

Chapter 6

Multimorbidity: The impact on health systems and their development¹

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This chapter provides an overview of the descriptive epidemiology of multimorbidity in terms of its prevalence and distribution within the population and its associations with mortality, functional status and quality of life, and health services use and healthcare quality and safety. The analysis draws on both the published literature and on data about the prevalence of 40 long term conditions from 1.75 million primary care patients in Scotland. The implications for health service organisation and the measurement of health system performance for people with multimorbidity are discussed.

Introduction

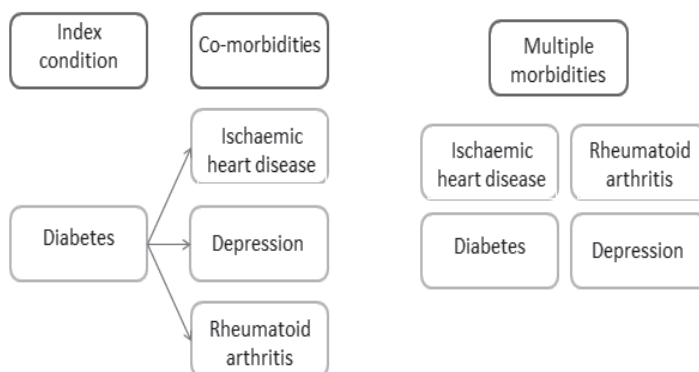
It is well recognised that health services in all developed and most developing countries face increasing challenges as the epidemiological transition from acute to chronic conditions as the main cause of mortality continues to play out, and because of the accompanying demographic transition towards increasingly older populations. A key consequence is that the proportion of people who have multiple chronic conditions is expected to rise, although health services remain largely configured to the management of single diseases.

Although largely based on published literature, the descriptive epidemiology of multimorbidity is illustrated throughout the chapter using data on the presence of 40 long-term conditions in 1 754 133 Scottish patients registered with 310 Scottish general practices. This dataset includes approximately one-third of the Scottish population, and is representative of the whole population in terms of age, sex and socio-economic deprivation. The dataset is described in more detail in Annex 6.A1.

What is multimorbidity?

The practice of medicine relies on a system of diagnostic classification which is paralleled by the ways that professions and health services are organised into disease-focused silos. However, diseases or morbidities occur in individuals who may experience none, one or several simultaneously. On the face of it, multimorbidity is therefore an obvious concept, but as with other broad concepts like “quality” or “continuity”, defining it and making it useful is not so straightforward. Although both focus on people with more than one condition, a key distinction is between “co-morbidity” and “multimorbidity” (Valderas *et al.*, 2009; van den Akker *et al.*, 1996).

Co-morbidity is the existence of *other* conditions in people who have one condition that is of primary interest (Feinstein, 1976), whereas multimorbidity is “the co-occurrence of multiple chronic or acute diseases and medical conditions within one person” (van den Akker *et al.*, 2001). Figure 6.1 demonstrates this for one individual with four conditions. In a study of diabetes, this person would be considered to have three co-morbidities – ischaemic heart disease, depression and rheumatoid arthritis. In a study of multimorbidity, this person would be defined as being multimorbid by virtue of having four conditions, but none is the specific focus of interest.

Figure 6.1. Co-morbidity and multimorbidity

Source: Bruce Guthrie, Sally Wyke, Jane Gunn, Marjan van den Akker and Stewart Mercer for the OECD.

From a co-morbidity perspective, one disease is dominant and defined as the index condition. This usefully focuses researchers and health services on clearly defined populations of patients with disease X, who have additional needs because of other conditions they happen to have. It is useful where there are particular common needs that are not easily addressed within a single disease framework. An example is the identification and management of co-morbid depression in patients with physical health problems like diabetes. In this context, depression is defined as a co-morbidity of diabetes. Relevant research has included documenting the increasing prevalence of depression in people with diabetes, studies of the negative impact of depression on diabetes control (Lin *et al.*, 2004), and trials the effectiveness of complex interventions on both diabetes and depression outcomes (Katon *et al.*, 2010). Co-morbidity perspectives have usefully informed changes in health service organisation, such as the inclusion in the UK Quality and Outcomes Framework of financial incentives for general practitioners to screen people with ischaemic heart disease and diabetes for depression (depression as co-morbidity), and to provide an annual physical health review for people with serious mental illness (physical problems and especially cardiovascular disease as co-morbidity) (NHS England, 2009). This approach extends consideration beyond a single disease silo, and is useful for particularly common combinations of conditions. However, the index condition usually still dominates in the sense that the question being asked is of the form “how should depression in people with ischaemic heart disease be treated?” or “how should people with ischaemic heart disease and depression be treated?”.

In considering co-morbidity, one disease is dominant and defined as the index condition. This effectively retains a disease-silo approach, but usefully focuses attention on other important needs within this population that care for a single disease might not routinely consider. An example is the identification and management of co-morbid depression in patients with physical health problems like ischaemic heart disease and diabetes. In this context, depression is defined as a co-morbidity of the physical condition. Relevant research has included showing an increased prevalence of depression in people with physical disease (Gunn *et al.*, 2010; Mercer and Watt, 2007), studies of the negative impact of depression on disease control and outcomes (Lin *et al.*, 2004), and trialling the effectiveness of complex interventions on both diabetes and depression outcomes (Katon *et al.*, 2010). A related co-morbidity approach sometimes underlies health service organisation or measurement, such as the inclusion in the UK Quality and Outcomes Framework of financial incentives for General Practitioners to screen people with ischaemic heart disease and diabetes for depression, and to provide an annual physical health review for people with serious mental illness (NHS England, 2009). This approach extends care beyond a single disease silo, and is useful for particularly common combinations of conditions. However, the index condition and therefore a disease-silo approach usually still dominates.

