and social care after discharge from hospital (E3, Richards 2003). The interventions assessed aimed to carry out and then pass needs assessments and care plans on, rather than themselves provide post-discharge care. Two studies with costs reported very old money values: both showed lower costs for patients receiving the intervention (US\$8,956.44 vs. \$9,262.20 (1989–1992 values) and US\$3,630 vs. \$6,661 1982–1996 values)).

Discharge planning only – no cost data

- ‘Rev’: Different changes to discharge information transfer were found to improve process quality measures reported in the 18 intervention studies reviewed by Kripalan (2007)(E4), but none provided evidence of outcome quality or costs. Most of the interventions were discharge summaries or a change to how the summaries were sent.

Multidisciplinary team only – costed studies

- ‘Rev’: Five RCTs in a Cochrane review that compared community multidisciplinary teams or community mental health teams (CMHTs) with standard care for severe mental illness found total costs that were 12–53% lower for multidisciplinary teams Simmonds et al (2001) (E1). The CMHTs were associated with fewer suicides, reduced hospitalisation and hospital stay and fewer losses to follow-up, but resulted in no differences in patients’ social functioning.

Coordination-plus interventions

‘Coordination-plus’ refers to combined interventions that include better coordination as a primary or key change alongside other changes, such as reminding practitioners to provide treatments or assertive monitoring.

Nearly all multidisciplinary team models or interventions to improve teamwork include other changes such as care planning or use of guidelines, although often these are not made clear in the study reports.

In this review ‘teams’ were therefore classified as coordination plus interventions, although different team models involve more or less of the plus element, and most are evolved after the team is formed to use this structure to develop different team member coordination arrangements and other treatment enhancing methods made easier by the team structure (Øvretveit 1993).

Coordination-plus interventions are most often used for preventing hospital admissions and improving care for chronic diseases. Some US ‘medical home’ models include coordination as a primary element, while for others, coordination is a minor element (Fields et al 2010).

Discharge planning plus – costed studies

- ‘Rev’: A meta-analysis of 18 studies from eight countries found that discharge planning with support for older patients with congestive heart failure reduced readmission rates by about 25% and improved patients’ quality of life (E2) Phillips et al (2004).
- ‘Rev’: Money was reportedly saved in seven RCTs examining nurse-led and team-based post-hospital interventions for congestive heart failure that reported cost data. Readmission rates in the studies fell by between 22% and 45% (E3) McAlister et al (2001), Rich (2001) and Rich et al (1995). However, US studies later showed that these interventions are not cost-effective for all patients with congestive heart failure (E2) Congressional Budget Office (2004), DeBusk et al (2004). Those that reduced costs were those that started before or soon after discharge, focused on high-risk patients, and included face-to-face encounters with nurse care managers rather than telephone-only contact (Wagner 2004). But these reduced hospital income in the USA, and usually do not result in provider savings.

- ‘Rev’: A 20% median cost reduction was found in one review of 11 RCT studies of team coordination for stroke patient with early discharge from hospital, with a range of 4-30% cost reduction (E1) Langhorne (2005). There was significantly lower death or dependency in activities of daily living for teams coordinating discharge from the hospital and providing post-discharge care and rehabilitation at home.
- RCTs of the Transitional Care Model for older patients with complex needs leaving hospital show raised patient and family care giver satisfaction, and better physical health, functional status and quality of life. They also identified a 37% reduction in total costs (including those of the doctor, the hospital and home healthcare) and cost savings of US\$4,845 per patient, with total and average reimbursements per patient reduced with the Transitional Care Model compared to controls Naylor et al (1999, 2004) (E3).
- ‘Rev’: A review of coordination in primary healthcare settings found that team-managed, home-based primary care decreased costs for blood-pressure control, and lowered readmission rates and costs Barrett et al (2007) (E4).
- Seven US medical home demonstrations with coordination as a primary element reported different improvements in quality, and savings per patient ranging from US\$71 to \$530 (self-reports, summarised in Fields et al (2010) (E4)).
- Early findings from UK ‘virtual ward’ pilots show that this intervention is likely to improve quality but may not save costs by preventing hospital admissions. The estimates for Wandsworth (London, UK) are £520,000 costs per year, with £180,000 savings in avoided admissions for the first eight months Rankin (2010) (E4).
- Other primary studies (RCTs) show discharge coordination interventions can greatly reduce rehospitalisation (Coleman et al 2006 (a ‘care transitions intervention’), Jack et al 2009, and Naylor et al 2004 study already noted above with cost results for heart-failure patients). Importantly, some evidence from Peikes et al 2009 15 RCT review suggest community-based coordination approaches are ineffective for reducing rehospitalisations.

Assertive community treatment for mental health patients – costed studies

- ‘Rev’: Assertive community treatment (ACT) was defined as the ‘involvement of team medical personnel along with a case manager and team meetings to discuss treatment plans’ in a review by Latimer 1999 (E2). This review considered 34 studies using a variety of design. The most consistent effect was reduction in hospital use, especially if carefully specified models were followed (‘Based on costs in Quebec, high-fidelity assertive community treatment can cut costs if patients averaged more than about 50 days hospitalisation yearly’). Overall, ACT appeared to have lower costs, but there was not enough evidence from the studies of saved costs from avoided admissions to make clear conclusions.
- ‘Rev’: A later review also questioned the cost savings but confirmed the quality improvement of ACT (E1) Marshall & Lockwood (2000). It considered 26 RCTs of assertive community treatment for people with severe mental disorders compared to standard care, hospital-based rehabilitation and case management. The review was not able to draw clear cost-conclusions from the nine costed studies reviewed but some data suggested that ACT programs were more expensive. Patients receiving ACT were more likely to remain in contact with services and to be living independently, and less likely to be admitted to a hospital, to become homeless and to be unemployed when compared to standard community care. These findings were consistent when compared to hospital-based rehabilitation. There was insufficient data to allow for comparison to case management for patients remaining in contact with services and hospitalisation.
- ‘Rev’: Ziguras 2000 (E1) considered ACT and case management for severe mental illness in a review of 28 ACT and 16 case management studies. All studies in the community were with controls. Of the five costed studies, case management had lower total costs of care when compared to usual treatment.

Both ACT and case management reduced costs of care, family burden and family satisfaction. Case management increased admissions, but also decreased the total length of stay in the hospital. However, with ACT, the total number of admissions and the proportion of clients hospitalised were reduced. Overall, ACT was more effective in reducing hospitalisation compared to clinical case management.

Generally, the evidence to date suggests ACT is effective for caring for patients with severe mental illness in the community, but it is unclear from the research whether it reduces costs or whether it saves more than it costs. This may depend on how patients are chosen for the scheme.

Multidisciplinary teams – costed studies

- ‘Rev’: A review of 10 RCTs, focusing mostly on those with mental illness or terminal illness, considered multidisciplinary teams, case management and outreach or home care for vulnerable populations at home, or community homes or in hospice (E1) Wadhwa & Lavizzo-Mourey (1999). Compared to controls, half the studies showed no difference in costs. They showed significant differences between the two groups, with one reporting higher costs for the intervention group, but the quality of the cost data was insufficient to draw conclusions. None of the interventions consistently raised functional, clinical or psychological outcomes. Multidisciplinary outreach strategies were effective in reducing inpatient hospitalisations among patients with mental illness. Assertive case management was beneficial for this group, and improved their levels of satisfaction.
- ‘Rev’: For heart-failure patients, 15 studies found that multidisciplinary teams saved costs and three were cost neutral, as reported in a review of 18 RCTs including seven studies of multidisciplinary team heart-failure clinics and eight studies of multidisciplinary teams in a non-clinic setting providing follow-up (E1) McAlister et al (2004). Specialised follow-up by multidisciplinary teams reduced mortality, all-cause hospitalisation, and heart-failure hospitalisation rates.

The review identified that the factors critical to success were specialist heart-failure nurses, patient and caregiver education, and easy access to providers trained in heart failure.

- ‘Rev’: Palliative care teams were found by one review of 44 different types of studies to increase quality, but cost savings were unclear (E2) Higginson (2003). Palliative care teams were defined as ‘two or more health care workers, at least one of whom had specialist training or worked principally in palliative or hospice care’. One study reported a cost-effectiveness analysis. Other articles reported costs and resource use, but the designs and data collected did not allow any conclusions about costs or savings for palliative care teams. There was a trend, but not at a significant level, towards better satisfaction and therapeutic interventions. (See also the Brumley et al 2007 RCT),
- ‘Rev’: One review of seven studies of different designs of comprehensive multidisciplinary programmes for congestive heart failure found some weak evidence that they may save costs (Philbin 1999) (E2). Two studies reported lower costs in the intervention group resulting from fewer hospitalisations. Six studies reported that hospital admissions were reduced by 50–85%, and five showed improved functional status, aerobic capacity or satisfaction.
- ‘Rev’: Some models of coordinated health and social care for older people can result in improved outcomes, client satisfaction and/or cost savings or cost effectiveness, according to review by MacAdam (2008) (E2). Kodner (2006) proposed that a key element of this was multidisciplinary case management, for assessing and planning client needs, providing a single entry point into the healthcare system, and packaging and coordinating services (E4).

Multidisciplinary teams – no cost data

- ‘Rev’: A review of 141 studies for WHO Europe (Thornicroft and Tansella 2004) (E3) concluded that, for health systems with more resources, the evidence indicates benefits from ‘specialised’ CMHTs (primarily, ACT for patients with severe mental illness) or early intervention teams for early-episode psychosis.

ACT programmes reduced hospital use and improved patient satisfaction, but the study questioned whether benefits would be so great with the higher levels of continuity of care with UK alternatives to community mental health teams (CMHTs) (E2). The evidence reviewed showed that 'generic' CMHTs were appropriate for health systems with 'medium' levels of resources, and improved treatment adherence and satisfaction, but after all team costs were considered there was no evidence of reduced symptoms, better social functioning or lower costs.

- 'Rev': Gunn et al (2006) reviewed eight RCTs of 'complex system interventions', including multidisciplinary teams and enhanced communication, to increase recovery from depression in primary care. Eight RCTs had drop-out rates of 5–50%, but all eight also reported an increase in the proportion of patients recovering from depression (ranging from 10–33%) (E2).
- 'Rev': A review of a variety of study designs by Wadhwa and Lavizzo-Mourey (1999) concluded that multidisciplinary teams and case management did not provide better outcomes than standard care for functional, clinical or psychological outcomes for the patients with either mental or terminal illness living at home or in community. However, multidisciplinary teams did reduce hospitalisations of patients with mental illness (E2).
- 'Rev': Holland et al (2005) carried out an update of the McAlister et al (2004) review above. It also focused on RCTs of multidisciplinary teams for heart-failure patients (with most interventions involving symptom monitoring and self-management advice) and patient education. The study also found that multidisciplinary teams had lower all-cause and heart-failure admissions, and lower all-cause mortality. More effective interventions included those with telephone follow-up or a home-based component, but patient risk and intensity of the intervention appeared not to affect outcomes (E1).
- 'Rev': 'What do we know about health care team effectiveness?' was the question asked by this systematic review of the effectiveness of healthcare teams (Lemieux-Charles & McGuire 2006), defined as 'a collection of individuals who are interdependent in their tasks, who share

responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems (for example, business unit or corporation), and who manage their relationships across organisational boundaries'. The review was of 12 studies of teams compared to standard; 12 multi-site field studies, and nine team redesigns. The conclusions were that teams appeared to improve care, and that staff satisfaction and perceived team effectiveness appeared to be dependent on collaboration, conflict resolution, participation and cohesion, but no detailed guidance could be drawn for designing teams from the studies (E3).

Case management – costed studies

- 'Rev': One early review defined case management for mental health patients as 'outreach, identification, assessment and service planning, service linkage and monitoring, advocacy' (Gorey et al 1998)(E1). Five of six costed studies found lower intervention costs for case management of 'severely and persistently mentally ill people'. About 75% of case-managed care plans cost less than the average comparison care plan. In the 24 studies reviewed, about 75% of patients in a case management programme had better functional status, prevention of rehospitalisation and quality of life than comparisons.
- 'Rev': another early review of 11 studies of case management for mental health patients reported different findings (Marshall 1998): case management increased costs to healthcare providers, on average doubling hospital admissions compared to normal care, but may reduce cost to society (E2). This was an early review of case management for people with severe mental disorders in the community, including six costed studies. There was some evidence that case-managed patients were more likely to remain in contact with services but case management did not reduce hospital admissions - the rate was twice as high with these patients. One study reported a higher medication compliance with case management, but no other significantly greater clinical or social outcomes. There was evidence that case management increased costs for providers, but might reduce cost to society.

The conclusion was that the benefits over standard care were questionable ‘because a small advantage in numbers remaining in care is off-set by a large increase in admission rates, no obvious clinical gains and considerable uncertainty over costs.’ The evidence from this review is that case management is not a value improvement, but the number and quality of the studied reviewed mean the strength of evidence is not as high as the Gorey 1998 study above, but still achieved an E1 rating as all 11 were RCTs.

- ‘Rev’: In a review of case management for older people with congestive heart failure, of 17 studies with costing data, six showed significantly lower costs for case management-compared controls, six found no difference, and five did not report comparisons (Windham et al 2003)(E1).

