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## 24.1 Introduction

Structured disease management has been suggested as a potential means to improve the quality and reduce the cost of health care, and to enhance health outcomes for people with chronic conditions. Health professionals, policymakers and institutions in many countries in Europe and elsewhere have begun introducing some form of disease management programme and similar approaches in order to address the rising burden of chronic disease. However, attempts to do so have varied and the nature and scope of programmes and care models differ (Nolte et al. 2008, 2014). Some, such as Germany and the Netherlands, along with Denmark, France and Italy, have introduced large-scale, population-based structured disease management programmes while others are experimenting with smaller-scale care approaches, although this is changing (Nolte and Knai 2015).

As approaches to chronic disease management vary, so does the evidence about their effectiveness, about the value of different approaches, and about what works in what contexts and for what populations (Nolte and McKee 2008a). It has been noted that this is in part because of the variety of terms and concepts that are used to describe efforts to improve chronic illness care and its components. Coleman et al. (2009) have further highlighted the relative lack of scientific rigour in evaluating these approaches and the reporting of the results of such interventions, which tend to be complex in nature and scope, with several interrelated components often acting at different levels of service delivery (Craig et al. 2008).

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In this chapter, we explore the nature of disease management as a tool or strategy for integrated care. We examine the evidence base for disease management and identify requirements for advancing the debate, building on and updating our earlier work around chronic disease management and integrated care (Nolte and McKee 2008b; Nolte and Pitchforth 2014). We close with some overarching observations.

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## 24.2 What is Disease Management?

One of the key challenges to describing disease management as a strategy is that definitions of this concept vary widely (Krumholz et al. 2006; Schrijvers 2009). Disease management, by definition, traditionally targets patient groups with a specific condition, such as diabetes, and focuses on addressing the clinical needs of those affected (Nolte and McKee 2008b). However, more recent definitions are explicitly adopting a population-based approach that may also consider the needs that arise from multiple chronic conditions (Care Continuum Alliance 2010).

Disease management was first mentioned as a concept in the USA in the 1980s. It was initially used mainly by pharmaceutical companies offering educational programmes to employers and managed care organisations to promote medication adherence and behaviour change among people with chronic conditions such as diabetes, asthma and coronary artery disease (Bodenheimer 1999; The Boston Consulting Group 2006). From the mid-1990s, disease management strategies were adopted more widely across the private and public sectors in the USA (Krumholz et al. 2006), and, subsequently, in several European countries (Nolte and Knai 2015; Rijken et al. 2012), Australia (Glasgow et al. 2008; Hamar et al. 2015), Israel (Goldfracht et al. 2011) and Singapore (Tan et al. 2014), among others. This occurred in parallel with an emerging body of evidence, which pointed to the potential for disease management to improve care quality and lead to cost savings.

However, approaches vary widely in focus, nature and scope of interventions, and populations covered. For example, in the USA, descriptions range from ‘discrete programs directed at reducing costs and improving outcomes for patients with particular conditions’ (Rothman & Wagner 2003, p. 257) to ‘a population-based systematic approach that identifies persons at risk, intervenes, measures the outcomes, and provides continuous quality improvement’ (Epstein & Sherwood 1996, p. 832). Ellrodt et al. (1997, p. 1687) defined disease management as ‘an approach to patient care that coordinates medical resources for patients across the entire delivery system’. The Population Health Alliance (previously Care Continuum Alliance and, before that, Disease Management Association of America) defined disease management as ‘a system of coordinated health care interventions and communications for populations with conditions in which patient self-care efforts are significant’ (Care Continuum Alliance 2010, p. 55). The definition provided by the Population Health Alliance further stipulates for full-service disease management programmes to include six components: population identification processes; evidence-based practice guidelines; collaborative practice models to include

physician and support-service providers; patient self-management education; process and outcomes measurement, evaluation, and management; and routine reporting or feedback loop. Approaches that use fewer than these six components are to be considered disease management support services only.