From a multimorbidity perspective, the person seeking health care is made central rather than the particular conditions they happen to have. Even in people with multimorbidity, some decisions will still be made within a single disease framework (should this person with ischaemic heart disease take aspirin?), but decision making will often require balancing competing considerations [should this person with ischaemic heart disease take aspirin, even though they require a non-steroidal anti-inflammatory drug (NSAID) for their rheumatoid arthritis? Is their obesity more of a problem than their inflammatory arthritis? Is it more important to start the aspirin now than manage their depression?]. At any one moment, there may be an index condition which dominates in the way that an 'index' condition is central in a co-morbidity perspective, but over time what matters most to individuals will often change. Additionally, where a patient has many conditions, then single disease guideline recommendations are sometimes concordant in the sense that there is a single course of action recommended for multiple conditions. However, blindly following guidelines may also rapidly lead to patients taking large numbers of interacting and sometimes conflicting drugs (Boyd *et al.*, 2005).

The distinction between co-morbidity and multimorbidity highlights the tension between disease and patient-centred conceptions of health and health care, which is mirrored by the distinction between specialist and generalist

models of care. When patients have only one disease or when one disease dominates, then disease-focused specialist care will often be the most efficient and effective form of organisation. Examples include people with acute myocardial infarction and its immediate aftermath, and those having chemotherapy for cancer. However, for people with multiple, currently problematic conditions, then services based on disease silos may rapidly become duplicative and therefore inefficient in their use of resources (Starfield *et al.*, 2005), and burdensome and unsafe for the patient because of poor co-ordination and integration (May *et al.*, 2010; O'Brien *et al.*, 2010). The correct balance between specialist and generalist care will depend on how common multimorbidity is, and its impact on people with multiple conditions. These issues are considered in the next two sections.

How common is multimorbidity?

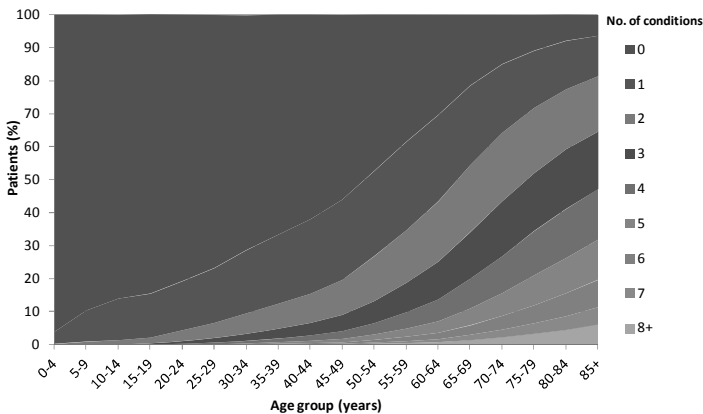
There is no consensus on how to measure multimorbidity (van den Akker *et al.*, 2001; Diederichs *et al.*, 2010; Salisbury *et al.*, 2011). Diederichs *et al.* conducted a systematic review which identified 39 different multimorbidity measures. These varied in a number of ways including the number of conditions counted (between 4 and 102), the data used to define if a condition was present (self-report, medical record review, routine electronic clinical data, and administrative data about hospital admission) and the population being measured (population samples, primary care users, hospital users; all ages or restricted to the elderly) (Diederichs *et al.*, 2010).

Unsurprisingly, prevalence estimates vary considerably depending on the measure used and the population sampled. For example, Salisbury *et al.* used electronic clinical data for patients aged 18 and over from a broadly representative sample of United Kingdom General Practices, and applied two indices to the same data – a count of 17 common and important conditions included in the UK Quality and Outcomes Framework primary care pay for performance programme, and a count of a 114 Expanded Diagnostic Clusters representing chronic conditions based on a US case-mix adjustment system (Salisbury *et al.*, 2011; Johns Hopkins Adjusted Clinical Group, 2011). The crude prevalence of multimorbidity defined as the presence of two or more conditions was 16% with the former and 58% with the latter. Others have shown that the measured prevalence of multimorbidity is higher in samples drawn from primary medical care users than general population ones, and increases as the number of conditions included in the count increase (van den Akker *et al.*, 2001; Fortin *et al.*, 2010). As a result, comparison of prevalence across studies using different methods for measuring multimorbidity presence and sampling from different populations is not meaningful. A key implication for comparing health systems is to be sure that a single measurement method has been used and

the same population is being sampled (Starfield *et al.*, 2005). However, despite the variation in methods and prevalence estimates, there are consistent findings across studies.

First, irrespective of how it is counted, multimorbidity is common, especially in older people of whom the majority have multimorbidity. Figure 6.2 shows the percentage of people with different numbers of conditions in Scotland (the dataset is described in Annex 6.A1). Of the 1 751 841 people in the dataset, 405 496 (23.1%) have at least two chronic conditions, and 237 798 (13.6%) have at least three. The number of chronic conditions that people have increases rapidly with age. From age 65, over half the population are multimorbid (defined as having two or more chronic conditions) and almost three-quarters by age 75. From age 50 onwards, the majority of people with any chronic condition are multimorbid, and from age 75 the majority of people with any chronic condition have three or more. Multimorbidity is more common in older people who also have more frailty and reduced functional status. However, multimorbidity is important in younger people since there are fewer older people in the population than the middle aged. Of the 405 496 people with at least two chronic conditions, 210 500 (51.9%) are aged under 65, as are 42% of those with three or more chronic conditions.