Case management – no cost data

- ‘Rev’: ACT is normally a case manager-based model which identifies and proactively treats patients in the community, defined in one review as involvement of team medical personnel along with a case manager and team meetings to discuss treatment plans’ (Latimer 1999). The results most consistently found in this review of 34 studies of ACT for mental health patients was that it reduced hospital use, particularly if carefully specified models were followed (E2). For example, ‘in Quebec, high-fidelity assertive community treatment can cut costs if patients averaged more than about 50 days hospitalisation yearly’.
- ‘Rev’: One review of mental health services considered both ACT and case management models, comparing both to controls (Ziguras and Stuart 2000) (E1). Both approaches reduced costs of care, family burden and increased family satisfaction. Of the five costed studies case management had lower total costs of care when compared to usual treatment. Case management increased admissions, but also decreased the total length of stay in the hospital. However, with ACT, the total number of admissions and the proportion of clients hospitalised were reduced. No cost data, but both ACT and case management reduced hospitalisation, with ACT being more effective in this.

Overall, there was more contact of ACT clients with mental health services, fewer drop outs, improved family satisfaction and outcomes and fewer hospital days per client.

Case management for older people

- In the United States, some well-evaluated programmes for older people have been found to reduce admissions and improve outcomes, and many have reduced costs to the health system. (See, for example, Kane et al’s 2003 evaluation of the US Evercare model).
- The evidence from UK and later reviews is less clear in part because of the UK case management approaches being different and because of increasing heterogeneity in newer approaches, especially when comparing programmes in different countries with different payment systems. US ‘Evercare’ models used intensive home nursing for patients when they became ill. One review of home-based care for older people found no effect on hospital admission (Elkan et al 2001).
- The Johari et al 2003 broad international review of a range of integrated care for older people, found that some models can reduce admission rates and costs of care. Two other reviews found little evidence that case management can reduce use of health services (Hutt et al 2004, Singh 2005).

Disease management – costed studies

Disease management, perhaps even more than other categories of interventions reviewed here, covers a large range of different types of scheme with multiple component interventions. Coordination is the main principle underlying the approach, but, in this authors view, the variety raises questions about how meaningful the evidence is which is provided in reviews and meta-analyses:

- ‘Rev’: A meta-analysis of 67 studies of disease management programmes for asthma, diabetes or heart failure (Krause 2005) (E1) concluded that disease management is ‘economically effective’ – especially for severely and moderately ill patients. The study also found that some types of disease management programme, such as team-based programmes, are more economically effective than others. Economic effectiveness was a composite effect measure of cost,

hospitalisations, clinic visits and emergency department visits reported in each study. The meta-analysis found that, in general, disease management was economically effective, but there were significant differences in types of interventions. Team-based interventions were the most economically effective, with nurse-based and self-managed less effective. Economic outcomes appeared to be better in interventions aimed at more severely and moderately ill patients than those for patients with mixed severity, and did not differ by disease type (heart failure, diabetes or asthma). Quality improvements were not assessed in detail.

- ‘Rev’: In a review of disease management for depression, Neumeyer-Gromen et al (2004) (E1) defined disease management as incorporating all of the following: patient self-management education, provider education, collaborative care, routine reporting and regular feedback between different professions, interdisciplinary discussion of treatment options and supervision by specialists. Compared with usual primary care, disease management increased adherence to treatment, improved patient and provider satisfaction and significantly reduced depression severity, in different degrees of depression, settings and US populations. In six studies, cost-utility ratios ranged from US\$9,051 to \$48,500 per quality-adjusted life year.
- ‘Rev’: Disease management for heart failure in the general population was the subject of one review of 19 studies (Whellan et al 2005). Of the 10 studies that were costed, five showed significantly lower costs with disease management compared to usual care, one reported significantly higher costs, and four others found no difference between the two groups. Overall, disease management was associated with significant decreases in all-cause hospitalisation.
- ‘Rev’: One review found that disease management for heart failure in older people had reduced costs in nine studies, and in two it had made no difference (E1) (Yu et al 2006). The review defined disease management as ‘using multiple interventions in a systematic manner to manage heart failure across health-care delivery systems’. The 11 ‘effective programs’ improved quality of life, decreased hospital readmissions by 29%–85%, and were cost saving.

Four significantly reduced mortality rates by 28%–78%. Effective disease management provided a wider range of in-hospital care, was more likely to include home visits and ongoing surveillance and management, and involved multidisciplinary teams or care that included both a cardiac nurse and cardiologist.

- ‘Rev’: Disease management with multidisciplinary teams and specialised clinics was reviewed by McAlister 2001 (E1). Three of the two studies with costings reported cost savings, reduced rates of admission and length of hospital stay (12 RCT studies reviewed general population). No effect was found on recurrent myocardial infarctions or all-cause mortality, but intervention patients were more likely to be prescribed appropriate medications. Five of seven trials showed significant reductions in cardiovascular risk factors of cholesterol, smoking cessation, blood pressure and possible higher quality of life.

Disease management – no cost data

- ‘Rev’: The Norris et al. 2002 review compared the findings of 27 studies of disease management, ‘organised, proactive multi-component approach to healthcare delivery...care is focused on and integrated across the entire spectrum of disease and its complications, the prevention of co-morbid conditions, and the relevant aspects of the delivery system’ with 15 studies of case management ‘a set of activities whereby the needs of populations of patients at risk for excessive resource utilization, poor outcomes or poor coordination of services are identified and addressed through improved planning, coordination and provision of care’. The study found improvements with disease management that were consistent in the US and Europe with both community and managed care systems. The improvements found were in process quality indicators of glycemic control (drop by 0.5%, in screening and monitoring of lipid concentrations 15.6% (range 4% to 39%), dilated eye exams [9% (range 3% to 20%)] and foot exams [26.5% (range 11% to 54%)] (E2).
- ‘Rev’: The Knight et al. 2005 systematic review of diabetes disease management programmes also reported positive findings and found a significant

mean reduction in patients' glycosylated haemoglobin of 0.5% points, and that those with the highest reductions involved pharmacists counselling patients, and interventions to both physicians and patients (E2).

- 'Rev': Generally, disease management did not improve functional status of rheumatoid arthritis patients, was the conclusion of a review of 11 RCTs and studies with other designs (Badamgarav et al. 2003). However, the review found interventions lasting longer than five weeks gave significant improvements in patient functional status, but intensity of intervention did not affect functional status (E3).

Other coordination-plus interventions

Integration interventions – no cost data

- 'Rev': One study (Briggs and Garner 2006) reviewed 'a variety of managerial or operational changes to health systems to bring together inputs, delivery, management, and organisation of particular service functions'. The conclusion from the five studies reviewed was that there was no clear evidence of the effects of integration on cost. One study found that costs per patient were higher than with usual care, while another found that integration interventions were less costly (E3).
- 'Rev': Jeffery et al (2000) (E2) carried out a Cochrane review of integrated programmes for psychosocial treatment for people with both severe mental illness and substance misuse problems. The review considered six studies of integrated care programmes (with substance misuse treatment integrated with psychiatric care provided by the same team), and one study of case management with five hours a week substance misuse treatment groups. The review studied the effect of integrating services in a single location for patients with both mental illness and substance misuse issues. It found no strong evidence of different outcomes for any of the programmes compared with psychiatric treatment alone, but identified some evidence that a residential integrated programme was more likely to retain patients than non-residential programmes.
- 'Rev': A review of integrated care programmes or schemes for older people Johri et al (2003) (E4) did not find good evidence of outcomes, but did

identify useful descriptions and success factors. It considered studies in different countries of community-based long-term care schemes and reforms to provide integrated care for older people. It identified the following common success factors in seven effective integrated care programmes: a single entry-point system, case management, geriatric assessment and multidisciplinary teams, and the use of financial incentives.

'Organised cooperation' – no cost data

- 'Rev': Mitchell et al (2002) (E2) reviewed seven RCT studies of formal cooperation and liaison arrangements to involve and link family practitioners/GPs with specialist teams. It was not possible to draw conclusions about costs because the cost of creating the arrangements could not be calculated. There was some evidence of better physical and functional health outcomes, but this varied between the studies, with some interventions resulting in clear improvements for patients with chronic mental health conditions. Interventions in primary care and/or outpatient or home-care settings reduced use of A&E/emergency department, but hospital-based interventions appeared to have little effect on their use. Interventions with greater integration with primary medical care and those targeting high-risk patients also appeared to reduce use of emergency departments.

Continuity of care interventions

- 'Rev': Crawford et al (2004) (E3) carried out a 'narrative review' of 60 studies (many of which were qualitative) of factors and interventions that helped or hindered continuity of care for patients with severe mental illness. These interventions included assertive community outreach and CMHTs. The review defined continuity as longitudinal (over a period of time, often involving continuity of provider) and cross-sectional (continuity of care between different services or settings). However, it noted that most studies did not provide clear definitions. There were few experimental studies in this topic, with some non-randomised trials but mostly epidemiological or qualitative research. The review noted three meta-analyses of case management, assertive community outreach and CMHTs that showed that these interventions can prevent loss of contact with patients.

It concluded that care coordination was important for care between primary and secondary services, and between medical, social and other services. (See also Parker et al 2010).

Telemedicine – no cost data

- ‘Rev’: A review of tele-rehabilitation interventions in the community by Kairy et al (2009) (E4) found improved attendance and compliance. Only five of the studies examined costs. The review shows some early evidence of potential cost savings for the provider.
- ‘Rev’: Remote patient management interventions hold great promise and show some evidence of providing coordinative value improvement. These include physiological monitoring, protocol-driven decision support, new provider, and telecommunications for providing services to patients distant in space, or time (Coye et al 2009) (E4). The Parè et al 2007 review found monitoring of chronic disease accurate and positively affects patients’ attitudes, behaviour, and satisfaction, with lower in emergency department (ED) visits and hospital admissions across studies of pulmonary and cardiac disease, but varied in diabetes (E3). Reduced rehospitalisations for heart failure was reported in four US hospitals from in-home monitoring and coaching after hospitalisation for congestive heart failure (CHF) at rates of 72% and all cardiac-related hospitalisations of 63% (Brookes, 2005) (E4). Kaiser Permanente has also reported 33%–50% lower cost of care delivery and increased patient satisfaction from early pilots Johnston et al 1997) (E4).

Rapid-access chest pain clinics

- ‘Rev’: This is another model where improvements due to better coordination are difficult to separate out from other aspects of the model that appear to influence the improved outcome – primarily, in terms of faster treatment where needed. One review of investigation facilities for chest pain (Mant et al 2004) included nine studies of rapid-access chest pain clinics. The (mostly weak) evidence suggested that this type of clinic might increase detection of acute coronary syndrome, enable earlier assessment of exertional angina and earlier diagnosis of non-cardiac pain, and could possibly reduce hospital admission for patients with non-cardiac pain (E4).

However, the clinics had higher costs. A more recent study by Dougan et al (2001) indicated overall reduced costs for patient care, although the costing was based on doctors’ estimates of what the situation would be without the clinics. It argued that a daily immediate-access clinic could be the most effective approach for reducing unnecessary admissions for non-cardiac chest pain (Newby et al 1998).

Home healthcare and ‘hospital at home’ schemes

- The coordination component in this category of interventions is possibly less central than in others but significant results have been reported from US Quality Improvement Organisations, which reduced the trend towards increased hospitalizations by developing interventions with home healthcare agencies (Rollow et al 2006).

Patient process redesign

One large category of interventions that aims to improve coordination, directly or indirectly, is that of process redesign or lean manufacturing interventions (Womack and Jones 1998 and 2007). As regards effectiveness, spend costs and savings, the evidence of these is sparse and mostly in reports from implementers (Ben-Tovim 2007, 2008, Boaden et al 2008).

Clinical Pathways: These aim to make practice more evidence based and improve sequential and parallel coordination by defining actions for different caregivers at different stages in the patient’s journey through a service.

- One Cochrane review of a variety of study designs (n=27) evaluating ‘structured multidisciplinary care plans used by health services to detail essential steps in the care of patients with a specific clinical problem’ (Rotter et al 2010). Compared to usual care (n=20) there was reduced in-hospital complications and improved documentation, and lower length of stay, but no evidence of differences in readmission to hospital or in-hospital mortality. Overall there were lower hospital costs, but a wide range from +261 US\$ favouring usual care to -4919 US\$ for clinical pathways (in US\$ dollar standardized to the year 2000).

There was no assessment of whether lower hospital costs were associated with cost shifting to another health sector. Seven studies compared clinical pathways as part of a multifaceted intervention with usual care. No evidence of differences was found.

Other examples are:

- Reinertsen (2006) reported a reduction of patients contracting pneumonia while on ventilator from 40 to two per year, using an intervention that included a coordination improvement, with costs reduced from US\$1.6m to \$0.1m (spend costs unclear).
- Thompson et al (2003) identified a reduction of preparation time for antibiotics by four minutes per dose, giving nurse time savings of more than 5,000 hrs per year, but with no costings.
- Westwood and Silvester (2007) noted a 252% improvement in pathology productivity, with an estimated £365k in annual savings through earlier patient discharge, and delays in specimen reception being reduced from 13 minutes to one minute.

These and other reports and studies show that there is potential to improve value – in part, through better coordination.

Large-scale programmes to implement and spread improved coordination

There are no systematic reviews of different strategies to scale up or spread successful coordination pilots or interventions, and very few studies generally on scale-up or spread methods (Øvretveit 2010a). This section presents higher level infrastructure or programme interventions to carry out clinical coordination interventions which provide some costing data.

- One of the few detailed ‘spend cost’ studies of a large scale programme to improve coordination is by Liu et al. (2009). This study estimated the spend costs of a depression care improvement programme involving coordination changes in the USA public Veterans Administration (VA) system. The study considered all programme activities, including time spent reading e-mail and holding conference calls, payments to participants, and time of the technical support.