Although authors have increasingly adopted the definition proposed by the Population Health Alliance, variation in what is referred to as disease management has remained (Coelho et al. 2014; Coleman et al. 2009; Lemmens et al. 2009; Martinez-Gonzalez et al. 2014; Peytremann-Bridevaux et al. 2015; Pimouguet et al. 2011). Norris et al. (2003) observed that programmes tend to vary ‘in breadth, in focus or purpose ... [they] may also vary with the writer’s perspective (economic, research, clinical) and the delivery system to which the term is being applied (e.g. primary care, specialty-based services contracted to another delivery system, pharmacy services)’ (pp. 478–479). This appears to have changed little since Norris and colleagues published their observations in 2003, as we shall see below. While variation may be necessary to focus a given programme to the needs of a given population, it poses challenges for comparison and the assessment of effect in particular. Furthermore, in many settings, the focus continues to be on single diseases, albeit with some adjustment to consider comorbidity (Fullerton et al. 2011), and there remain concerns overall about the suitability of current approaches to disease management to address the complex needs of those with multiple disease processes (Aspin et al. 2010; Nolte et al. 2012a; Rijken et al. 2012).

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## 24.3 What are the Impacts of Disease Management?

As noted in the introduction to this chapter, structured disease management has been proposed as a means to improve the quality and reduce the cost of health care, and ultimately improve health outcomes for the chronically ill. However, the evidence on the ability of such approaches to achieve this varies by type of approach and target group. What is known is mainly based on small studies of high-risk patients, often undertaken in academic settings (Mattke et al. 2007). Evidence of the impact of large-scale, population-wide programmes is slowly becoming available, such as from Australia (Hamar et al. 2015), Denmark (Smidth et al. 2013), Germany (Fuchs et al. 2014; Jacob et al. 2015; Mehring et al. 2014) and the Netherlands (de Bakker et al. 2013; Elissen et al. 2012; Tsiachristas et al. 2015).

There is now a wide range of systematic reviews, reviews of reviews and meta-analyses of the evidence on (chronic disease)-specific interventions and disease management programmes. However, reflecting the variation in the interpretation and use of the term ‘disease management’, it remains challenging to arrive at an overarching conclusion. This is particularly the case where terms such as disease management are being used interchangeably with ‘collaborative care’, ‘case management’, or, indeed, ‘integrated care’, reflecting the challenges that have been discussed in the context of assessing the evidence base for the impacts of integrated care, as reported in Chap. 3. For example, Ouwens et al. (2005) presented a review

of systematic reviews of approaches seeking to improve the care for people with chronic conditions. While broadly referring to ‘integrated care’ programmes, of the 13 systematic reviews considered, 8 were reviews of disease management interventions, each employing a distinct definition of disease management. The remainder reviewed some form of care or case management (two reviews), multi-disciplinary teams/structures (two), and more generally management of patients with chronic health problems (one). Similarly, Martinez-Gonzalez et al. (2014) provided a meta-review of integrated care programmes for adults with chronic conditions, of which the majority reported on disease management interventions.

As we noted elsewhere in this book (see Chap. 3), this issue is not only of academic relevance but has important implications for practice. Empirical evidence of approaches that can be subsumed under the above terms is often difficult to compare because of a lack of clarity in defining and describing the approach being studied. This challenge was also highlighted by Ouwens et al. (2005). They concluded, on the basis of their review of reviews, although there was considerable heterogeneity in interventions, patient populations, and processes and outcomes of care, programmes under review appeared to have led to improvements in the quality of care. Yet, they noted that the variation in definitions and components of care, and failure to recognise these variations, could lead to inappropriate conclusions about programme effectiveness and the application of findings in practice.

Building on the work by Ouwens et al. (2005), this section updates and amends an earlier rapid review of the evidence base for chronic disease management (Nolte and Pitchforth 2014). Our earlier work assessed the evidence identified in 15 systematic reviews and meta-analyses that were published between 2004 and 2012. We complemented these with an additional eight systematic reviews, which we identified from a separate search of PubMed (NCBI 2016) carried out to inform Chap. 3. The review presented here is not intended to be exhaustive. Instead, we sought to provide an overview of the nature of evidence that has been published since the work by Ouwens et al. (2005) and to examine the extent to which recent evidence has provided more certainty around the impacts of disease management on service and health outcomes, and the implications of these findings in the context of integrated care. Table 24.1 provides a summary overview of the main observations of the 23 systematic reviews considered here.