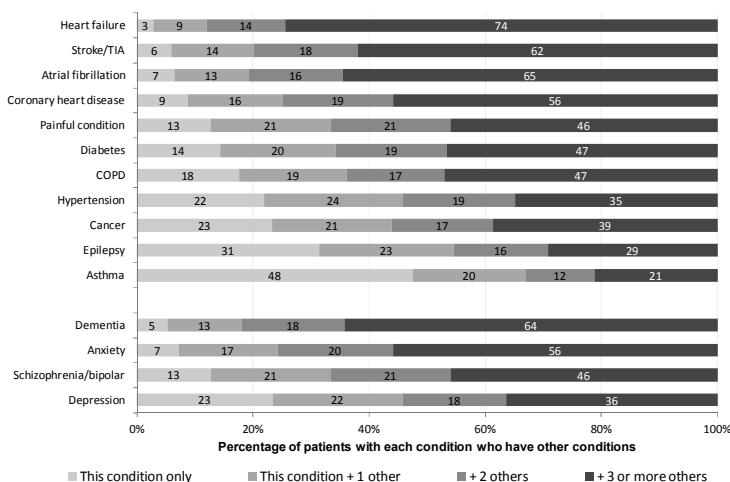
Figure 6.2. Number of chronic conditions by age in Scotland



Source: Bruce Guthrie, Sally Wyke, Jane Gunn, Marjan van den Akker and Stewart Mercer for the OECD.

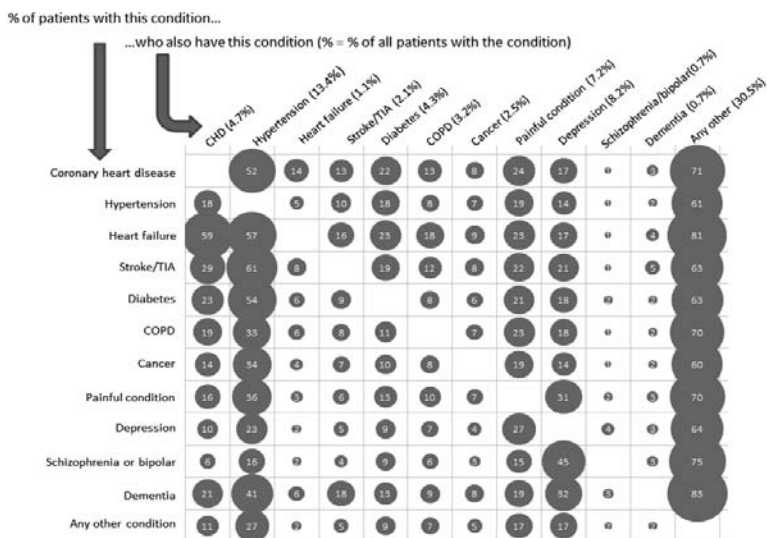
Figures 6.3 and 6.4 use the same data to show the proportion of people in Scotland with selected, common chronic conditions who have other diseases, and Figure 6.3 co-occurrence of selected conditions (Information Services Division, 2008). It is therefore clear that people with single chronic diseases are the minority, except in children and younger adults.

Figure 6.3. Proportion of patients with common long-term conditions who also have other diseases



Source: Bruce Guthrie, Sally Wyke, Jane Gunn, Marjan van den Akker and Stewart Mercer for the OECD.

Figure 6.4. Commonly occurring co-morbidity in a Scottish primary medical care population¹



1. The figure should be read horizontally (52% of people with coronary heart disease have hypertension, 14% heart failure, 13% stroke and so on). TIA is transient ischaemic attack ('mini-strokes'), COPD is chronic obstructive pulmonary disease. "Other" conditions are one or more of the remaining 29 long-term conditions included in the analysis.

Source: Bruce Guthrie, Sally Wyke, Jane Gunn, Marjan van den Akker and Stewart Mercer for the OECD.

Second, Figure 6.4 illustrates that different combinations of conditions may be more or less concordant. For example, coronary heart disease, hypertension, stroke/TIA and diabetes are significantly concordant in that management of cardiovascular risk is core to their chronic management. In contrast, other conditions are discordant in that treatment has no overlap or the management of one condition significantly complicates treatment of another. The most obvious example of that is where physical and mental health conditions co-exist. Depression is the most commonly occurring mental health co-morbidity of physical diseases, but people with depression, schizophrenia or bipolar disorder, and dementia all have relatively high rates of physical conditions. In total, 156 700 people had multimorbidity including at least one mental health problem (8.9% of the total population, 39.6% of people with multimorbidity). This is particularly important since physical and mental health care are typically less well co-ordinated than care for physical conditions alone, especially where physical conditions are relatively concordant. Although older people with multimorbidity are more likely to have a mental health problem recorded, 63.9% of multimorbidity that included mental health problems occurred in people age under 65 years (Table 6.1).

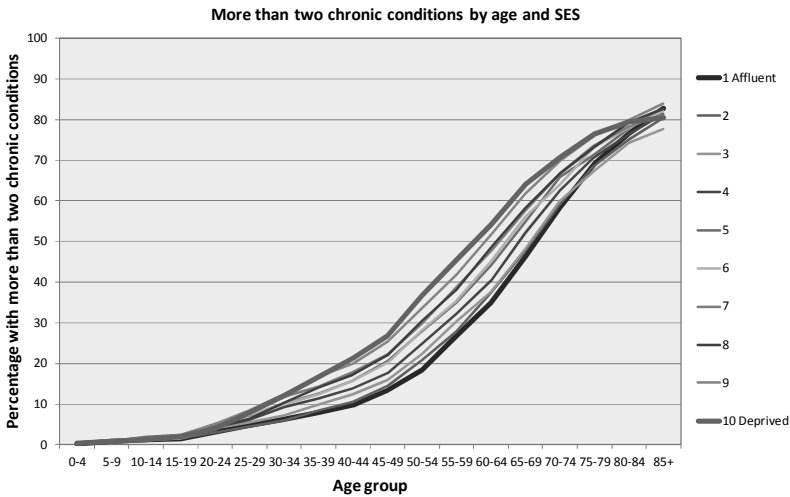
Table 6.1. Prevalence of physical and mental health co-morbidity by age in a Scottish primary care population

Age (years)	Number. (%) with multimorbidity	Number (%) with multimorbidity including at least one mental health condition
0-24 (n=479156)	8 460 (1.8)	3540 (0.7)
25-44 (n=508389)	53 953 (10.6)	35050 (6.9)
45-64 (n=473127)	140 512 (29.7)	61536 (13.0)
65+ (n=291169)	192 960 (66.3)	56574 (19.4)

Source: Bruce Guthrie, Sally Wyke, Jane Gunn, Marjan van den Akker and Stewart Mercer for the OECD.