The cost of implementation was US\$100,000 per region for each of three regions - 85 % of these QI costs were for preparation and design. A third of the costs were on integration of the programme into the VA’s electronic health record system and the addition of the new model into standard policies and culture was also costly. The savings were not estimated. The report also was not able to assess whether spend costs would be less if the programme were replicated in other regions.

- Other spend cost reports for wide-scale programmes with a major coordination improvement element include a similar depression QI programme in Kaiser Permanente, which spent US\$166,503 for QI design and implementation in three practices (Rubenstein et al. 1995, 2002). The IHI estimates of costs for breakthrough collaboratives from an evaluation of three collaboratives on congestive heart failure or diabetes (Cretin, Shortell, and Keeler 2004) ranged from US\$81,000 per organisation to US\$148,000. In a similar depression collaborative, six privately funded organisations paid US\$12,500 each to participate (Meredith et al. 2006)

One final item of note: Mitchell & Lang (2004) describe coordination as comprising the most important contribution that nurses make to patient safety. She suggests that this ‘integrative function’ is probably ‘a component of the oft-repeated finding that richer staffing (greater percentage of registered nurses to other nursing staff) is associated with fewer complications and lower mortality’. However, there is no evidence that extra nurse staffing for patient safety is more effective if that extra staffing time is focused on coordination, or that other methods and systems are more cost-effective.

Chapter 6

Summary of findings

6.1 Under-coordination

Overall, this review found less evidence than expected about the amount and severity of poor quality resulting from under-coordination, and the evidence which did exist was not strong because causal links are not simple or direct. Even more striking was the lack of strong evidence about the cost of under-coordination. The evidence, however, is increasing and the potential cost appears to be high. The costs are possibly higher than for other large cost categories such as hospital-acquired infections or adverse drug events. Under-coordination may account in part for these and many other types of adverse events and poor quality. Much of the evidence of cost of poor quality comes from part of the single studies of single subjects which have considered the business case for specific improvements.

6.2 Solutions?

There is some evidence that some categories of coordination change can improve process indicators of quality (for example, for medication reconciliation), but much less evidence of improvements to end outcomes such as cost and clinical outcomes (for example, for case management). There is great variation of specific interventions within one category of one type of coordination (for example, disease management), and the same term is used to describe many types of interventions. Many of the reviews of categories of interventions do not penetrate into the details of the differences in the types of coordination, or of how they were implemented.

In addition, many coordination changes include other treatment or patient activation interventions (termed above ‘coordination-plus’ changes), and it is difficult and possibly inappropriate to separate these and assess their different contributions to results.

6.3 Costs and savings

The review found very little evidence of the ‘spend costs’ to carry out these, or other coordination interventions. Often savings reports do not calculate ‘spend costs’, or underestimate these costs. Often savings are potential savings which still need to be realised by a second ‘cash change’ – such as by redeploying personnel whose time is saved through better coordination, reducing staff or increasing income by treating more patients. There are a number of limitations with many costing studies, especially with the less research-based business case reports. These often do not take full account of all ‘spend costs’, or of other’s costs and costs to society.

Certainty about saving money and raising quality

Considering all the above, high certainty about achieving a coordination value improvement – saving money *and* raising quality by improving coordination – is not possible. The evidence should be viewed as giving indications of probable or possible value improvements, and the research as showing some of the choices. Much then depends on local adopters making their own estimates for the likely cost and quality results with their payment systems, given their adaption and implementation of the coordination change shown in the research.

With the exception of electronic medical records, and some computer physician order entry systems, no evidence of other benefits, or of possible negative consequences of most coordination intervention (Harrison et al 2007) have so far been reported (for example, clinicians time spent on coordination then reduces the time they were able to spend using their specific skills to help the patient, in a way which led to lower quality). For example, Horwitz et al 2006 propose that improving handovers can also contribute to building a safety culture, but there are no easy ways to measure and attribute any such changes to a handover intervention.

6.4 Preventing unnecessary hospitalisation

One conclusion that stands out from the evidence is that the coordination schemes which are most likely to be value improvements are those that prevent unnecessary hospitalisation, especially those targeted at frequently admitted patients or high emergency care users. Some of these improve processes and outcome quality of care for patients and cost less to make and operate than the costs otherwise incurred by hospitalisation.

However, a distinction needs to be made between preventable rehospitalisation for many types of surgical, medical and other types of patients (defined as 7-, 30-, or 90- day readmissions), and preventable hospitalisation for patients with chronic long-term illness, even though there is an overlap between these groups of patients. This distinction needs to be developed to take account of two sets of evidence:

- Some community-based coordination approaches – especially disease management – can prevent unnecessary hospitalisation of patients with chronic illness and other complex needs, and can improve value if those patients most at risk of hospitalisation are carefully targeted.
- Unnecessary rehospitalisation for a range of types of patients is more effectively prevented through hospital discharge schemes, often with hospital-based team supportive follow-up

(Coleman et al 2006, Naylor et al 2004, Jack et al 2009). (Peikes et al's 2009 review of 15 RCTs suggests that care coordination interventions that are limited to community settings are ineffective in reducing rehospitalisation).

However, only some of these enhanced discharge and support schemes may result in value improvements; early findings from the UK virtual wards pilots show that they incur higher costs than savings (Rankin 2010).

Finally, this quote from a recent study suggests a possible practical strategy:

'When the typical patient (US Medicare (i.e. over 65)) has almost two chances in three of being rehospitalized or of dying within a year after discharge... ensuring that a follow-up appointment with a physician is scheduled for every patient before he or she leaves the hospital is probably more efficient than trying to identify high-risk patients and arranging follow-up care just for them'. (Jencks et al 2009)

6.5 Summary

Part 2 outlined the evidence found in the review of research about under-coordination and about possible improvements to coordination. Part 3 now presents different analyses of these findings which show the implications for different stakeholders.

Practical implications,
recommendations
and analysis

3

Chapter 7

Practical guidance and problem solving

7.1 Practical guidance

This third part of the review presents actionable improvements which follow from the evidence reviewed. The purpose of this review was:

- to give practical guidance for improving quality and saving money which was based on the best available evidence
- to avoid giving misleading information about the effectiveness and savings of interventions by showing the strength of evidence behind recommendations and by emphasising that effectiveness and cost savings depend on context and implementation capability.

Tables 7.1 and 7.2 present an analysis of the findings which help readers consider the implications for action. Table 7.1 gives a way to match a problem to a possible evidence-based solution, as well as giving recommendations about practical local implementation. Table 7.2 shows specific patient conditions and the coordination value improvements that may be appropriate for them.

Guidance A: Matching the problem to the solution

Table 7.1 lists:

- **Problem.** This refers to negative events experienced by patients and avoidable waste, caused by under-coordination.
- **Possible solutions, for which there is some evidence.** Details of the strength of evidence are given in chapter six, summary of findings (p35).
- **Recommendations.** This column gives specific advice about local action, emphasising the need to adapt and test any solution.

Table 7.1: Matching the problem to a solution

Problem	Solution evidence	Recommendations
Generally, for all coordination problems and solutions		
<p>Patient harm, poor quality and wasted time and resources caused by under-coordination.</p> <p>Start by identifying patients most at risk or suffering due to under-coordination.</p>	<p>Evidence about methods and models of care that increase quality and reduce waste, but that cost less to implement than the savings or extra income they bring – either potentially or in the current financing system.</p> <p>Ideally, the evidence will also be about how to make the change, and the costs of making the change, not just whether the change improves quality and reduces costs.</p>	<p>Use the research to identify potential coordination value improvements and then estimate local cost, spend costs, and savings with the current financing system, or use a Return on Investment (ROI) calculator (NIII 2010) or business case method (for example, Martin et al 2009, or Nolan and Bisognano 2006). Consider establishing a cost and saving sharing agent (CaSSA) for situations where one provider gains from another provider's spending on coordination improvement.</p>
Matching patient need to provider coordination		
<p>Referrals: patients who are not referred to a specialist deteriorate and need more costly care, while others are referred unnecessarily.</p> <p>Delays: these often take place before specialist consultation.</p> <p>Inappropriate referrals: inappropriate referrals to specialists cost money and uses appointments needed by other patients.</p>	<p>Co-location: on its own, co-location may not cost less, but it usually gives some quality improvement.</p>	<p>Consider which patients this solution would be most likely to benefit, and estimate costs and savings of co-location and which additional changes are needed and their costs to ensure the effective cross-working made easier by physical proximity then occurs.</p>
	<p>Specialist outreach clinics: some schemes improved patient access (decreased cost, distance and travel time), attendance at clinics, the quality of care (adherence to guidelines and to treatment) and health outcomes, but some cost more than they saved.</p>	<p>If quality alone is important then this is a good option, but estimate the likely reduction of hospital admissions and the costs of avoidable patient deterioration in order to judge whether costs would be saved.</p>
	<p>Telemedicine: remote consultation, patient monitoring, proactive patient reminders or combinations of all these show great promise, and could be a coordinative value improvement if ICT infrastructure investments have already been made.</p>	<p>If someone else will pay for or share the costs of the system (and the high cost of running it), this can be a value improvement. Consider how much it would cost you to add video net access to specialists for specific patients, and likely savings. Consider home telemonitoring, if others can share or carry the costs of the system and if you can add the human actions that follow from the monitoring and have to pay only for staff time.</p>
	<p>Changing referral practices: two strategies are effective to reduce high inappropriate referrals by type and by provider:</p> <ul style="list-style-type: none"> – second opinion or enhanced services provided before a referral – guidelines for referrals, with standard referral forms and specialists involved in the education. <p>Other access-improving strategies for reducing delayed or non-referred patients include the two points listed above, but also specialist outreach, financial and transport changes and registers with case follow-up or case-finding personnel.</p>	<p>Identify which referrers or patients have the highest inappropriate referrals, and consider costs and likely effectiveness of these two potential interventions identified (see left).</p> <p>Identify delayed or non-referred patients and their providers, and assess the costs and quality impacts of different interventions, and the likely spend cost and impact of making the change.</p>

Problem	Solution evidence	Recommendations
Communications		
Patients not treated or receiving the wrong treatment: information or responsibility is not clearly passed on by one provider to another.	Handover system: the evidence mostly refers to interventions that are more sophisticated than simply a new handover form, and show the need for careful co-development of the system with users and the importance of adopting a number of interventions. Most studies show higher user satisfaction and better intermediate outcomes. Only one study reported possible loss of patient details (Grainge et al 2005).	Find an effective handover system that others have developed, and use this as a basis for developing a system led by local users of the system and senior clinicians. Most manual and computer-based handover systems reduce avoidable harm, but often cost more to make and operate than they save. Much depends on how difficult and costly it is to add a well-tested paper system to a computer system. Systems based on electronic medical record (EMR) only are less effective.
Adverse drug events and medication errors: providers do not know the patient's prior medications, or do not review the full list in relation to the patient's condition.	Medication reconciliation: MedRec reduces errors, is likely to reduce adverse drug events, and is likely to save extra costs and suffering caused by such events enough to pay for the cost of most manual and some computer-based MedRec systems.	Choose a MedRec suited to your service and adapt it and implement it collaboratively, following the examples of others. If it is properly co-implemented with high user involvement, savings are likely to cover costs and this will also help develop a quality and safety culture, which offers other benefits.
Inadequate discharge information: post-hospital providers receive insufficient information to plan the patient's care.	Discharge planning: the spend cost to develop this can be significant, but can reduce provider costs through faster discharge. A discharge care plan on its own has a minimal effect on care following discharge.	Consider simple, low-cost improvement to discharge information designed collaboratively with post-hospital services. Develop any communication change with users, based on proven examples.
Coordination plus other changes		
Inadequate after-care arrangements: patients are discharged without adequate after-care arrangements and may need readmission.	Discharge planning linked to after-care: evidence suggests that this is more likely than patient needs assessment or planning by the discharging unit to reduce preventable readmission and rehospitalisation, costs and clinical deterioration.	Consider whether hospital-based or primary healthcare-based support for older patients with congestive heart failure or stroke patients could be provided, modelled on models proven elsewhere. Make local costings and plan for how to address the issue of hospitals losing income from readmissions which would be prevented.
'Lost' mental health patients: patients become lost in the system, or unstable and possibly a risk to others, with high cost of hospitalisation for acute crisis.	Assertive community treatment (ACT): three reviews show that ACT is effective for caring for patients with mental health problems in the community, but whether it is cost saving or saves more than costs is unclear from the research and may depend on how patients are chosen for ACT.	Assess how far it is possible to identify and predict patients likely to require admission that might be prevented by ACT. Assess whether ACT could be built into existing services and be effective at a lower cost than setting up a new ACT service. If local politics are important then this may be a good option, as it is likely to be cost neutral if well implemented, and there may be community resources to help if this is already a high-profile issue.
Inconsistent or delayed mental health treatment: mental health patients in the community experience inconsistent treatment, or cannot access care until breakdown.	Community mental health teams: unclear or no effects on cost and quality outcomes, but a potential value improvement if patients who are at risk of hospitalisation are targeted and wider social costs are considered.	Calculate local costings for models that focus on preventing avoidable admissions. These are popular with users, but with generic models the costs are high compared to any savings.