Conditions most frequently considered in reviews were heart failure (Drewes et al. 2012; Gonseth et al. 2004; Roccaforte et al. 2005, 2006; Takeda et al. 2012; Whellan et al. 2005; Yu et al. 2006), diabetes (Egginton et al. 2012; Elissen et al. 2013a; Knight et al. 2005; Pimouguet et al. 2011), asthma or chronic obstructive pulmonary disease (COPD) (Adams et al. 2007; Boland et al. 2013; Kruis et al. 2013; Lemmens et al. 2011; Niesink et al. 2007; Peytremann-Bridevaux et al. 2008, 2015), depression (Archer et al. 2012; Ekers et al. 2013; Neumeyer-Gromen et al. 2004; Thota et al. 2012), or a combination of these (de Bruin et al. 2011; Ofman et al. 2004; Tsai et al. 2005). Definitions of disease management varied among studies, although all adopted a fairly comprehensive conceptualisation. Earlier

**Table 24.1** Evidence of effect of disease management programmes as reported in 23 systematic reviews

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
<i>Chronic heart failure</i>										
Gonseth et al. (2004)	54 studies: 27 RCT, 27 non-RCT	Heart failure (ages 65+)	An intervention designed to manage heart failure and reduce hospital readmissions using a systematic approach to care and potentially employing multiple treatment modalities (adapted from Weingarten et al. (2002), who used the definition by Ellrodt et al. (1997))		↓					(↓)
Roccaforte et al. (2005)	33 RCT	Heart failure	None specified; description of DMP characteristics of included studies: multidisciplinary approach, use of specialist nurse or case manager, (patient) education, planned home/outpatient clinic visits, regular phone contacts		↓	?		↓	+	
Whellan et al. (2005)	19 RCT	Heart failure	None specified; focus on postdischarge interventions		↓			(↓)		(↓)
Göhler et al. (2006)	36 RCT	Heart failure	None specified; considered interventions ranging from patient education on self-monitoring and knowledge of disease to		↓			↓		

(continued)

Table 24.1 (continued)

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
Yu et al. (2006)	21 RCT	Heart failure (ages 60+)	electronic home monitoring; all had to have scheduled interventions after discharge A programme that uses multiple interventions in a systematic manner to manage heart failure across different healthcare delivery systems (adapted from Ellrodt et al. (1997) and Weingarten et al. (2002))		↓	(+)		(↓)		(↓)
Drewes et al. (2012)	46 studies: 32 RCT, 4 CT, 9 before/after, 1 chart review §	Heart failure (adults)	Interventions that contained 2 or more elements of the Chronic Care Model (healthcare system, community resources and policies, self-management support, delivery system design, decision support, clinical information system) (Wagner 1998)		↓	+		↓		
Takeda et al. (2012)	25 RCT (of which 2 represented disease management)	Heart failure (adults)	Used broad conceptualisation of 'clinical services interventions', which included case management, clinic models and multidisciplinary interventions, including		↓**	(+)*		(↓)*		

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Table 24.1 (continued)

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
			disease management, which was defined as 'a system of coordinated healthcare interventions and communications for populations with long-term conditions in which patient self-care is significant' (adapted from Royal College of Physicians (2004))							
<i>Diabetes</i>										
Knight et al. (2005)	24: 19 RCT; 5 non-RCT	Diabetes (adult patients)	Programmes that use a systematic approach to care and include more than 1 intervention component. A systematic approach to care was defined as inclusion of any of the following components: guidelines, protocols, algorithms, care plans, or systematic patient or provider education programmes	+ / (+)	(↓)	(+)	(+)		(+)	
Pimouguet et al. (2011)	41 RCT	Diabetes type 1 or type 2	Ongoing and proactive follow-up of patients that includes at least 2 of 5 components; patient education; coaching;	+				=		