Third, multimorbidity occurs at an earlier age in socioeconomically deprived populations compared to more affluent ones (although this is much less commonly studied than associations with age) (Mercer and Watt, 2007; Salisbury *et al.*, 2011; van den Akker *et al.*, 1998; Uijen and van de Lisdonk, 2008). Using the same Scottish dataset, Figure 6.5 shows that there is a socioeconomic gradient in the prevalence of multimorbidity in adults, which is greatest in middle age when those living in the most deprived postcodes are approximately twice as likely to have multimorbidity than the most affluent. Put another way, at age 55, the most deprived patients have the same rates of multimorbidity as the most affluent at age 65. To our knowledge, this has not been studied in any detail in other populations. However, although the size of the gradient may vary, we would expect to see similar socioeconomic gradients in other countries.

Figure 6.5. Prevalence of multimorbidity (two or more chronic conditions) by age and socioeconomic status in Scotland



Source: Bruce Guthrie, Sally Wyke, Jane Gunn, Marjan van den Akker and Stewart Mercer for the OECD.

Fourth, diseases and therefore multimorbidity are not randomly distributed in the population but are clustered in particular individuals (van den Akker *et al.*, 2001; van den Akker *et al.*, 1998). Using data from a Dutch primary medical care population study for 335 chronic and recurrent diseases, van den Akker *et al.* compared the actual distribution of multimorbidity to that if diseases were randomly distributed. They found that, compared to a random distribution, disease and multimorbidity was concentrated in a smaller than expected number of sicker people with a greater than expected number of conditions, and this was particularly the case in younger people (van den Akker *et al.*, 1998). This is at least partly due to some diseases having shared causes, with smoking for example being a cause of a wide range of cardiovascular and lung diseases, and is one explanation for the observation above that most people with chronic disease have more than one. However, even conditions without an obvious shared aetiology are associated. Depression is more common in people with increasing numbers of physical conditions, and this association is only partly explained by functional status and quality of life (Gunn *et al.*, 2010). How multimorbidity develops over time and the elucidation of causal mechanisms is an important area for future research (Valderas *et al.*, 2009). This is particularly relevant to preventing multimorbidity. Given current

understanding, prevention is likely to be possible by taking steps known to prevent the development of individual conditions, or multiple conditions where there is a shared aetiology like smoking, obesity, poor diet, low rates of physical exertion or alcohol overuse. From that perspective, implementing effective population and individual health promotion programmes should reduce multimorbidity. However, understanding why conditions without a known aetiological pathway are associated would potentially create new methods of prevention.

Finally, there is one study that has examined changes in the prevalence of multimorbidity over time, using the same measurement method in a consistent primary care population. This found that the age-sex standardised proportion of people with four or more conditions increased from 2.6% in 1985 to 7.5% in 2005. The reasons for this are not clear, but the authors hypothesised that it was due to increasing diagnosis of asymptomatic disease due to changing diagnostic thresholds (for hypertension and diabetes in particular), and increased survival with chronic disease due to better treatment (Uijen and van de Lisdonk, 2008). Given aging populations and continued improvement in survival in people with heart disease, stroke, cancer and other conditions, it seems likely that the proportion of people with multiple chronic conditions will increase in the future, although measuring the extent of this will require use of the same measurement method in the same population over time. However, leaving aside changes in prevalence due to aging, it is important to recognise that it is not clear whether rising rates should be considered an indication of good health system performance (because of better survival with chronic disease, or increased diagnosis of asymptomatic diseases like hypertension where treatment reduces future risk of more serious conditions) or poor health system performance (because of inadequate population and individual disease prevention).

The impact of multimorbidity

Multimorbidity is common irrespective of how it is measured, so any impact on a range of outcomes will have significant population implications. This section describes how multimorbidity is associated with a range of broadly grouped outcomes:

- Mortality;
- Functional status and quality of life;
- Health services use, and health care quality and safety.

Mortality

Multimorbidity is associated with higher mortality (Gijzen *et al.*, 2001). Much of the research in this area has taken a co-morbidity perspective, typically by examining how mortality varies by number of condition in people who have an index condition of particular interest (Gijzen *et al.*, 2001; Satariano and Ragland, 1994; Yancik *et al.*, 1998; Yancik *et al.*, 2001). For example, Satariano and Ragland found that mortality in women with early breast cancer was largely driven by death from other causes in women with co-morbidity (Satariano and Ragland, 1994). The observed association with mortality underlies some of the most widely used multimorbidity measures such as the Charlson Index (Charlson *et al.*, 1987). The Charlson index is essentially a weighted multimorbidity count of 19 conditions, where the weights are derived based on the observed association between conditions and mortality. It is well validated, with ten-year mortality rates in the original validation cohort being 8% for those with a score of zero, 25% with a score of one, 48% with a score of two and 59% for those scoring above three (Charlson *et al.*, 1987; Librero *et al.*, 1999). Many multimorbidity scores show similar associations with mortality, although the strength of association varies somewhat between scores (Perkins *et al.*, 2004).