Problem	Solution evidence	Recommendations
Coordination plus other changes continued		
Slow access to heart specialists: patients with heart failure lack rapid access to and support from specialists.	Multidisciplinary teams and education: teams offering follow-up with specialist heart-failure nurses and patient caregiver education can both be effective for reducing costs and raising quality for patients.	Consider this approach for heart-failure patients, and calculate local cost estimates.
Patient not knowing where to seek help: errors, harm, delays in treatment and waste take place due to patients not knowing who can best help and being too ill to struggle with the system, and due to providers having insufficient time to coordinate with others.	Care management: compared to process improvement, this is a lower-cost, lower-risk way to superimpose coordination over existing structures. It can improve value if those patients who can benefit most are targeted to reduce preventable hospitalisation or length of stay. There is strong evidence of improvement to the process of care indicators, but evidence of clinical and cost outcomes is weak.	Consider current hospital costs and quality deficiencies for patients with severe mental illness, and estimate costs and benefits of targeted case management for these patients, and for older people with congestive heart failure.
Preventable deterioration: patients whose health deteriorates and may need hospitalisation due to lapses in treatment or lack of access to the right specialist during flare ups in their condition.	Disease management: some schemes can prevent unnecessary hospitalisation and may improve quality of care and support. If patients are carefully selected, some disease management schemes may cost less than the cost of care if the patient deteriorates.	Consider seriously for severely and moderately ill asthma, diabetes or heart-failure patients at risk of preventable hospitalisation. Identify those patients most likely to benefit from proven disease management programmes and calculate local cost estimates.
Over-complicated processes: delays, waste and poor quality are caused by complicated processes involving many different steps, which hinder sequential patient coordination and flow.	Patient flow process redesign: there is inconclusive evidence and publication bias in relation to the many interventions grouped under this heading. This is an abstract label referring to many different types of changes. There are some relatively successful examples of value improvement, but only in special circumstances that may not be replicated elsewhere.	Only do this if you have the capability to project manage it well, with sufficient expertise, senior clinician and middle-management involvement, and can consistently progress it over two years. It is a high-risk intervention but with the potential for high gain. Probably the most promising options to consider are integrated pathway models (built by enthusiastic clinicians) that require less radical process reorganisation. Remember that clinicians may need to respond to many different types of patients other than those in the patient flow process redesign.
Preventing unnecessary hospitalisation: patients are hospitalised when this could easily have been prevented.	Some coordination approaches cost less than hospitalisation and are preferred by some patients, and some have been found to result in better clinical outcomes.	Ensure that purchasers or some party takes the lead to identify target patient groups, collect service providers who could cooperate to prevent unnecessary admissions, agree aims, cost and saving sharing objectives, and choose and implement an agreed coordination strategy from the list in this review.

Other potential coordination value improvements that lack strong evidence

- information technology coordination improvements
- payment schemes for longer episodes of care
- shared-care schemes
- interventions for more appropriate referrals
- schemes for formal cooperation and liaison primary healthcare–specialist arrangements
- specialists located on site
- practice-based multidisciplinary interventions.

Guidance B: Matching the patient conditions to solutions

The next table, 7.2, gives a way of finding, for a specific patient condition, the coordination value improvements that could be tested locally.

Table 7.2: Matching the problem to a solution

Patient need or condition	Potentially effective coordination value improvements
Asthma	<p><i>NB: Effectiveness locally depends on context, implementation and monetising the change.</i></p> <p><i>The E1–E4 gradings refer to the strength of evidence supporting the statement as described in the grading scale at section 3.2 above.</i></p> <p>Some disease management programmes targeted at severely and moderately ill patients (E1, Krause 2005).</p>
Diabetes	<p>Some disease-management programmes targeted at severely and moderately ill patients (E1, Krause 2005) and for diabetes patients in the general population (E2, Norris et al 2002, E2, Knight et al 2005).</p> <p>Possibly certain shared care interventions (E4, Greenhalgh 1994).</p>
Depression	<p>Some disease management programmes targeted at severely and moderately ill patients (E1, Neumeyer-Gromen et al 2004).</p>
Heart failure	<p>Some disease management programmes targeted at severely and moderately ill patients (E1, Krause 2005), and for heart-failure patients in the general population (E2, Norris et al 2002, E2, Knight et al 2005).</p> <p>Multidisciplinary teams giving follow-up with specialist heart-failure nurses, and patient caregiver education (E2 McAlister et al 2004).</p> <p>Some discharge planning programmes with support, for older patients with congestive heart failure (E2 Phillips et al 2004).</p> <p>Some carefully targeted case management approaches for older people with congestive heart failure (E1 Windham et al 2003).</p> <p>Nurse-led and team post-hospital interventions for congestive heart-failure patients (E3, Rich 2001 and Rich et al 1995, E3, McAlister et al 2001), but only if started before or soon after discharge, focusing on high-risk patients, and using face-to-face encounters with nurse care managers rather than telephone-only contact (E3, Wagner 2004).</p> <p>Possibly remote patient management in-home monitoring and coaching after hospitalisation for congestive heart failure (E4 Brookes 2005).</p>
Heart disease in the general population	<p>Disease management with multidisciplinary teams and specialised clinics (E1 McAlister et al 2001), especially those with telephone follow-up or a home-based component (E1 Holland et al 2005).</p>
Severe mental illness	<p>Some case management approaches targeted to particular patients (E1 Gorey et al 1998, E1 Ziguras and Stuart 2000, but questioned by Marshall 1998 (E1).</p> <p>Possibly assertive community treatment (improves quality but lower costs uncertain, E2 Latimer 1999 (E2), (E1 Marshall and Lockwood 2000, Ziguras 2000 E1).</p>
Older patients with complex needs leaving hospital	<p>Transitional Care Model (TCM) (E3, Naylor et al 1999 and 2004, (and for other patients E3, Coleman et al 2006).</p>
Older patients in the general population	<p>Some disease management programmes (E2, Yu et al 2006).</p>

continued opposite

Table 7.2: Matching the problem to a solution

Patient need or condition	<p>Potentially effective coordination value improvements</p> <p><i>NB: Effectiveness locally depends on context, implementation and monetising the change.</i></p> <p><i>The E1–E4 gradings refer to the strength of evidence supporting the statement as described in the grading scale at section 3.2 above.</i></p>
Stroke	Team coordination giving early coordinated discharge from hospital and providing post-discharge care and rehabilitation at home (E3 Langhorne et al 2005).
Hospital patients	<p>Some handover systems, if carefully co-developed with users and using a number of methods to implement (E4).</p> <p>Some approaches to medication reconciliation (E4).</p> <p>Some clinical pathway approaches (E3).</p> <p>Some rapid response teams (or medical emergency teams, or critical care outreach teams).</p>
Many types of patient in primary health care	<p>Some specialist outreach clinics (E3 Gruen et al 2003).</p> <p>Possibly specialists located on site in primary healthcare – especially mental health workers (E3, Bower and Sibbald 2000).</p> <p>Possibly schemes for formal cooperation and liaison arrangements to involve and link UK primary medical practitioners with specialist teams, especially those targeting high-risk patients (E2 Mitchell et al 2002).</p> <p>Possibly tele-rehabilitation interventions in the community (E4 Kairy et al 2009) and remote patient management (E4 Brookes 2005).</p>

Chapter 8

Research recommendations

8.1 Introduction

This chapter notes limitations of the research identified by this review, and makes specific recommendations for future:

- research into under-coordination
- evaluation research into clinical coordination interventions
- research into costs of clinical coordination interventions
- research into patient–provider and carer coordination
- research into other areas, including how to finance coordination improvements, whether ICT can benefit coordination, and how rapidly to spread effective improvements.

8.2 Research into under-coordination

The research consistently identifies waste, harm and sub-optimal quality resulting from under-coordination. It reveals that the size and seriousness of the problem is at least equal to that from each of the categories of over-, under-, and misuse- of interventions. Some subject-specific research, such as hospital-primary care coordination, provides empirical data, but the amount and quality of the evidence is limited. In addition, there is little strong evidence about the cost of under-coordination.

The challenges in estimating these costs and the need to adopt different perspectives and timescale have been noted. But these are opportunities and invitations for innovations in research and in funding for research.

The limitations are not only in the amount of data, but also the degree of certainty that many of the studies provide about whether or how much under-coordination is associated with patient and cost outcomes. This is related to underdeveloped theories or models showing pathways through which coordination influences intermediate and final outcomes, and a lack of awareness about how theory could improve the research and of different research designs. The lack of such models makes it more difficult for those implementing interventions to adapt the interventions in their setting. Models and theories could provide implementers with an understanding of pathways of influence which they could reproduce, and in this way help them to adapt the intervention rather than mimicking exactly a coordination change elsewhere (Øvretveit 2011c, Øvretveit 2011b, Øvretveit et al 2011).

Exact specification of different types of under- and optimal- clinical coordination is at the early stages, and there is great potential to advance the field with measures, operational definitions and definitions of standards. Another gap is in empirical research into the coordination requirements of patients with co-morbidities, and in studying whether combinations of conditions occur commonly in many patients, and how these are responded to (Fortin et al 2007).

Recommendation: prioritise research into ‘critical coordination instances’

- Use previous research and expert consensus to identify which types of coordination, and for which patients, are most critical for both optimum care and reducing resource use (critical coordination instances), for patients in acute hospitals, those who are recently discharged, people with long-term conditions or with multiple morbidity, and for the early detection of people at risk of preventable health deterioration.
- Fund and carry out empirical research into these critical coordination instances, informed by theory that relates coordination through care processes to outcomes, in order to quantify the number of patients affected by under-coordination, and the clinical, cost and other consequences.
- Prioritise research into the coordination requirements of patients with co-morbidities, in order to identify common combinations, different coordination options, and the groups for which coordination is most critical.
- Make more use of existing measures of under-coordination and effective coordination to provide needed data, to help develop and use new measures, and to develop evidence-based standards for clinical coordination.
- Fund and carry out a wider comprehensive overview which allows comparisons of coordination problems and costs across all patient groups and services, including grey literature and current projects.

8.3 Evaluation research into effectiveness of clinical coordination interventions

The review found similar limitations in the evaluation research into coordination improvements. Organisations are using many types of changes that are thought to improve different types of coordination, but there is very little evidence of their effectiveness for improving process indicators, and even less for improving the main end outcomes of resource use, clinical quality and patient satisfaction.

This is not because there is not enough research – the review showed that there is a growing body of research into many types of coordination improvement. It also showed the limitations of RCT design, even for answering efficacy questions about coordination changes, but also for answering effectiveness, implementation and generalisation questions. The lack of usable evidence is in part because of underdeveloped theory and research designs for studying clinical coordination changes which can discover pathways of influence, and an over-reliance on a limited set of experimental designs for conducting research and which do not give answers for practical questions.

Most research does not sufficiently distinguish the content of the coordination change from the implementation of the change. It subsumes both as ‘the intervention’, and does not well describe either. Neither do many studies properly recognise the different types of intervention within one category type (such as handover or disease management), and the different ways in which one specific intervention can be implemented – or which context factors are critical for its success. Few studies aim to test or study the same change in different settings to discover generalisability (Øvretveit 2011c, Øvretveit et al 2011). As a result, the research is often inconclusive and does not provide adequate answers for practical change.

A further gap is the lack of independent costed evaluations of the growing number of private ‘coordination-plus’ interventions in different settings. A few such evaluations have shown some do not achieve their promised better outcomes. One US employer-benefits assessment found that private disease management providers overstated their return on investment by over 50% (Anderson 2005).

The observations made in the Whellan et al (2005) review of evaluations of disease management interventions were similar to those made by other reviews of coordination interventions:

The positive outcomes of the studies used in this analysis will be difficult for many providers and health care organisations to achieve. Lack of details about the intervention design creates a significant amount of uncertainty about the resources required to replicate the results. None of the studies considered societal costs such as patient or family time spent participating in the intervention.

The economic benefit that a provider, health care organisation, payer, or society will achieve with DM [disease management] remains uncertain.

The variation in the geographic location of these studies, with significant differences in health care systems and reimbursement, increases the risk that implementing a strategy proven successful in one location will provide similar cost reductions in another. (Whellan et al 2005)

Recommendation: more theory-based and user-focused evaluations that provide more practical guidance

- Make more independent and costed research into private ‘coordination-plus’ schemes, in different settings, especially the many different types of disease management programmes.
- RCT research reports need to provide better descriptions of the content of the coordination change, the implementation and the context, to increase the reader’s understanding of exactly what was evaluated and enable translation to other settings. (Glasziou et al 2008)
- Carry out more quasi-experimental and naturalistic research to develop theory about how a coordination change is best made, how the changes influence behaviour and intermediate activities, and thus influences end outcomes. (Øvretveit 2011c, Øvretveit et al 2011b, Øvretveit et al 2011)
- Take advantage of natural coordination experiments to identify the most and least successful, and make descriptions and explanations. Such experiments need to build in useful comparative research as part of the funding and designs, in order to build knowledge that would also be useful for spread.
- Assess the advantages and disadvantages of separating care and coordination for particular patients and designing specific systems for them (for example, many disease management schemes), compared to models that retain such patients in existing care systems but allow enhanced coordination to be added (some case management models).
- Involve informed practical users of research in defining the questions they need answered, and in assessing whether research can deliver, or is

delivering already, what they require, so that it can be more helpful to them.

8.4 Research into costs and savings of coordination interventions

The review found some research had compared costs of new coordination approaches to usual care. However, most of the research did not quantify the spend costs of different parties to make the changes, or the savings, gains or losses to different parties. Generally, estimates of costs and of savings or losses to different parties were either absent or unreliable in business case studies, overly complicated and difficult to use in economic studies, or specific to the details of one type of funding system. The resource challenge facing healthcare makes research in this field of limited value if it does not address resource questions.