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Table 24.1 (continued)

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
Egginton et al. (2012)	52 studies: 45 RCT, 7 non-RCT	Diabetes type 2	treatment adjustment; monitoring; care coordination Not defined; uses the term 'care management', distinguished delivery mode (office (interaction or chart review in outpatient setting), web (interaction using computer/Internet) and telephone (interaction using telephone/pager)) and leader type (physician, other (e.g. multidisciplinary team, nurse))	+		(+)		(+)		?
Elissen et al. (2013a)	61 studies: 41 RCT, 6 CT, 4 before/after, 10 observational studies §	Diabetes mellitus (adult patients)	Interventions that included at least 2 components of the Chronic Care Model (Wagner 1998)	+					+	
<i>Asthma and/or chronic obstructive pulmonary disease (COPD)</i>										
Lemmens et al. (2009)	36 studies: 28 RCT, 8 controlled before/after	Asthma or COPD (adults aged 16+)	Multiple interventions in the context of disease management targeting the patient (e.g. patient education, self-management support), professional practice (e.g. professional education, audit, feedback)	=	↓	+	(+)		(+)	

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Table 24.1 (continued)

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
Peytremann-Bridevaux et al. (2015)	20 RCT	Asthma (adults aged 16+)	or organisational structure (e.g. role redesign, follow-up) Interventions that met five criteria: at least one organisational component (i.e. elements that interfere with the care process or that aim to improve continuity of care) targeting patients; at least one organisational component targeting healthcare professionals (e.g. physicians, nurses, etc.), the healthcare system, or both; presence of a patient education or self-management support component; or both; active involvement of two or more healthcare professionals; and minimum duration of three months	+/(+)	?	+				
Adams et al. (2007)	32 studies: 20 RCT; 5 CT; 7 before/after	COPD	Interventions that contained at least 1 element of the Chronic Care Model (self-management support, delivery system design,	+/(+)	↓	?		=		(↓)

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Table 24.1 (continued)

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
Niesink et al. (2007)	10 RCT	COPD	decision support, clinical information system) (Wagner 1998) Programmes that contained at least one of the following components: (1) multidisciplinary care team, (2) clinical pathway, (3) clinical follow-up, (4) case management, or (5) self-management or patient education	(+)		(+)				
Peytrenn-Bridevaux et al. (2008)	13 studies: 9 RCT; 1 CT; 3 before/after	COPD	Interventions included 2 or more different components (e.g. physical exercise, self-management, structured follow-up), active involvement of 2 or more health care professionals in patient care; consideration of patient education; at least 1 component of the intervention lasted a minimum of 12 months	+/(+)	↓	(+)		=		
Boland et al. (2013)	11 studies: 7 RCT, 2 before/after, 2 case-control	COPD	Interventions that contained 2 or more elements of the Chronic Care Model (Wagner et al. 2001):		↓	+		↓		↓

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Table 24.1 (continued)

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
			organisational support, community resources and policies, self-management support, delivery system design, decision support, clinical information system; programme had minimum duration of 12 months							
Knuis et al. (2013)	26 RCT	COPD	Integrated disease management intervention which includes at least 2 of the following components: Education/self-management; exercise; psychosocial; smoking cessation; medication; nutrition; follow-up and/or communication; multidisciplinary team; financial intervention, and which includes active involvement of at least two different categories of healthcare providers; minimum duration of three months	+/(+)	↓	+/(+)	n/r	=	n/r	n/r

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Table 24.1 (continued)