Two observations about the distribution of multimorbidity above are relevant in considering the implications. First, chronic disease is not randomly distributed in the population, with morbidities clustering in particular individuals, and this clustering being strongest in younger and middle-aged people (Gunn *et al.*, 2010; van den Akker *et al.*, 1998). Second, multimorbidity occurs at an earlier age in people with low socioeconomic status. Differences in the prevalence of multimorbidity are therefore likely to contribute to variations in potential years of life lost between countries, and between people of different socioeconomic status within countries (Gardner and Sanborn, 1990; Nolte and McKee, 2004).

Functional status and quality of life

Multimorbidity is associated with reduced functional status, usually measured in terms of ability to carry out activities of daily living (Boyd *et al.*, 2007, Fuchs *et al.*, 1998; Perrucio *et al.*, 2007, Kadam *et al.*, 2007; Yancik *et al.*, 2007; Bayliss *et al.*, 2004; Greenfield *et al.*, 1993). Using primary medical care consultation data, Kadam *et al.* showed that poor functional status was associated with the overall burden of multimorbidity in terms of both the number of conditions and their severity (Kadam *et al.*, 2007). Greenfield *et al.* studied people having hip replacement and found that

much of the variation in functional status after one year was explained by the degree of multimorbidity people had, and that differences in multimorbidity case-mix explained all variation between hospitals in functional outcomes (Greenfield *et al.*, 1993). The key implication is that case-mix adjustment for multimorbidity will be important if patient-reported outcome measures are used to assess the quality of health care.

Fortin *et al.* have systematically reviewed the literature on the association between multimorbidity and quality of life. Although the research reviewed varied in terms of how both multimorbidity and quality of life were defined and measured, there was consistent evidence that physical quality of life fell with increasing multimorbidity (Fortin *et al.*, 2004). Associations between multimorbidity and quality of life were stronger for severity-adjusted multimorbidity measures, with more severe disease not unexpectedly having greater impact on quality of life (Fortin *et al.*, 2005; Fortin *et al.*, 2006). Although few studies have examined it directly, there is also some evidence that the impact of multiple conditions is greater than the sum of the impacts of individual conditions (*i.e.* that multimorbidity has an additional impact in itself) (Rijken *et al.*, 2005). A weakness of existing research is that the majority of studies either excluded people with psychiatric illness or did not include mental health problems in morbidity counts (Fortin *et al.*, 2004).

Clearly, multimorbidity has a significant impact in how people are able to lead their lives. A useful framework for understanding the impact of chronic illness was developed by Corbin and Strauss using qualitative interview data (Corbin and Strauss, 1985). They showed that people with chronic illnesses have three lines of “work”: *illness work* refers to the tasks associated with medical regimens, crisis prevention and management, symptom management and diagnostic related work; *everyday life work* refers to the essential round of daily tasks that keeps a household running, housework, personal care, childcare, earning money, cooking, eating; *biographical work* refers to the need for reconsideration of one’s past in the light of current illness and to imagine a new future. Because outlook can be bleak, this often raises unwanted emotions and psychological distress, which in turn need to be managed. Each type of work has associated tasks and requires consideration about who does them, how, where, when, with what consequences and in the face of which challenges.

The work and the tasks required in managing multimorbidity clearly vary enormously between people in different circumstances but also over time as illnesses develop and as social environments change. Different types of task need to be sequenced and the resources available for each carefully balanced; using the offer of a ride from a neighbour for a trip to the hospital (*illness work*) means that it is harder to ask for a ride to visit a family member or to

take children to school (everyday life work). Balancing out competing demand for resources, and especially of energy, can be a major drain on people with multimorbidity. Maintaining valued social roles – performing important everyday life work – is often prioritised at the expense of managing symptoms (Townsend *et al.*, 2003). Managing complex drug regimens also creates tension between lines of work; in general people express an aversion to taking drugs and want to retain an idea of themselves as “drug free” (biographical work) whilst recognising that drugs are necessary to manage their conditions (illness work) and can help them perform social roles (everyday life work). People with multiple conditions face more barriers and find self-management more difficult because of the compound impact of their conditions, the difficulty and amount of work involved in managing medications, and because a single, dominant, often painful condition often interfered with an ability to undertake the illness work associated with other conditions (Bayliss *et al.*, 2003). Treatment burden (May *et al.*, 2010), discussed further below, is important because the greater demands placed by a medical regimen or the sequencing of medical visits (the extent of illness work) means that fewer resources are available for valued activities that most impact of quality of life. The trade-offs involved may particularly affect the most socio-economically disadvantaged who have fewer personal and community resources to call on, and who may therefore experience greater impact on their quality of life and greater difficulty in effectively managing their health problems.

Health service use and health care quality and safety

Health service use

Unsurprisingly, multimorbidity is associated with increased use of health services including inpatients and ambulatory care (Salisbury *et al.*, 2011; Gijzen *et al.*, 2011; Librero *et al.*, 1999; Wolff *et al.*, 2002). It is estimated that about two thirds of total US health care spending is devoted to the ~25% of people with multimorbidity. To some extent, this increase in health service use is exactly what would be expected because need is greater in people with multiple conditions (Salisbury *et al.*, 2011), but at least some increased use is because of failures of co-ordination and complications of treatment including adverse drug events from complex prescribing regimes (Leendertse *et al.*, 2008; Zhang *et al.*, 2009). Much of the increase in health service use is concentrated in the final year or two of life, which at times will be inappropriate if palliative care approaches are more indicated than aggressive “curative” treatment (Wolff *et al.*, 2002; Murray *et al.*, 2005).