Recommendations: develop return-on-investment science and carry out more and better estimates of the resource implications of care coordination

- Include resource estimations as part of evaluations, and as the default for evaluation research, rather than as an afterthought.
- Develop and provide to researchers and practitioners simple descriptions of methods for estimating problem costs, intervention costs, and savings and losses, to different parties in different financing systems, in order to enable them to take account of resources in proposing, monitoring and evaluating coordination changes. Simple computer spreadsheet models could allow decision makers to input different financing scenarios, in order to discover at which level payments make the intervention cost saving.
- Prioritise studies that focus specifically on potential and actual savings of coordination changes, so as to help others decide how best to invest the limited time and finance for changes, and to make more informed decisions about investments, policies and regulations. Designing such studies with an eye to the studies’ return on investment could make more finance available for the research.

8.5 Other research observations and recommendations

Research into coordination between patients, providers and carers

Broader definitions of care coordination are needed which include patients and informal carers. Initial and mostly observational research suggests that considerable quality and cost improvement can result from change to provider–patient relations (Foot & Maybin 2010). More research into different types of enhanced patient communication, activation and participation – that include costings – would help decision makers make more effective choices, given the many competing claims about these interventions which do have a strong face validity.

Does information and communication technology improve coordination?

Information and communication technology (ICT) not only has potential, but is being viewed as the main way to improve clinical communication about individual patients in an increasingly fragmented and complex system which has fewer resources and care personnel. Electronic medical and health records are seen as an important way to facilitate coordination. ‘Over-promise’ and ‘underperform’ are terms often associated with ICT, but independent empirical evidence is lacking, both into implementation and outcomes for ICT-based coordination, including unintended negative outcomes.

One significant gap in knowledge is whether, or how, any improved communication brought by ICT changes collaborative behaviour and patient outcomes, as well as data about its cost-effectiveness. Although the high capital and operating costs are much commented on, hardly any independent research has examined these costs in relation to the benefits for different parties.

Another area for research is whether heightened concern about security of patient information is in fact leading to providers having less access to necessary information. It is possible that cumbersome access security is too time consuming for providers to use.

Another issue for research is the way patient privacy may be used by different parties to advance and defend their interests rather than to protect patients.

Do finance systems affect coordination?

Another gap noted in this review is the lack of research into financing coordination improvements. There are a number of general studies that have considered the effects of different reimbursement systems and other payment systems for providers. However, few have considered how these systems affect coordination, or have studied systems aiming to improve coordination – especially between different services or facilities paid in different ways.

Few have considered schemes to provide investment capital for coordination improvement or have asked how returns on investment over time can be secured with different providers, and sometimes payers, involved. The generic term used in this report for such schemes is ‘cost savings sharing agencies’ (CaSSAs). No research has considered Social Impact Bonds (Social Finance Organisation 2009).

What are the best ways to spread an effective coordination improvement?

A fourth gap noted is the lack of research into spread or scale-up of coordination improvements. There are no systematic reviews of different strategies to scale up or spread successful coordination pilots or interventions, and very few studies generally on scale-up or spread methods (Øvretveit 2011b).

Would more innovative research provide more useful answers to some questions?

The following quotation is from one of the reviews examined for this report, and most of the others said the same:

The review suggests that X interventions can improve healthcare processes and outcomes, but due to the limitations in terms of the small number of studies, sample sizes, problems with conceptualising and measuring coordination, and heterogeneity of interventions and settings, it is difficult to draw clear conclusions or generalisable inferences about the key elements of X and its effectiveness.

Certainly better designed and described RCT studies could provide better information for decision makers, but cannot answer many of the questions. More innovative evaluation research methods are required, some of which include collaborative and action research approaches. The time has come for research to provide more practical value, and to stop spending resources on research that cannot provide more informative answers to pressing questions.

Recommendations for the agencies which finance research are given in the next chapter, which provides research-informed recommendations for different stakeholder groups.

Chapter 9

Practical recommendations for different groups

9.1 Analysis

This chapter presents some general findings, and then makes research-informed recommendations for different groups: patients, providers, purchasers, regulators and agencies that fund or carry out research.

Each conclusion is qualified, and will depend on the specific intervention in the general category of interventions (termed the ‘intervention label name’), how the finance system works, and local implementation efficiency and effectiveness.

9.2 Conclusions about coordination interventions

Some of conclusions about certain coordination interventions considered in the review were that:

- Co-location or forming a team is unlikely to increase quality and reduce waste or costs, unless other specific procedure changes are also made to ensure coordination. Neither is assessing the patient’s needs following discharge, unless additional actions are taken to enable the services who take over care to provide for these needs.
- Disease management can reduce severity of depression and adherence to treatment in patients with mental illness, glycaemic control in diabetic patients and mortality and readmission rates in patients with heart failure.

In some cases, it can reduce hospitalisation costs and can improve value for a purchaser.

- Case management can improve outcomes for patients with mental health problems, heart failure or diabetes. Careful patient monitoring accounts partially for some of the effects, but there is no clear evidence about which other activities and training may be important, and there are great variations between study findings and models evaluated. No conclusions about cost savings can be drawn from the conflicting evidence.

It was not possible to make other, clearer, conclusions about the relative advantages of different coordination approaches. Many approaches involved a combination of coordination and other interventions, and many interventions were poorly described in the research. There is little evidence about which combinations are most effective for different purposes, and many different outcome measures and costing methods are used in the research.

The sections below present the author’s view of the implications of the evidence for different stakeholder groups. These are presented as a starting point for debate, and to encourage discussion within these groups about the action they might take to improve coordination and to counteract the pressures which are currently reducing coordination.

9.3 Recommendations

Patients

There are large differences in how well different care providers communicate and collaborate with others in caring for patients. There is evidence that professionals and services do not always know what care patients have been receiving, and do not pass on information about their care.

Often this is because many providers do not have a system that quickly helps them to find out who is caring for the patient, and to work more effectively with those professionals. Patients often have to compensate for the absence of such a system, by passing on the information themselves. But this is only effective where the patient is able, or feels well enough, to do so.

Patients would be advised to think of coordination in the same way that they think of treatments. The effectiveness with which a service identifies the professional with the relevant expertise and brings him or her to the patient, and how well the service then connects that professional with the other care providers, is as important to the patient's health and experience of care as the particular treatment they receive. Conflicting advice and treatments can cause harm.

Some information about how well providers coordinate care is available from safety and quality indicators collected about providers on public websites. Patients can use this when choosing a provider, or to change to a provider that shows that it can coordinate their care.

Patients are advised to always ask what information the provider has, check that they have the correct details, and ask them to coordinate with others who are providing their care. It is a good idea to bring along any medication they are taking, and to check that the provider has written down the details. Asking providers what they are doing to improve communication while ensuring security of personal health data can encourage providers to make improvements, and shows that patients are aware of the issues.

New information technology within health systems may be reducing the amount of information which providers have access to, which has both positive and negative consequences. Some reduced access might not be in patients' interest and may be motivated by the interests of professions and IT departments. If a patient feels confident in the security of internet personal health data sites, such as Google health, then putting health data on such a site and giving selected providers access to it can overcome the difficulties that providers can have in accessing the data patients want them to have. But there has not yet been research into how well this solution works.

Providers

Providers are advised to use the evidence as a general guide, before making estimates for their service. The research evidence shows what they might expect from an intervention, but each service will be different. The impact could be plus or minus 50% of that shown in the research, or more. Research has identified the types of quality problems to look for that could be reduced at a cost less than the cost of the quality problem. But providers will need to get and use data from their service about the size of each problem, the wasted time, and the financial cost of the problem to the service.

Also, the service might be financed differently to the one in the study. It might not have to bear the cost of the problem, or it may even receive extra income from the problem caused. For example, a readmission caused by a too-early or poor discharge may bring in income that may be lost if improvements are made to patient discharge. For this reason, it is important that providers are aware of how they are rewarded or penalised for different quality problems, and need to work with purchasers to make changes towards value-based financing that rewards rather than punishes them from doing the right thing.

Calculating one's own estimates is especially important for assessing the likely 'spend cost' of the solution. The result is likely to be different from that of the service cited in the study. Each service will need a slightly different solution, which will need to be implemented in a slightly different way, both of which will use more or less resources than those at the study site.

Even a standard handover checklist will need to be modified for different services and types of handover.

Similarly, research shows that for a solution to be effective it needs to be adapted to the service in question. Research is also showing why this is so, and how to carry out the adaptation. The causes of a coordination problem in one service will be different in their specifics to those in another, even though they may be generally similar. Research can propose likely causes, and can help providers start an analysis of causes. But problems are never due to just one cause, and a solution has to involve multiple changes in order to address the different causes. The research does not give a detailed road map. Only by knowing the specific causes in a service can the provider then design the combination of solutions for the causes.

Purchasers

When purchasers pay for the consequences of problems caused by under-coordination within a service, or between services, they are wasting money that could be used for other patients. The challenge is knowing which problems cause the most suffering and waste, and which are resolvable at a cost proportionate to the likely savings. This review offers some indications, but the practical challenge is to gather details of the specific services and patients covered, and then to set local purchaser strategies to address these. This will include:

- identifying those patients most likely to benefit from improved coordination where the cost savings also are high
- selecting provider performance indicators which can be used to track the indicators and outcomes most influenced by coordination
- revising payment systems to avoid penalties and give incentives for effective coordinative actions
 - to pay both for investments in changes and for continuing activities and extra time needed
- sharing costs and savings – either through a purchaser venture capital fund or by outsourcing to a cost and savings sharing agent (CaSSA) the tasks of agreeing a project, monitoring expenditure and savings, and sharing the resulting savings or costs.

Regulators

The evidence is that under-coordination is costly in terms of unnecessary suffering and wasted resources. It is part of a regulator's mission and duty to act on this evidence in order to protect patients and to help reduce the costs to purchasers and providers.

Regulators have a powerful influence and a key leadership role, especially in stimulating improved coordination between different provider services.

The research suggests specific actions that regulators can take, which includes:

- developing measurable process-of-care standards for coordination within and between services
- setting safety and quality goals targeting coordination problems shown in the research
- developing and using appropriate indicators of coordination performance.

Regulators influence on providers has both good and unanticipated negative consequences. Regulators sometimes underestimate the costs of compliance. For this reason, collaboration with providers and other stakeholders, and pilot testing, is necessary.

Agencies that fund or carry out research

The extensive McDonald et al (2007) review of coordination noted that:

'A dearth of evidence surrounding the efficacy and cost-effectiveness of various care coordination programs are pressing issues facing decision makers. They want practical answers about what to implement to improve care coordination, and yet the field is only just emerging as an area of concerted study from a conceptual as well as a pragmatic perspective.'

Four years later, there are more studies – but not necessarily better practical answers. Chapter 8 described the main gaps and limitations in the research, in conceptualising and measuring coordination; in empirical data about the size and

consequences of different types of under-coordination; in limited data about effectiveness and cost of intervention and savings, loss and profit results; in theory of the links between coordination and intermediate and final outcomes; and in descriptions and evaluations of programmes to spread effective coordination approaches.

These gaps are attractive opportunities for research funders and researchers to be in the forefront of a new field. Some gaps in knowledge can be reduced through better RCTs, but many require new research methods that are more suited to understanding relationships between people and behaviour in social systems, and for quantifying resource use, waste and savings. Innovation in research and in research funding is required to provide practical answers, both to stimulate action and to help actors in the field, who are already making changes, to make better-informed decisions.

Chapter 10

Conclusions and author's comments

10.1 Conclusions

There is evidence that better coordination of providers' care can save money and improve quality for patients. But it depends on which way is used to coordinate, and how well the approach is implemented. Savings depend on whose perspective is taken and how providers are paid – often providers spending the money on better coordination with others do not make savings.

Many changes for better care coordination have not been well evaluated, so it is important to consider promising as well as proven changes. Also, a change found to have little effect in one place may work somewhere else - no evidence does not mean that a change cannot save money and raise quality.

There is evidence also that better coordination combined with other changes can save money and raise quality. These include: models of care to prevent hospital admissions (disease management, case management, and multidisciplinary team-based approaches) and other chronic care and illness-prevention models. The most cost-effective approaches are those which use good data to identify the patients most at risk of deterioration, which actively reach out to help these patients, and effectively coordinate the right type of care and self-care services.

Changes in payment systems, regulation, professional education and codes of practice are needed to create environments to encourage coordination. These changes are needed to counteract the increasing fragmentation and pressures to neglect coordination.

It is possible that those who suffer most from under-coordination are people who are poor, vulnerable and/or from ethnic minorities. The avoidable deterioration of their health is likely to result in high costs for public systems. Researchers have neglected these groups, perhaps even more than health providers have.

10.2 Author's comments

As healthcare and payments become more fragmented, and resources become fewer, providers tend to focus more on their own tasks, and less on passing on information and adjusting their work to others. Without coordination, specialisation becomes a danger rather than a benefit. Adverse events and poor quality increases, adding costs and leading to bureaucracy to enforce procedures which do not solve the problems of under-coordination. Purchasers are able to take an overview and see the waste, but appear powerless to influence significant changes, and appear committed to micro-payment systems which do not reward coordination. Everyone waits for information technology to solve the problems.

Improving coordination is about relationships between people, which is why it is difficult. Changes affect relationships between individual professionals, who often have set views about others. The changes demand extra time from professionals when time is at a premium, and when they often do not believe the change will benefit either them or patients: 'People don't call back and we don't have time to chase them.'

Adding to quality an equal emphasis on saving money, or making profit, is not because the author wants to save the government money or help shareholders. It is because quality improvement needs financial incentives in a tight financial climate to speed and scale up proven improvements. The double benefit of higher quality and lower costs from value improvement can unite professionals, managers, payers and patients to give the time and energy which has often not been committed for quality improvement on its own. But, as the research shows, the types of changes have to be carefully chosen and made for particular local patients and settings if they are to save money and raise quality.