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
<i>Depression</i>										
Neymeyer-Gromen et al. (2004)	10 RCT	Depression (adults aged 18+)	'Complete DMP' comprising use of evidence-based guidelines, patient self-management education, provider education, collaborative care, reminder systems, monitoring (detailed definition not provided, inferred from the text)	+		+	+	+		?
Archer et al. (2012)	79 RCT	Depression or anxiety (any age)	Collaborative care intervention that included (i) multi-professional approach to patient care, (ii) structured management plan, (iii) scheduled patient follow-up, and (iv) enhanced interprofessional communication	+(adults)		+(adults)	+(adults)		+(adults)	
Thota et al. (2012)	32 studies: 28 RCT, 5 quasi-experimental	Major depression, minor depression, dysthymia	Collaborative care intervention that included at least a case manager, primary care provider, and mental health specialist with collaboration among these roles	+		+	+		+	

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Table 24.1 (continued)

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
Ekers et al. (2013)	14 RCT	Depression plus one or more physical health problems (adults aged 16+)	Nurse-delivered collaborative care with at least two of the following components: proactive follow-up of participants, assessment of patient adherence to psychological and pharmacological treatments, monitoring of patient progress using validated measure, provision of psychological support, regular communication and supervision with mental health specialists and/or primary care physician	+						
<i>Combined</i>										
Ofman et al. (2004) †	102 experimental or quasi-experimental	Asthma (9 studies), back pain (6), COPD (6), chronic pain (2), heart failure (9), coronary artery disease (6), depression (20), diabetes (22), hyperlipidaemia (6), hypertension (7), rheumatoid arthritis (9)	An intervention designed to manage or prevent a chronic disease using a systematic approach to care and potentially employing multiple treatment modalities (adapted from Ellrodt et al. (1997))	+(+)	(↓)	(+)	+	(↓)	+(+)	(↓)

(continued)

Table 24.1 (continued)

	Number studies reviewed	Condition/s targeted	Definition disease management	Functional status, clinical outcomes	Hospitalisation	Quality of life	Patient satisfaction	Mortality	Process	Cost
Tsai et al. (2005)	112 randomised and nonrandomised trials	Asthma (27 studies), chronic heart failure (21), depression (33), diabetes (31)	Interventions that included at least one of the 6 elements deemed to be essential for providing high-quality care to patients with chronic illnesses: delivery system design, self-management support, decision support, clinical information systems, community resources, and healthcare organisation (adapted from Wagner et al. (1999))	+		+/(+)			+/(+)	
De Bruin et al. (2011)	31 studies: 18 RCT, 3 quasi-experimental, 3 cross-sectional, 2 descriptive, 2 before/after, 2 prospective observational, 1 longitudinal analysis of paid claims	Diabetes (14 studies), depression (4), heart failure (8), COPD (5)	Interventions that contained 2 or more elements of the Chronic Care Model (healthcare system, community resources and policies, self-management support, delivery system design, decision support, clinical information system) (Wagner 1998)							(↓)

Note Symbols in bold indicate a significant finding; ↓, significant reduction in more than half of studies reviewed or as demonstrated in meta-analysis; (↓) some evidence of reduction; + significant improvement in more than half of studies reviewed or as demonstrated in meta-analysis; (+) some evidence of improvement; +/(+) significant improvement in some outcomes; = no significant change in outcome concerned;? evidence inconclusive

\*Considered two RCTs of disease management only

§ Study also reviewed 15 systematic reviews which were not included in the meta-analysis

‡ Assessed percentage of statistically significant comparisons per outcome (number of statistically significant comparisons for selected outcomes favouring treatment/total number of comparisons)

studies tended to draw on the definition by Ellrodt et al. (1997), which we described earlier in this chapter as ‘an approach to patient care that coordinates medical resources for patients across the entire delivery system’ (p. 1687), while more recent reviews built on the Chronic Care Model (CCM) proposed by Wagner (1998), which considers six elements as essential for improving chronic illness care. Several reviews analysed primary studies that included a minimum of two discrete interventions considered beneficial for chronic illness care, such as patient self-management, provider feedback, structured follow-up, or role re-design (Boland et al. 2013; de Bruin et al. 2011; Drewes et al. 2012; Knight et al. 2005; Kruis et al. 2013; Lemmens et al. 2009; Peytremann-Bridevaux et al. 2008, 2015) or a variation of this conceptualisation (Egginton et al. 2012; Göhler et al. 2006; Gonseth et al. 2004; Neumeyer-Gromen et al. 2004; Roccaforte et al. 2005; Tsai et al. 2005). Three reviews focusing on depression explicitly used the concept of ‘collaborative care’, considered to include a multiprofessional approach to patient care and care or case management (Archer et al. 2012; Ekers et al. 2013; Thota et al. 2012). Typically, at least half of primary studies covered by reviews were set in the USA, followed by Australia, the UK, Canada, Sweden and the Netherlands. Two reviews focused on studies set in the USA only (Egginton et al. 2012; Neumeyer-Gromen et al. 2004).