As an example of this, Wolff *et al.* examined admissions for ambulatory care sensitive conditions (ACSCs) and preventable complications in

1.2 million people aged 65 and over in the US Medicare programme (Wolff *et al.*, 2002). ACSCs are conditions where better ambulatory/primary care is expected to reduce the need for admission (hence their alternative name of “potentially preventable admissions”). Examples include admissions with exacerbations of asthma and chronic obstructive pulmonary disease, perforated appendicitis, and dehydration. Examples of preventable complications include post-operative infection and iatrogenic pneumonia. Multimorbidity was defined as a condition count using a proprietary case-mix adjustment software (the Ambulatory Care Group classification system) (Johns Hopkins Adjusted Clinical Group, 2011; Wolff *et al.*, 2002). Admissions with ACSCs and preventable complications are very significantly increased in people with more conditions (Table 6.2). After adjustment for age and sex, people with four or more chronic conditions have over 90 times the odds of either type of admission compared to those with none. Their mean annual mean expenditure is 60 times greater than those with none (and 12 times greater those with only one chronic condition) (Table 6.2).

Table 6.2. Odds ratios for admissions with ACSCs and preventable complications, and mean expenditure by number of chronic conditions

No. of chronic conditions	% of beneficiaries	Odds ratio (95% CI) for admission with an ACSC ¹	OR (95% CI) for admission with preventable complication ¹	Mean annual Medicare expenditure (USD) ²
0	18.0	1	1	211
1	17.3	7.5 (6.5-8.6)	6.0 (5.0-7.2)	1 154
2	21.8	18.1 (15.8-20.8)	13.6 (11.4-16.2)	2 394
3	28.8	36.4 (31.8-41.7)	29.2 (24.5-34.8)	4 701
≥4	24.1	98.5 (86.1-112.7)	91.4 (76.8-108.6)	13 973

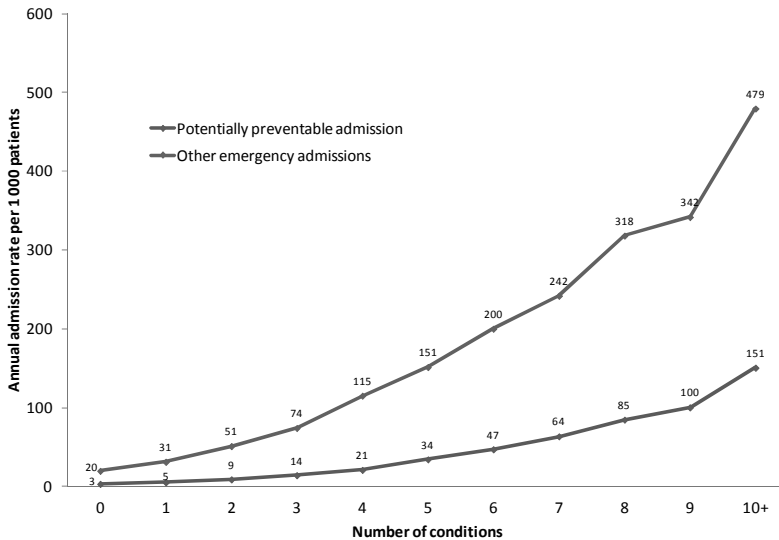
1. Adjusted for age and sex. Note that age has only small independent associations (for example, for ACSC, OR compared to 65-69 were 1.0 for 70-74, 1.2 for 75-79, 1.6 for 80-84 and 2.5 for 85 and over).

2. Age has only limited effect on expenditure after number of conditions is accounted for (for example, for people with 0 chronic conditions, mean expenditure is USD 195 in those aged 65-69 and USD 303 for those aged 85 and over; for people with more than four chronic conditions, mean expenditure is USD 14 109 for those aged 60-69 and USD 14 282 for those aged 85 and over).

Source: Adapted from Wolff *et al.* (2002).

Figure 6.6 shows admission rates with potentially preventable admissions and all other emergency admissions in Scotland by number of conditions, showing a similar relationship as found in the US Medicare study.

Figure 6.6. Potentially preventable¹ and other emergency admission rates in 226 593 patients in 40 Scottish practices with linked primary care and hospital admissions data



1. “Potentially preventable” admissions as defined by NHS Scotland use a very similar list of ICD codes as “ambulatory care sensitive admissions” as defined by Wolff *et al.* (2002).

Source: Bruce Guthrie, Sally Wyke, Jane Gunn, Marjan van den Akker and Stewart Mercer for the OECD.

Wolff *et al.*'s main conclusion was that strengthening US primary care was the intervention most likely to improve care for older people with multiple conditions in the United States, because specialist care would inevitably be fragmented for people with multiple conditions. This is illustrated by Pham *et al.*'s examination (Pham *et al.*, 2007) of US Medicare claims data for people aged 65 and over (Table 6.3), where the number of physicians seen increases steeply as the number of conditions a person has increases, for both primary care physicians and specialists. The one-third of older people with seven or more conditions saw a median of 11 physicians spread over seven different practice sites in the year studied.

This highlights the importance of someone taking clear responsibility for co-ordination and integration for people with multiple conditions, although with increasing numbers of physicians involved, the risk of all providers assuming that someone else has this responsibility increases (a situation described by Balint in the 1950s as the “collusion of anonymity” (Balint, 1957) where all are responsible in theory allowing none to be in practice).