The future of healthcare is as team enterprise between people. Under-coordination is a symptom of volume-cost healthcare based on discrete care items provided by individual professionals and services in separate buildings, working on a piece-work basis. Future healthcare is a value improvement system, which makes the whole healthcare outcome for the patient greater than the sum of the help which each provides, and which supports a patient to be independently healthy or more active in their care.

Appendix 1

Acronyms

Acronym	Explanation
A&E	Accident and emergency
ACT	Assertive community treatment
CMHT	Community mental health team
ED	Emergency department
EMR	electronic medical record
ER	Emergency room
GP	General practitioner (family practitioner in the USA)
ICT	Information and communication technology
IPC	Interprofessional collaboration
IPE	Interprofessional education
MedRec	Medication reconciliation
RCT	Randomised controlled trial

Appendix 2

References

Agrawal A and Wu WY (2009). 'Reducing medication errors and improving systems reliability using an electronic medication reconciliation system.' *Jt Comm J Qual Patient Saf*, vol 35, no 2, pp 106–14.

Akbari A, Mayhew A, Al-Alawi MA, Grimshaw J, Winkens R, Glidewell E, Pritchard C, Thomas R and Fraser C (2008). 'Interventions to improve outpatient referrals from primary care to secondary care (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 4, article CD005471.

Anderson CD and Mangino RR (2006). 'Nurse shift report: who says you can't talk in front of the patient?'. *Nurs Adm Q*, vol 30, no 2, pp 112–22.

Anderson T (2005). 'Employers should investigate disease management 'math crimes''. *Employee Benefit News*, January issue.

Arora V, Manjarrez E, Dressler D, Halasyamani L, Kripalani S. Hospitalist handoffs: A systematic review and task force recommendations. *Journal of Hospital Medicine* 2009, vol 4, issue 7, pp 433–440

Arora V et al (2010). 'Problems after discharge and understanding of communication with their primary care physicians (PCPs) among hospitalized seniors: a mixed methods study'. *Journal of Hospital Medicine*, pp 12–20.

Badamgarav E, Croft JD Jnr, Hohlbauch A, Louie JS, O'Dell J, Offman JJ, Suarez_Almazor ME, Weaver A, White P, Katx P, 'Effects of disease management programs on functional status of patients with rheumatoid arthritis'. *Arthritis Rheum* 2003, June 15; 49 (3)pp 377-87.

Bails D, Clayton K, Roy K and Cantor MN (2008). 'Implementing online medication reconciliation at a large academic medical center'. *Jt Comm J Qual Patient Saf*, vol 34, no 9, pp 499–508.

Baker R, Freeman G, Boulton M, et al. Continuity of care: patients' and carers' views and choices in their use of primary care services. NHS Service Delivery and Organisation R&D Programme, 2005. <http://www.sdo.nihr.ac.uk/files/project/13b-final-report.pdf> (accessed 6 June 2011).

Barrett B, Curran V, Glynn L, Godwin M 2007 CHSRF Synthesis: Interprofessional Collaboration and Quality Primary Healthcare December 2007, Canadian Health Services Research Foundation: Ottawa, Ontario.

Ben-Tovim, D, Bassham, J, Bennett, D, Dougherty, M, Martin, M, O'Neill, S, Sincock, J, Szwarcbord, M 2008 Redesigning care at the Flinders Medical Centre: clinical process redesign using 'lean thinking', *MJA*, vol 188, no 6, pp S27–S31.

Ben-Tovim DI, Bassham JE, Bolch D, et al. 2007 Lean thinking across a hospital: redesigning care at the Flinders Medical Centre. *Aust Health Rev* 2007; 31: pp10-15.

Boaden R, Harvey G, Moxham C and Proudlove N (2008). *Quality improvement: theory and practice in healthcare*. National Library for Health/NHS Institute for Innovation and Improvement/ University of Warwick. Available at: <http://www.institute.nhs.uk/qualityimprovement> (accessed on 26th November 2010)

- Bower P and Sibbald B (2000). 'On-site mental health workers in primary care: effects on professional practice (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 3, article CD000532.
- Briggs CJ and Garner P (2006). 'Strategies for integrating primary health services in middle- and low-income countries at the point of delivery (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 2, article CD003318.
- Brookes L (2005). 'SPAN-CHF II: specialized primary and networked care in heart failure II. Programme and abstracts from the ninth annual scientific meeting of the Heart Failure Society of America. Boca Raton, Florida, 18–21 September 2005. Available at: www.medscape.com/viewarticle/514121 (accessed 15 July 2010)
- Brumley R, Enguidanos S, Jamison P et al (2007). 'Increased satisfaction with care and lower costs: results of a randomized trial of in-home palliative care'. *J Am Geriatr Soc*, vol 55, pp 993–1000.
- Catchpole KR, De Leval MR, McEwan A, Pigott N, Elliott MJ, McQuillan A, MacDonald C and Goldman AJ (2007). 'Patient handover from surgery to intensive care: using Formula 1 pit-stop and aviation models to improve safety and quality'. *Paediatr Anaesth*, vol 17, no 5, pp 470–78.
- Chassin MR and Galvin RW (1998). 'The urgent need to improve health care quality: Institute of Medicine National Roundtable on Health Care Quality'. *JAMA*, 280, pp 1000–05.
- Cleland J, Ross SA, Miller SC, et al (2009). 'There is a chain of Chinese whispers ...': empirical data support the call to formally teach handover to pre-qualification doctors'. *Qual Saf Health Care*, vol 18, pp 267–71.
- Coffey M, Cornish P, Koonthanam T, Etchells E and Matlow A (2009). 'Implementation of admission medication reconciliation at two academic health sciences centres: challenges and success factors'. *Healthcare Quarterly*, vol 12, pp 102–09.
- Coleman EA, Parry C, Chalmers S and Min S-J (2006). 'The care transitions intervention: results of a randomized controlled trial'. *Arch Intern Med*, vol 166, pp 1822–28.
- Commonwealth Fund (2003). *National survey of physicians and quality of care*. Commonwealth Fund. Available at: <http://www.commonwealthfund.org/Content/Surveys/2003/2003-National-Survey-of-Physicians-and-Quality-of-Care.aspx> (accessed on 6 June 2011)
- Congressional Budget Office (2004). *An analysis of the literature on disease management programs*. Washington, DC: CBO. Available at: <http://www.cbo.gov/ftpdocs/59xx/doc5909/10-13-DiseaseMngmnt.pdf> (accessed on 6 June 2011)
- Coye M, Ateret Haselkorn A and DeMello S (2009). 'Remote patient management: technology-enabled innovation and evolving business models for chronic disease care'. *Health Affairs*, vol 28, no 1, pp 126–35.
- Crawford MJ, de Jonge E, Freeman GK and Weaver T (2004). 'Providing continuity of care for people with severe mental illness – a narrative review'. *Soc Psychiatry Psychiatr Epidemiol*, vol 39, no 4, pp 265–72.
- Cretin S, Shortell SM and Keeler EB (2004). 'An evaluation of collaborative interventions to improve chronic illness care. Framework and study design'. *Evaluation Review*, vol 28, no 1, pp 28–51.
- Davidson SM, Manheim LM, Werner SM, Hohlen MM, Yudkowsky BK and Fleming GV (1992). 'Prepayment with office-based physicians in publicly funded programs: results from the Children's Medicaid Program'. *Paediatrics*, vol 89, pp 761–67.
- Dean Franklin B, Burnett S, Cooke M et al (2010). 'How safe are clinical systems?' London: Health Foundation.
- DeBusk RF, Miller NH, Parker KM, Bandura A, Kraemer HC, Cher DJ (2004). 'Care management for low-risk patients with heart failure: a randomized, controlled trial'. *Ann Intern Med*, vol 141, pp 606–13.
- DeCarolis DD, Leraas MC and Rowley C (2005). 'Medication reconciliation upon admit using an electronic medical record'. *Pharmacotherapy*, vol 25, pp 1505.

- Delate T, Chester E, Stubbings T, Barnes C (2008). 'Clinical outcomes of a home-based medication reconciliation program after discharge from a skilled nursing facility'. *Pharmacotherapy*, vol 28, issue 4, pp 444–52.
- Disease Management Association of America (2010). 'DMAA: the Care Continuum Alliance'. DMAA website. <http://www.carecontinuum.org/> (accessed on 6 June 2011)
- Dougan JP, Mathew TP, Riddell JW, Spence MS, McGlinchey PG, Nesbitt GS (2001). 'Suspected angina pectoris: a rapid-access chest pain clinic'. *QJM: Monthly Journal of the Association of Physicians*, vol 94, pp 679–86.
- Elkan R, Kendrick D, Dewey M, Hewitt M, Robinson J, Blair M (2001). 'Effectiveness of home based support for older people: systematic review and meta-analysis'. *BMJ*, vol 323, pp 719–25.
- Ernst ME, Brown GL, Klepser TB, Kelly MW (2001). 'Medication discrepancies in an outpatient electronic medical record'. *Am J Health Syst Pharm*, vol 58, pp 2072–75.
- Essential Evidence Plus (2010). 'Grading of recommendations assessment, development and evaluation (GRADE)'. Essential Evidence Plus website. Available at: www.essentialevidenceplus.com/product/ebm_loe.cfm?show=grade (accessed June 2 2010)
- Fields D, Leshen L and Patel K (2010). 'Quality gains and cost savings through adoption of medical homess'. *Health Affairs*, vol 29, no 5, pp 819–26.
- Foot, C & Maybin, Jo 2010 How to deliver high-quality, patient-centred, cost-effective care: Consensus solutions from the voluntary sector, The Kings Fund, London.
- Forrest CB, Glade GB, Baker AE, Bocian A, von Schrader S and Starfield B (2000). 'Coordination of specialty referrals and physician satisfaction with referral care'. *Arch Pediatr Adolesc Med*, vol 154, pp 499–506.
- Fortin M, Soubhi H, Hudon C, Bayliss E and van den Akker M (2007). 'Multimorbidity's many challenges'. *BMJ*, vol 334, pp 1016–17.
- Gandhi TK (2005). 'Fumbled handoffs: one dropped ball after another'. *Ann Intern Med*, vol 142, no 5, pp 352–58.
- Glasziou P Meats E Heneghan C Shepperd S 2008 What is missing from descriptions of treatment in trials and reviews? *BMJ*, 2008 vol 336 1472-4.
- Gleason KM, Groszek JM, Sullivan C, Rooney D, Barnard C, Noskin JA (2004). 'Reconciliation of discrepancies in medication histories and admission orders of newly hospitalized patients'. *Am J Health Syst Pharm*, vol 61, pp 1689–95.
- Gorey KM, Leslie DR, Morris T, Carruthers WV, John L and Chacko J (1998). 'Effectiveness of case management with severely and persistently mentally ill people'. *Community Mental Health Journal*, vol 34, no 3, pp 241–50.
- GRADE Working Group (2004). 'Grading quality of evidence and strength of recommendations'. *BMJ*, vol 328, pp 1490–98.
- Grainge C, Traer E, Fulton J. (2005) Do weekend plan standard forms improve communication and influence quality of patient care? *Postgrad Med J*; 81(958): pp 524-5.
- Greenhalgh PM (1994). Shared care diabetes: a systematic review. Occasional paper 67. London: Royal College of General Practitioners.
- Greenhalgh T and Peacock R (2005). 'Effectiveness and efficiency of search methods in systematic reviews of complex evidence: audit of primary sources'. *BMJ*, vol 331, pp 1064–65.
- Greenhalgh T, Robert G, Bate P, Kyriakidou O, Macfarlane F and Peacock R (2004). How to spread good ideas: a systematic review of the literature on diffusion, dissemination and sustainability of innovations in health service delivery and organisation. London: National Co-ordinating Centre for NHS Service Delivery and Organisation. Available at: <http://www.sdo.nihr.ac.uk/files/project/38-final-report.pdf> (accessed on 6 June 2011)