Studies reported on a diverse set of outcomes, reflecting the condition being targeted. In brief, available reviews provided fairly consistent evidence of a positive impact of disease management interventions targeting those with depression. For example, a meta-analysis of 102 experimental or quasi-experimental studies targeting 11 conditions by Ofman et al. (2004) found that disease management interventions for those with depression had the highest proportion of studies demonstrating substantial improvements in patient care (48% statistically significant), which was supported by evidence of significant improvements of disease management programmes for depression severity (Neumeyer-Gromen et al. 2004). Subsequent reviews focused on the impacts of disease management conceptualised as ‘collaborative care’, and these demonstrated significant improvements in depression symptoms, patient adherence to treatment, response to treatment and satisfaction with care, among other outcomes (Archer et al. 2012; Ekers et al. 2013; Neumeyer-Gromen et al. 2004; Thota et al. 2012).

A similar consistency was found for disease management interventions targeting heart failure. These showed, for example, statistically significant reductions in the frequency of disease-specific and all-cause hospitalisations of at least 15% up to 30% and more (Drewes et al. 2012; Gonseth et al. 2004; Roccaforte et al. 2005; Whellan et al. 2005; Yu et al. 2006), with a significant reduction in all-cause mortality demonstrated in three of the seven reviews considered (Drewes et al. 2012; Göhler et al. 2006; Roccaforte et al. 2005). A 2012 meta-review of meta-analyses of heart failure disease management programmes noted that out of a total 13 reviews that reported on all-cause mortality, 6 had identified statistically significant improvements, with effect sizes varying from 3 to 25%, mostly clustering around 15–20% (Savard et al. 2011). Drewes et al. (2012) highlighted the substantial heterogeneity among findings of primary studies included in their

review, which they were unable to explain by the quality of studies, the length of follow-up, or the number of components considered beneficial in chronic care. Two reviews reported evidence that programmes which had incorporated a multidisciplinary team approach had a stronger impact on outcome measures (Göhler et al. 2006; Roccaforte et al. 2005).

Evidence for the impact of disease management on diabetes also tended to show beneficial effects overall, with significantly improved glycaemic control among diabetes disease management populations compared to usual care, along with improvements in the quality of care as measured through, for example, adherence to treatment guidelines (Elissen et al. 2013a; Knight et al. 2005; Pimouguet et al. 2011). The overall clinical significance of observed improvements in glycaemic control remains uncertain, although there was evidence that disease management may be more effective for patients with poor control (Pimouguet et al. 2011). Elissen et al. (2013a) noted that the most promising results were attained in studies with limited follow-up (<1 year) and by programmes that included more than two chronic care components. The review by Knight et al. (2005) further showed that observed effects were larger for studies conducted in the USA, although the number of trials outside the USA considered in their review was small. Overall there was considerable variation across studies included in individual reviews in terms of intervention delivery methods, duration and populations covered, leading Egginton et al. (2012) to conclude that findings from their review would not allow for recommendations for a particular type of intervention to be more effective than another one.