**Table 6.3. Median number of physicians seen in the year 2000
by number of chronic conditions**

No. of conditions	No. (%) of patients	Median physicians seen in one year (interquartile range)	Median primary care physicians seen in one year (IQR)	Median specialists seen in one year (IQR)	Median practices attended (IQR)
0-2	257 471 (13)	3 (2-5)	1 (1-2)	2 (1-3)	2 (1-3)
3-4	451 774 (24)	5 (3-7)	2 (1-3)	3 (2-5)	3 (2-5)
5-6	448 855 (25)	7 (5-10)	2 (1-3)	4 (3-6)	4 (3-6)
≥7	629 354 (38)	11 (8-16)	3 (2-5)	8 (5-9)	7 (5-9)

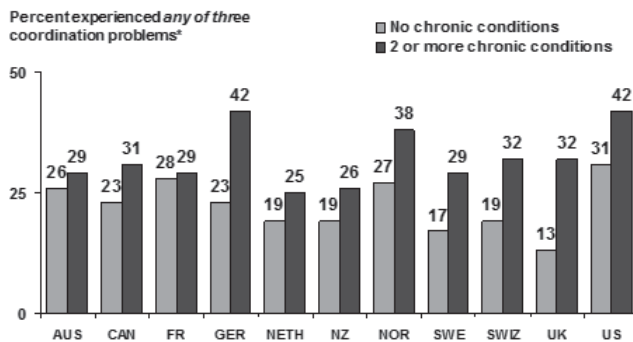
Health care quality and safety

Measuring the quality and safety of care is not straightforward, since both are multi-faceted concepts. Studies examining the association between multimorbidity and quality of care are not wholly consistent with some finding lower quality in those with multiple conditions, and some higher quality (Gijssen *et al.*, 2001). For people with cancer, there is evidence that people with co-morbidity are less likely to receive guideline recommended therapy, although in at least some cases this may be because the risks of aggressive therapy in people with other serious conditions may outweigh the benefits (Gijssen *et al.*, 2001). Similar evidence exists for other conditions. In one study, control of blood pressure and treatment intensification to try to achieve control was worse in people with other conditions than those with hypertension alone (Turner *et al.*, 2008). Although the reasons for this were unclear in this study, others have identified that care for depression may be squeezed out by the “competing demands” of physical condition care (Nutting *et al.*, 2000). However, in contrast, other studies using large electronic databases to measure quality of care have fairly consistently found that quality of care is better overall for people with multiple conditions than those with only one (Higashi *et al.*, 2007; Min *et al.*, 2007). For example, Higashi *et al.* examined receipt of high-quality measured by multiple measures in three different populations. People with more conditions consistently received a higher percentage of recommended care. This was partly explained by their more frequent use of health services, which provides more opportunities for clinicians to optimise care (Higashi *et al.*, 2007).

A difficulty is that most existing quality indicators are typically focused on individual conditions, and even those studies examining quality for multiple conditions simultaneously effectively only sum up these individual condition indicators. What this ignores is the way in which care is

integrated, co-ordinated, personal or has high continuity, all of which are identified as important in qualitative studies of people with multimorbidity (Bayliss *et al.*, 2008). However, measurement of these is less straightforward than many quality indicators which can often be measured from electronic or paper medical records. Although there are no gold-standard measures, patients themselves are currently the best single source of data on how well care is integrated, co-ordinated or has high continuity. The Commonwealth Fund has carried out repeated multinational surveys of people with chronic conditions focusing on health system performance, and has published a range of findings stratified by the number of chronic conditions, and some examples are included below (Commonwelath Fund, 2011). These show that firstly, people with multiple conditions experience more problems with co-ordination (Figure 6.7) and medical error (Figure 6.8) which is likely to be at least partly mediated by the number of doctors that people see (Figure 6.9). Secondly, co-ordination problems are experienced by at least one in three people with multimorbidity in virtually every country (Figure 6.7). However, experience of co-ordination problems and errors by people with multimorbidity varies almost two-fold between countries.

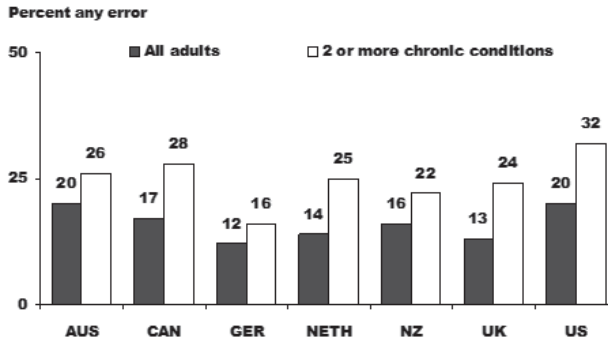
Figure 6.7. Experience of co-ordination problems by number of chronic conditions



* Test results/records not available at time of appointment, received conflicting information from different health professionals and/or ordered test that had already been done.

Source: 2010 Commonwealth Fund International Health Policy Survey in Eleven Countries.

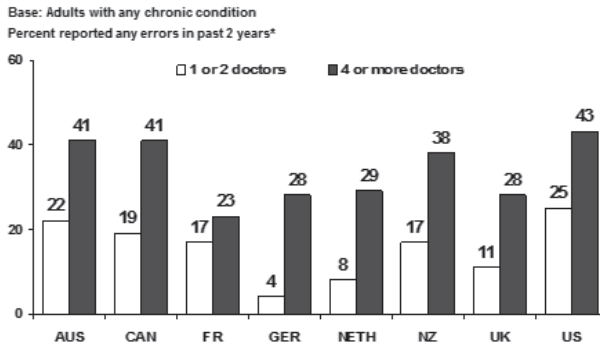
Figure 6.8. Experience of medical errors by number of conditions



Note: Errors include medical mistake, wrong dose/medication or lab test error.

Source: 2007 Commonwealth Fund International Health Policy Survey. Data collection Harris Interactive, Inc.

Figure 6.9. Experience of medical errors by number of doctors seen



* Experienced medical mistake, medication error and/or lab test error or delay.

Source: 2008 Commonwealth Fund International Health Policy Survey of Sicker Adults. Data collection Harris Interactive, Inc.