- Grimshaw JM, Winkens RAG, Shirran L, Cunningham C, Mayhew A, Thomas R, Fraser C. Interventions to improve outpatient referrals from primary care to secondary care. *Cochrane Database of Systematic Reviews* 2005, Issue 3. [DOI: 10.1002/14651858.CD005471]
- Grainge C, Traer E, Fulton J. (2005) Do weekend plan standard forms improve communication and influence quality of patient care? *Postgrad Med J*; 81(958): pp 524-5.
- Gruen RL, Weeramanthri TS, Knight SE and Bailie RS (2003). 'Specialist outreach clinics in primary care and rural hospital settings (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 4, article CD003798.
- Gunn J, Diggins J, Hegarty K, Blashki G. A systematic review of complex system interventions designed to increase recovery from depression in primary care. *BMC Health Serv Res*. 2006;6:88.
- Harrison M, Eardley W and McCarron B (2005). 'Time to hand over our old way of working?'. *Hosp Med*, vol 66, no 7, pp 399-400.
- Harrison M, Koppel R and Barlev S (2007). 'Unintended consequences of information technologies in health care – an interactive sociotechnical analysis'. *J Am Med Inform Assoc*, vol 14, pp 542-49.
- Higginson IJ, Finlay IG, Goodwin DM, et al. Is there evidence that palliative care teams alter end-of-life experiences of patients and their caregivers? *J Pain Symptom Manage*. 2003 Feb;25(2): pp 150-68.
- Holland R, Battersby J, Harvey I, Lenaghan E, Smith J and Hay L (2005). 'Systematic review of multidisciplinary interventions in heart failure'. *Heart*, vol 91, no 7, pp 899-906.
- Horwitz L, Moin T, Krumholz HM, Wang L, Bradley E (2009). 'What are covering doctors told about their patients? Analysis of sign-out among internal medicine house staff'. *Qual Saf Health Care*, vol 18, pp 248-55.
- Horwitz LI, Green ML, Krumholz HM, Huot SJ (2006). 'Transfers of patient care between house staff on internal medicine wards: a national survey'. *Arch Intern Med*, vol 166, pp 1173-77.
- Hutt R, Rosen R and McCauley J (2004). *Case managing long-term conditions*. London: King's Fund. Available at: <http://www.kingsfund.org.uk/document.rm?id=90> (accessed on 6 June 2011).
- Institute for Health Improvement (2008). 'Link quality and financial management: strategies to engage the chief financial officer and provide value for patients'. IHI website. Available at: www.ihl.org (accessed on 30 October 2010).
- Institute of Medicine (2008). *Creating a business case for quality improvement research: expert views, workshop summary*. Washington, DC: Institute of Medicine/The National Academies Press.
- Irajpour A, Norman I and Griffiths P (2006). 'Interprofessional education to improve pain management'. *Br J Community Nurs*, vol 11, no 1, pp 29-32.
- Jack BW, Chetty VK, Anthony D et al (2009). 'A reengineered hospital discharge program to decrease rehospitalization: a randomized trial'. *Ann Intern Med*, vol 150, pp 178-87.
- Jee S and Cabana D (2006). 'Indices of continuity of care: a systematic review'. *Med Care Res Rev*, vol 63, pp 158-88.
- Jeffery DP, Ley A, McLaren S and Siegfried N (2000). 'Psychosocial treatment programmes for people with both severe mental illness and substance misuse (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 2, article CD001088.
- Jencks SF, Williams MV and Coleman EA (2009). 'Rehospitalizations among patients in the Medicare fee-for-service program'. *N Engl J Med*, vol 360, pp 1418-28.
- Johnson JK and Arora VM (2009). 'Improving clinical handovers: creating local solutions for a global problem'. *Qual Saf Health Care*, vol 18, no 4, pp 244-45.
- Johnston B, Wheeler L and Deuser J (1997). 'Kaiser Permanente medical center's pilot tele-home project'. *Telemedicine Today*, vol 5, no 4, pp 16-17, 19.

- Johri M, Beland F and Bergman H (2003). 'International experiments in integrated care for the elderly: a synthesis of the evidence.' *Int J Geriatr Psychiatry*, vol 18, no 3, pp 222–35.
- Joint Commission (2010). *The care continuum standards*. Oak Brook, Illinois: Joint Commission.
- Joint Commission (2007a). *Improving America's Hospitals*. Oak Brook, Illinois: Joint Commission.
- Joint Commission (2007b). National Patient Safety Goals Hospital Version Manual Chapter, including Implementation Expectations.
Available at:
http://www.jointcommission.org/standards_information/npsgs.aspx (accessed on 6 June 2011)
- Joint Commission (2007c). *The Joint Commission's report on quality and safety: sentinel event root cause and trend data*. Oak Brook, Illinois: Joint Commission.
- Joint Commission (2006). 'Medication reconciliation.' *Sentinel Event Alert*, issue 35.
Available at:
http://www.jointcommission.org/assets/1/18/SEA_35.pdf (accessed on 6 June 2011)
- Jones D and Mitchell A (2006). *Lean thinking for the NHS*. London: NHS Confederation.
- Kairy D, Lehoux, P Vincent, C et al (2009). 'A systematic review of clinical outcomes, clinical process, healthcare utilization and costs associated with telerehabilitation.' *Disability and Rehabilitation*, vol 31, no 6, pp 427–47.
- Kane R, Keckhafer G, Flood S, Bershadsky B and Siadaty M (2003). 'The effect of Evercare on hospital use.' *J Am Geriatr Soc*, vol 51, pp 1427–34.
- Kelley R (2009). 'Where can \$700 billion in waste be cut annually from the US healthcare system?'. Ann Arbor, MI.
Available at: www.factsforhealthcare.com/whitepaper/HealthcareWaste.pdf
(accessed on 26th November 2010)
- Kimmelstiel C, Levine D, Perry K, Patel AR, et al (2004). 'Randomized, controlled evaluation of short- and long-term benefits of heart failure disease management within a diverse provider network: the SPAN-CHF trial.' *Circulation*, vol 110, pp 1450–55.
- Kitch, B, Cooper, J Zapol, W Jessica M Karson, A Hutter, M. Campbell, E (2008). 'Handoffs causing patient harm.' *Joint Commission Journal on Quality and Patient Safety*, vol 34, no 10, pp 563–70.
- Knight K, Badamgarav E, Henning JM, Hasselblad V, Anacleto D, Ofman JJ, Weingarten SR (2005). 'A systematic review of diabetes disease management programs.' *Am J Manag Care*, vol 11, no 4, pp 242–50.
- Kodner DL. The quest for integrated systems of care for frail older persons. *Aging Clin Exp Res*. 2002 Aug;14(4):pp 307-13.
- Kodner D and Spreeuwenberg C (2002). 'Integrated care: meaning, logic, applications, and implications – a discussion paper.' *International Journal of Integrated Care* Oct–Dec; 2: e12.
- Kramer JS, Hopkins PJ, Rosendale JC et al (2007). 'Implementation of an electronic system for medication reconciliation.' *Am J Health Syst Pharm*, vol 64, pp 404–22.
- Krause DS (2005). 'Economic effectiveness of disease management programs: a meta-analysis.' *Dis Manag*, vol 8, no 2, pp 114–34.
- Kripalani S, LeFevre F, Phillips CO, Williams MV, Basaviah P and Baker DW (2007). 'Deficits in communication and information transfer between hospital-based and primary care physicians.' *JAMA*, vol 297, pp 831–41.
- Kwan J Sandercock P 2005 In-Hospital Care Pathways for, Stroke: An Updated Systematic Review *Stroke* 2005;36; pp 1348-1349.
- Langhorne P, Taylor G, Murray G et al (2005). 'Early supported discharge services for stroke patients: a meta-analysis of individual patients' data.' *Lancet*, vol 365, no 9458, pp 501–06.

- Latimer EA (1999). 'Economic impacts of assertive community treatment: a review of the literature'. *Can J Psychiatry*, vol 44, no 5, pp 443–54.
- Lee LH, Levine JA and Schultz HJ (1996). 'Utility of a standardized sign-out card for new medical interns'. *J Gen Intern Med*, vol 11, no 12, pp 753–55.
- Liu, C Rubenstein L, Kirchner J, Fortney, J Perkins M Ober S Pyne J Chaney E (2009). 'Organizational cost of quality improvement for depression care'. *Health Services Research*, vol 44, issue 1, pp 225–244.
- MacAdam M (2008). *Frameworks of integrated care for the elderly: a systematic review*. Ottawa, Canada: Canadian Policy Research Networks.
- Manley HJ, Drayer DK, McClaran M et al (2003). 'Drug record discrepancies in an outpatient electronic medical record: frequency, type, and potential impact on patient care at a hemodialysis center'. *Pharmacotherapy*, vol 23, no 2, pp 231–39.
- Mant J, McManus RJ, Oakes RA, Delaney BC, Barton PM, Deeks JJ et al (2004). 'Systematic review and modelling of the investigation of acute and chronic chest pain presenting in primary care'. *Health Technol Assess* 2004;8(2): pp1–170
- Marshall M, Gray A, Lockwood A and Green R (1998). 'Case management for people with severe mental disorders (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 2, article CD000050.
- Marshall M and Lockwood A (2000). 'Assertive community treatment for people with severe mental disorders (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 2, article CD001089.
- Martin LA, Neumann CW, Mountford J, Bisognano M, Nolan TW. Increasing Efficiency and Enhancing Value in Health Care: Ways to Achieve Savings in Operating Costs per Year. IHI Innovation Series white paper. Cambridge, Massachusetts: Institute for Healthcare Improvement; 2009. Available on: www.ihf.org (accessed on 26th November 2010)
- McAlister FA, Lawson FM, Teo KK and Armstrong PW (2001). 'A systematic review of randomized trials of disease management programs in heart failure'. *Am J Med*, vol 110, pp 378–84.
- McAlister FA, Stewart S, Ferrua S and McMurray JJ (2004). 'Multidisciplinary strategies for the management of heart failure patients at high risk for admission: a systematic review of randomized trials'. *J Am Coll Cardiol*, vol 44, no 4, pp 810–19.
- McDonald KM, Sundaram V, Bravata DM, Lewis R, Lin N, Kraft S, McKinnon M, Paguntalan H and Owens DK (2007). 'Care coordination' in Shojania KG, McDonald KM, Wachter RM, Owens DK (eds) *Closing the quality gap: a critical analysis of quality improvement strategies*. Technical review 9. Rockville, MD: Agency for Healthcare Research and Quality.
- Meredith LS, Mendel P, Pearson M, Wu SY, Joyce G, Straus JB, Ryan G, Keeler E and Unutzer J (2006). 'Implementation and maintenance of quality improvement for treating depression in primary care'. *Psychiatric Services*, vol 57, no 1, pp 48–55.
- Miller LG, Matson CC and Rogers JC (1992). 'Improving prescription documentation in the ambulatory setting'. *Fam Pract Res J*, vol 12, pp 421–29.
- Mistry K, Jagers J, Lodge A, Alton M, Mericle J, Frush K and Meliones J (2009). *Using six sigma methodology to improve handoff communication in high-risk patients*. AHRQ project report. Durham, NC: Duke Children's Hospital.
- Mitchell G, Del Mar C and Francis D (2002). 'Does primary medical practitioner involvement with a specialist team improve patient outcomes? A systematic review' *Br J Gen Pract*, vol 52, no 484, pp 934–39.
- Mitchell PH and Lang NM (2004). 'Nurse staffing: a structural proxy for hospital quality?' *Med Care*, vol 42, no 1, pp 1–3.
- Mitchell J (2006). 'Defining patient safety and quality of care' in National Quality Forum, *Standardizing a patient safety taxonomy: a consensus report*. Washington, DC: National Quality Forum.

- Moore C, Wisnivesky J, Williams S et al (2003). 'Medical errors related to discontinuity of care from an inpatient to an outpatient setting'. *J Gen Intern Med*, vol 18, no 8, pp 646–51.
- Nassaralla C, Naessens G, Chaudhry R, Hansen M and Scheitel S (2007). 'Implementation of a medication reconciliation process in an ambulatory internal medicine clinic'. *Qual Saf Health Care*, vol 16, pp 90–94.
- Naylor MD, Brooten D, Campbell R, Jacobsen BS, Mezey MD, Pauley MV and Schwartz JS (1999). 'Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial'. *JAMA*, vol 281, pp 613–20.
- Naylor MD, Brooten DA, Campell RL, Maislin G, McCauley KM and Schwartz JS (2004). 'Transitional care of older adults hospitalized with heart failure: a randomized, controlled trial'. *J Am Geriatr Soc*, vol 52, pp 675–84.
- Neumeyer-Gromen A, Lampert T, Stark K and Kallischnigg G (2004). 'Disease management programs for depression: a systematic review and meta-analysis of randomized controlled trials'. *Medical Care*, vol 42, no 12, pp 1211–21.
- Newby DE, Fox KA, Flint LL and Boon NA (1998). 'A 'same day' direct access chest pain clinic: improved management and reduced hospitalisation'. *QJM: Monthly Journal of the Association of Physicians*, vol 91, pp 333–37.
- NHS Alliance (2007). *A very present danger*. London: NHS Alliance. Available at: www.nhsalliance.org/documents/survey-reports/ (accessed on 23 September 2010)
- NHSLN 2001 ImpAct, Shared care prostate clinic at Colchester Hospital, a model of clinical research and development, NHS learning network newsletter, January 2001, Vol 3, issue 1.
- NHS Modernisation Agency (2004). *10 high impact changes for service improvement and delivery: a guide for NHS leaders*. Leicester: NHS Modernisation Agency.
- NIII Return on Investment (ROI) calculator, 2010. Available at: www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/Return_on_investment_%28ROI%29_calculator.html (Accessed 23Nov2010.)
- Nolan, T & Bisognano, M Finding the balance between quality and cost, *Healthcare Financial Management*, April 2006, pp 67-72.
- Norris SL, Nichols PJ, Caspersen CJ et al (2002). 'The effectiveness of disease and case management for people with diabetes. A systematic review'. *Am J Prev Med*, vol 22, suppl 4, pp 15–38.
- Øvretveit J (2011a). Does clinical coordination improve quality and save money? A summary of a review of the evidence. London: Health Foundation. Available at: www.health.org.uk or <http://public.me.com/johnovr> (accessed on 21 May 2011)
- Øvretveit, J (2011b) Widespread focused improvement: lessons from developing countries for scaling up specific improvements to health services *International Journal of Quality Assurance in Health Care*, 2011;pp 1–8.
- Øvretveit, J (2011c). How does context affect interventions to improve patient safety? *International Journal for Quality in Health Care* 2011;pp. 1–8.
- Øvretveit, J Leviton, L Parry, G (2011). Increasing the generalisability of improvement research with an improvement replication programme *BMJ Qual Saf*. 2011; 20(Suppl_1): p. i87-i91
- Øvretveit J (2009a). 'Care coordination assessment tool'. Medical Management Centre, Karolinska Institutet, website. Available at: <http://public.me.com/johnovr> (accessed on 26th November 2010)
- Øvretveit J (2009b). *Does improving quality save money? A review of evidence of which improvement to quality reduce costs for health service providers*. London: Health Foundation. Available at: www.health.org.uk or <http://public.me.com/johnovr>