Such variation was also observed in studies that examined the evidence base for disease management targeted at people with asthma or COPD. Among these, there was consistent evidence of significantly reduced hospitalisations among those receiving disease management for COPD (Adams et al. 2007; Boland et al. 2013; Lemmens et al. 2009; Peytremann-Bridevaux et al. 2008), and, possibly, asthma (Lemmens et al. 2009). There was evidence that patients who received three or more chronic care interventions in disease management programmes for COPD had lower rates of hospitalisations (Boland et al. 2013). Impacts on health outcomes were mixed across reviews, with evidence of significant improvements in some outcomes, such as exercise capacity in COPD patients (Peytremann-Bridevaux et al. 2008), and measures of quality of life among patients with asthma (Lemmens et al. 2009; Pimouguet et al. 2011) or with COPD (Boland et al. 2013; Niesink et al. 2007; Peytremann-Bridevaux et al. 2008). Evidence of impact on mortality was more difficult to interpret. For example, Peytremann-Bridevaux et al. (2008) estimated, on the basis of ten studies, a trend for reduced mortality, while Boland et al. (2013), based on the findings of six primary studies, found a small but significant reduction in all-cause mortality (0.70, 95% CI 0.51–0.97). However, similar to reviews of disease management targeting diabetes or heart failure, findings of primary studies included in reviews of COPD interventions were heterogeneous, varying by study-, intervention- and disease-characteristics, and it remains unclear which specific components of interventions have the greatest benefit.



Few studies explicitly considered costs, and where they did, the evidence tended to be inconsistent (Egginton et al. 2012; Neumeyer-Gromen et al. 2004; Ofman et al. 2004). De Bruin et al. (2011) reviewed the impact of disease management programmes on healthcare expenditures for patients with diabetes, depression, heart failure or COPD. Of 31 studies reviewed, 21 reported incremental healthcare costs per patient per year, and of these, 13 demonstrated evidence of cost savings but observed effects were typically not statistically significant or not tested for statistical significance. Conversely, Boland et al. (2013), in a review of the economic impact of disease management programmes targeting COPD specifically, found these to lead to hospitalisation savings of 1060 € (95% CI: 80–2040 €) per patient per year and savings in total healthcare utilisation of 898 € (95% CI: 231–1566 €). The review further demonstrated indicative evidence that COPD disease management led to greater savings in studies of patients with severe COPD or those with a history of exacerbations. However, heterogeneity of studies included in either review remains a considerable challenge, with variation in the intervention (content and type) and study design. De Bruin et al. (2011) highlighted variation in the economic evaluative approach chosen, the type of direct health care costs and cost categories considered, alongside lack of reporting on reliability of estimates as a particular challenge to deriving comparative estimates. This highlights the need for higher-quality studies.

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## 24.4 Interpreting the Existing Evidence Base

The interpretation of evaluation findings such as those presented here will have to be placed in the context of programme implementation specifically and issues around evaluation more broadly (Nolte et al. 2012b). For example, where an evaluation finds improvements in process indicators (suggesting improved quality of care) but not in outcomes, this might be because the length of evaluation was not sufficient to demonstrate health improvements. Likewise, an evaluation might find that a given intervention improved outcomes for a subgroup of participants only; this might indicate that the intervention was suboptimal or not sufficiently targeted at those who would benefit most. Also, intervention effect will differ by disease type.

This is reflected in the overarching findings of our review. We found fairly consistent evidence that disease management can have beneficial impacts on outcomes for those with depression, in terms of both disease severity and treatment response. Similarly, for those with heart failure, existing evidence points to beneficial effects of disease management on measures of utilisation (reduced hospital use) and outcomes (reduced mortality). Evidence of the impact of disease management on diabetes outcomes remains less certain, however. While some interventions are frequently found to have statistically significant impacts on glycaemic control, which typically forms the primary outcome, the clinical importance of observed reductions remains questionable. Likewise, for COPD, the impact of

disease management on outcomes tends to be less consistent, with the possible exception of exercise capacity and quality of life. However, available evidence does consistently demonstrate reduced hospitalisation, which has been shown to lead to actual savings in one review (Boland et al. 2013).