- Øvretveit J (2009c). *Leading evidence based value improvement*. Chichester: Kingsham Press.
- Øvretveit J (2007). *Economics and effectiveness of interventions for improving quality and safety of health care*. Stockholm: Medical Management Centre, Karolinska Institutet.
- Øvretveit J (2005a). *Research and knowledge about the effectiveness of interventions to improve patient safety. A review of research and guidance*. Stockholm: Medical Management Center, Karolinska Institutet.
- Øvretveit J (2005b). *What are the advantages and disadvantages of different quality tools? A review and synthesis of the evidence*. Copenhagen: World Health Organization.
Available at: http://www.euro.who.int/__data/assets/pdf_file/0004/74668/E87577.pdf
(accessed on 6 June 2011)
- Øvretveit J (2004a). 'Framework for quality improvement translation: understanding the conditionality of interventions.' *Joint Commission Journal on Quality and Safety*. Global supplement. August, pp 15–24.
- Øvretveit J (2004b). *The cost of poor quality in health care – a review of research*. Report for Stockholm County Council. Stockholm: Medical Management Centre, Karolinska Institutet.
- Øvretveit J (2003a). *Grading evidence for decision-makers: issues and methods in assessing the scientific quality of research and summarizing strength of evidence for public health research reviews*. Discussion document for the World Health Organization Health Evidence Network, Copenhagen. Stockholm: Medical Management Centre, Karolinska Institutet.
- Øvretveit J (2003b). *What is the best strategy for improving quality and safety of hospitals – a review and synthesis of the evidence*. Copenhagen: World Health Organization.
- Øvretveit J (2002). *Action evaluation of health programmes and change. A handbook for a user focused approach*. Oxford: Radcliffe Medical Press.
- Øvretveit J (2000). 'The economics of quality – a practical approach.' *International Journal of Health Care Quality Assurance*, vol 13, no 5, pp 200–07.
- Øvretveit J (1993). *Coordinating community care: multidisciplinary teams and care management in health and social services*. Milton Keynes: Open University Press.
- Øvretveit J (1992). *Health service quality*. Oxford: Blackwell Scientific Press.
- Paquette-Lamontagne M, McLean WM, Besse L et al (2002). 'Evaluation of a new integrated discharge prescription form.' *Ann Pharmacother*, vol 35, pp 953–58.
- Parè G, Jana M, and Sicotte C (2007). 'Systematic review of home telemonitoring for chronic diseases: the evidence base.' *Journal of the American Medical Informatics Association*, vol 14, no 3, pp 269–77.
- Parker G, Corden A and Heaton J (2010). *Synthesis and conceptual analysis of the SDO Programme's research on continuity of care*. Southampton: National Institute for Health Research Evaluations, Trials and Studies Coordinating Centre.
- Peikes D, Chen A, Schore J and Brown R (2009). 'Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries: 15 randomized trials.' *JAMA*, vol 301, pp 603–18.
- Petersen LA, Brennan TA, O'Neil AC, Cook EF and Lee TH (1994). 'Does housestaff discontinuity of care increase the risk for preventable adverse events?'. *Ann Intern Med*, vol 121, no 11, pp 866–72.
- Petersen LA, Orav EJ, Teich JM, O'Neil AC, Brennan TA. (1998) Using a computerized sign-out program to improve continuity of inpatient care and prevent adverse events. *Jt Comm J Qual Improv*; 24(2): pp 77-87.
- Philbin EF. (1999) Comprehensive multidisciplinary programs for the management of patients with congestive heart failure. *J Gen Intern Med*. 1999 Feb;14(2): pp 130-5.

- Phillips CO, Wright SM, Kern DE, Singa RM, Shepperd S and Rubin HR (2004). 'Comprehensive discharge planning with post-discharge support for older patients with congestive heart failure: a meta-analysis'. *JAMA*, vol 291, pp 1358–67.
- Pronovost P, Hobson DB, Earsing K et al (2004). 'A practical tool to reduce medication errors during patient transfer from an intensive care unit'. *J Clin Outcomes Manag*, vol 11, p 2633.
- Pronovost P, Weast B, Schwarz M et al (2003). 'Medication reconciliation: a practical tool to reduce the risk of medication errors'. *J Crit Care*, vol 18, no 4, pp 201–05.
- Rankin S (2010). 'Wandsworth community virtual wards'. Presentation, International Quality Improvement Exchange meeting, The Health Foundation, 2010.
- Reeves S (2001). 'A systematic review of the effects of interprofessional education on staff involved in the care of adults with mental health problems'. *J Psychiatr Ment Health Nurs*, vol 8, no 6, pp 533–42.
- Reinertsen JL (2006). 'Interview with Gary Kaplan'. *Quality and Safety in Health Care*, vol 15, no 3, pp 156–58.
- Renholm M, Leino-Kilpi H, Suominen T. Critical pathways. A systematic review. *J Nurs Adm* 2002;32: pp 196 – 200.
- Rich MW (2001). 'Heart failure disease management programs: efficacy and limitations'. *Am J Med*, vol 110, pp 410–12.
- Rich MW, Beckham V, Wittenberg C, Leven CL, Freedland KE and Carney RM (1995). 'A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure'. *N Engl J Med*, vol 333, pp 1190–95.
- Richards S and Coast J (2003). 'Interventions to improve access to health and social care after discharge from hospital: a systematic review'. *J Health Serv Res Policy*, vol 8, no 3, pp 171–79.
- Rogers G, Alper E, Brunelle D et al (2006). 'Reconciling medications at admission: safe practice recommendations and implementation strategies'. *Jt Comm J Qual Saf*, vol 32, pp 37–50.
- Rollow W, Lied TR, McGann P et al (2006). 'Assessment of the Medicare quality improvement organisation program'. *Ann Intern Med*, vol 145, pp 342–53.
- Rotter T, Kinsman L, James E, Machotta A, Gothe H, Willis J, Snow P and Kugler J (2010). 'Clinical pathways: effects on professional practice, patient outcomes, length of stay and hospital costs (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 3, article CD006632.
- Rozich JD, Howard RJ, Justeson JM, Macken PD, Lindsay ME, Resar RK. (2004). 'Patient safety standardization as a mechanism to improve safety in health care'. *Jt Comm J Qual Saf*, vol 30, no 1, pp 5–14.
- Rozich JD and Resar RK (2001). 'Medication safety: one organisation's approach to the challenge'. *J Clin Outcomes Manag*, vol 8, no 10, pp 27–34.
- Rubenstein L, McCoy J, Cope D, Barrett P, Hirsch S, Messer K and Young R (1995). 'Improving patient quality of life with feedback to physicians about functional status'. *Journal of General Internal Medicine*, vol 10, no 11, pp 607–14.
- Rubenstein L, Parker LE, Meredith LS, Altschuler A, dePillis E, Hernandez J and Gordon NP (2002). 'Understanding team-based quality improvement for depression in primary care'. *Health Services Research*, vol 37, no 4, pp 1009–29.
- Schoen C, Osborn R, Doty M, Bishop M, Peugh J and Murukutla N (2007). 'Toward higher-performance health systems: adults' health care experiences in seven countries'. *Health Affairs*, vol 26, no 6, pp w717–34.
- Schoen C, Osborn R, Huynh PT et al (2004). 'Primary care and health system performance: adults' experiences in five countries'. *Health Affairs*, w487–w503 (published online 28 October 2004; 10.1377/hlthaff.w4.487) (accessed on 26th November 2010)
- Schoen C, Osborn R, Huynh PT et al (2005). 'Taking the pulse of health care systems: experiences of patients with health problems in six countries'. *Health Affairs*, Jul-Dec; Suppl Web Exclusives:W5-509-25. (accessed on 26th November 2010)

- Simmonds S, Coid J, Joseph P, Marriott S and Tyrer P (2001). 'Community mental health team management in severe mental illness: a systematic review'. *Br J Psychiatry*, vol 178, pp 497–502, discussion 3–5.
- Singh D (2005). *Transforming chronic care: evidence about improving care for people with long term conditions*. Birmingham: Health Services Management Centre, University of Birmingham. Available at: http://www.download.bham.ac.uk/hsmc/pdf/transforming_chronic_care.pdf (accessed on 6 June 2011).
- Social Finance Organisation (2009). *Social Impact Bonds: rethinking finance for social outcomes*. London: Social Finance Organisation. Available at: http://www.socialfinance.org.uk/sites/default/files/SIB_report_web.pdf (accessed on 6 June 2011).
- Stock R, Scott J and Sharon G (2009). 'Using an electronic prescribing system to ensure accurate medication lists in a large multidisciplinary medical group'. *Joint Commission Journal on Quality and Patient Safety*, vol 35, no 5, pp 271–79.
- Thompson, D N, Wolf, G A, Spear, S J (2003) Driving Improvement in Patient Care: Lessons From Toyota, *Journal of Nursing Administration*, 33 (11): pp 585-595
- Thornicroft G and Tansella M (2004). 'Components of a modern mental health service: a pragmatic balance of community and hospital care: an overview of systematic evidence'. *British Journal of Psychiatry*, vol 185, pp 283–90.
- van Eaton EG, Horvath KD, Lober WB, Rossini AJ and Pellegrini CA (2005). 'A randomized, controlled trial evaluating the impact of a computerized rounding and sign-out system on continuity of care and resident work hours'. *J Am Coll Surg*, vol 200, no 4, pp 538–45.
- Varkey P, Cunningham J and Bisping DS (2007). 'Improving medication reconciliation in the outpatient setting'. *Jt Comm J Qual Patient Saf*, vol 33, no 5, pp 286–92.
- Vira T, Colquhoun M and Etchells E (2006). 'Reconcilable differences: correcting medication errors at hospital admission and discharge'. *Qual Saf Health Care*, vol 15, pp 122–26.
- Wadhwa S, Lavizzo-Mourey R. Tools, methods, and strategies. Do innovative models of health care delivery improve quality of care for selected vulnerable populations? A systematic review. *Jt Comm J Qual Improv*. 1999 Aug;25(8):pp 408-33.
- Wagner EH (2004). 'Deconstructing heart failure disease management'. *Ann Intern Med*, vol 141, pp 644–46.
- Wagner MM and Hogan WR (1996). 'The accuracy of medication data in an outpatient electronic medical record'. *J Am Med Inform Assoc*, vol 3, pp 234–44.
- Webster J (1999). 'Practitioner-centred research: an evaluation of the implementation of the bedside hand-over'. *J Adv Nurs*, vol 30, no 6, pp 1375–82.
- Weingarten SR, Henning JM, Badamgarav E et al (2002). 'Interventions used in disease management programmes for patients with chronic illness – which ones work? Meta-analysis of published reports'. *BMJ*, vol 325, no 7370, pp 925–28.
- Weintraub AJ, Kimmelstiel C, Levine D et al (2005). 'A multicenter randomized controlled comparison of telephonic disease management vs automated home monitoring in patients recently hospitalized with heart failure: SPAN-CHF II trial'. Programme and abstracts from the 9th annual scientific meeting of the Heart Failure Society of America, September 18–21, 2005, Boca Raton, Florida.
- Westwood N and Silvester K (2007). 'Eliminate NHS losses by adding Lean and some Six Sigma'. *Operations Management*, vol 33, no 5, pp 26–30.
- Whellan DJ, Hasselblad V, Peterson E, O'Connor CM and Schulman KA (2005). 'Metaanalysis and review of heart failure disease management randomized controlled clinical trials'. *Am Heart J*, vol 149, no 4, pp 722–29.
- Windham BG, Bennett RG and Gottlieb S (2003). 'Care management interventions for older patients with congestive heart failure'. *American Journal of Managed Care*, vol 9, no 6, pp 447–61.

Womack J Jones D 2007 *Lean Solutions : How Companies and Customers Can Create Value and Wealth Together*, Simon & Schuster.

Womack J, Jones D. 1998 *Lean thinking. Banish waste and create wealth in your corporation*. London: Simon and Schuster, 1998.

Wong MC, Yee KC and Turner P (2008). 'A structured evidence-based literature review regarding the effectiveness of improvement interventions in clinical handover'. Hobart, Australia: eHealth Services Research Group, University of Tasmania.
Available at: www.safetyandquality.gov.au/internet/safety/publishing.nsf/Content/PriorityProgram-05

Wortman SB (2008). 'Medication reconciliation in a community, nonteaching hospital'. *Am J Health Syst Pharm*, vol 65, no 21, pp 2047–54.

Yu DS, Thompson DR and Lee DT (2006). 'Disease management programmes for older people with heart failure: crucial characteristics which improve post-discharge outcomes'. *Eur Heart J*, vol 27, no 5, pp 596–612.

Ziguras SJ and Stuart GW (2000). 'A meta-analysis of the effectiveness of mental health case management over 20 years'. *Psychiatric Services*, vol 51, no 11, pp 1410–21.

Zwarenstein M and Bryant W (2000). 'Interventions to promote collaboration between nurses and doctors (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 2, article CD000072.

Zwarenstein M, Goldman J and Reeves S (2009). 'Interprofessional collaboration: effects of practice-based interventions on professional practice and healthcare outcomes (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 3, article CD000072.

Zwarenstein M, Reeves S, Barr H, Hammick M, Koppel I and Atkins J (2001). 'Interprofessional education: effects on professional practice and health care outcomes (Cochrane Review)'. *Cochrane Database of Systematic Reviews*, issue 1, article CD002213.

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