The majority of studies reviewed here echo the concerns reported by Ouwens et al. (2005), confirmed by a recent review of the same topic (Martinez-Gonzalez et al. 2014). Thus, it remains challenging to interpret the evidence from existing primary studies, which tend to be characterised by heterogeneity in the definition and description of the intervention and components of care under study. In this respect, the conclusions by Ouwens et al. (2005) still seem to hold, namely that variation in definitions and components of care, and failure to recognise these variations, might lead to inappropriate conclusions about programme effectiveness and the application of findings. While this further underlines the continued need for the use of consistent definitions and of better description of the content of interventions to enable comparison, evidence presented here does allow for some observations suitable to inform the further development of approaches to more effectively address chronic conditions.

Thus, available evidence points to the value of multifaceted approaches to enhance outcomes of those with chronic disease. For example, reviews that examined the impact of different care components highlighted an association between the format or 'modality' of the intervention and reported outcomes (Elissen et al. 2013a; Göhler et al. 2006; Roccaforte et al. 2005). Evidence from collaborative care models for the management of depressive disorders suggests that interventions were more effective when based in the community or that involved nurses as case managers (Thota et al. 2012). Further, Ekers et al. (2013) found that nurse-delivered treatment based on a collaborative care approach was effective in the treatment of depression in patients who also had at least one physical health problem, such as arthritis, cancer, coronary heart disease or stroke. Similarly, for persons with heart failure, the impact on outcomes was found to be stronger for those interventions that incorporated a multidisciplinary team approach (Göhler et al. 2006; Roccaforte et al. 2005), while disease management interventions that had a multimodal format according to the Chronic Care Model resulted in lower hospitalisation rates among patients with COPD compared with control groups (Adams et al. 2007; Boland et al. 2013), which in turn was linked to cost savings (Boland et al. 2013).

Other evidence points to the need to develop approaches that more specifically target those who are most likely to benefit. For example, Pimouguet et al. (2011) showed how diabetes disease management may be more effective for patients with poor glycaemic control. Similar findings were reported for a large population-based diabetes care intervention in the Netherlands (Elissen et al. 2012), although requiring further confirmation (Elissen et al. 2013b).

It is notable that in selected studies reviewed here the reported evidence tended to be stronger for primary studies undertaken in the USA compared to elsewhere. This was the case for disease management for diabetes (Knight et al. 2005) and collaborative care programmes for depression (Ekers et al. 2013). Given that much

of the available evidence tends to originate from the USA, these findings highlight a need for caution when considering transferring models across countries with different health systems, and for developing a more robust evidence base to demonstrate that relevant models are effective outside the US context (Nolte and McKee 2008b; Ekers et al. 2013).

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## 24.5 Conclusions

This chapter has reviewed the recent evidence base on the effectiveness of disease management strategies and programmes. We show that, overall, disease management holds promise to improve processes and outcomes of care but evidence that is available tends to be limited to a small set of conditions only. Arguably, by restricting the review reported here on published systematic reviews we will have missed more recent evidence from primary studies that have investigated the impact of disease management on a broader range of conditions.

There is emerging evidence that provides important insights into how disease management approaches that employ a multifaceted strategy and target those most likely to benefit are more likely to enhance outcomes of those with chronic disease. However, one fundamental issue remains, which is related to the need to develop a system-wide model of care for patients with chronic disease. Disease-specific approaches such as disease management programmes are ill-suited to meet the needs of the typical patient in primary care who frequently has multiple health problems with complex needs (Nolte and McKee 2008b). The rapid rise of those with multiple care needs is of particular concern to all health systems. The nature of multiple chronic conditions creates a challenging spectrum of health care needs in itself, with further complexity added to in cases of increasing frailty at old age in particular, involving physical, developmental, or cognitive disabilities. This complexity of health and care needs requires the development of delivery systems that bring together a range of professionals and skills from both the cure (healthcare) and care (long-term and social care) sectors (Nolte and McKee 2008a). More generalist approaches such as integrated care models that are being implemented in a range of European countries and elsewhere are potentially better equipped to respond to more complex patient needs, while disease management can form an important instrument within integrated care strategies. There remains a need for more systematic evaluation of new models of care as a means to inform the development of efficient and effective interventions to address the growing burden of chronic conditions globally.

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