Treatment burden and poly-pharmacy

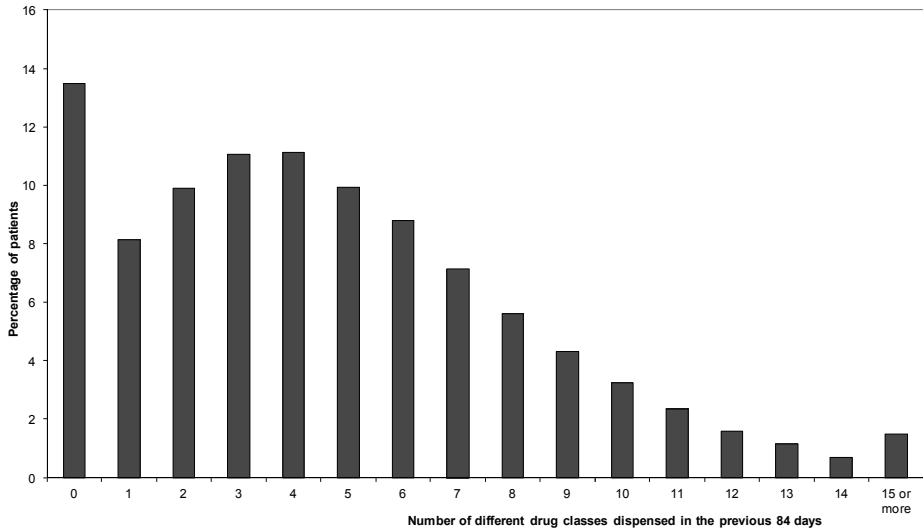
Health service professionals and guideline developers have historically paid relatively little attention to the burden that treatment imposes on people with multiple conditions, in terms of attendance at appointments (especially when these at multiple geographically dispersed institutions; Pham *et al.*, 2007), and drug and non-pharmacological treatment regimes (May *et al.*, 2010; O’Brien *et al.*, 2011). This has led to calls to make “treatment burden”

more explicit in research and organisation of care (May *et al.*, 2010). May *et al.* propose that improving this requires research to establish the weight of treatment burden and create tools to assess it in clinical practice; encouragement of co-ordination in clinical practice most plausibly through strengthening primary care; acknowledging co-morbidity in clinical evidence to make guidelines more useful by providing recommendations for people with multiple conditions rather than isolated recommendations condition by condition; and prioritising decision-making from the patient perspective to ensure that their concerns are paramount (May *et al.*, 2010). Most existing research in this area focuses on poly-pharmacy or multiple medication use, rather than treatment burden in its entirety.

Poly-pharmacy has a range of definitions, from people taking five or more drugs to people taking more than ten or more (Linjakumpu *et al.*, 2002; Fincke *et al.*, 2005; Hovstadius *et al.*, 2009; Hovstadius *et al.*, 2010; Payne and Avery, 2011). Figure 6.10 shows the number of drug classes prescribed in the last four months to all older residents of one Scottish region in 2010 (in practice, this underestimates the total number of drugs since people may additionally take over the counter medications). Almost half of older people are dispensed five or more drugs and one in five are dispensed ten or more drugs, making poly-pharmacy the norm in older people in the same way that multimorbidity is.

Large-scale longitudinal studies of poly-pharmacy are uncommon because population electronic prescribing databases are relatively recent creations. However, poly-pharmacy does appear to be increasing (Hovstadius *et al.*, 2010; Aparasu *et al.*, 2005), due to a number of factors including increasing multimorbidity and the increasing number of drugs recommended for chronic use by clinical guidelines, often for prevention rather than symptom control. Examples of the latter include treatment of hypertension, drugs for osteoporosis, and drugs like statins, anti-platelets, and ACE inhibitors for primary and secondary cardiovascular disease prevention. Although each recommendation is backed by high-quality trial evidence for single diseases, very few are made with any consideration of co-morbidity (Boyd *et al.*, 2007; Boyd *et al.*, 2005). Boyd *et al.* neatly demonstrate the implications of disease-based guidelines for people with multimorbidity by considering the case of an elderly woman with chronic obstructive pulmonary disease, type 2 diabetes, osteoporosis, hypertension and osteoarthritis. Following guidelines to the letter would imply that she be prescribed 12 sometimes interacting or contradictory medications taken at six different times of day, with an additional range of non-pharmacological recommendations (Boyd *et al.*, 2005).

Figure 6.10. Number of drug classes prescribed in the last four months to all 74 707 residents aged 65 and over in the Tayside region of Scotland on 1 April 2010



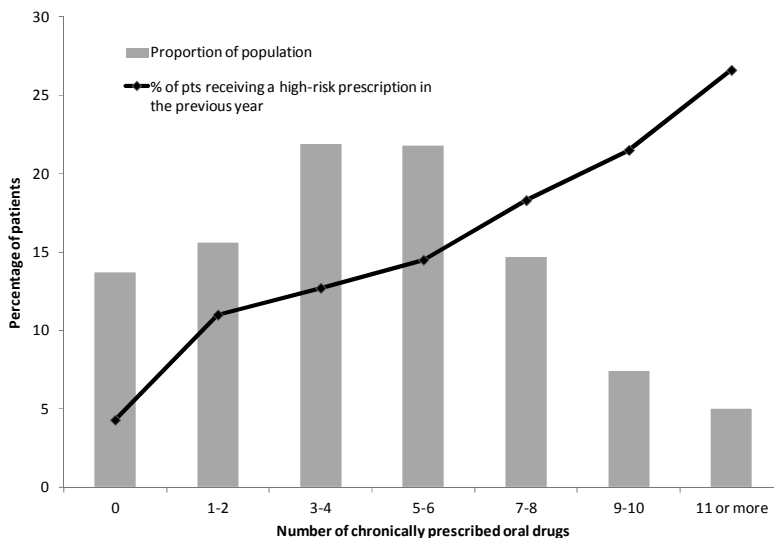
Source: Data provided by Dr Colin McCowan using the University of Dundee Health Informatics Centre dispensed prescribing database.

Each individual recommendation is entirely rational, but the whole may not be, because poly-pharmacy is a significant cause of iatrogenic harm and is strongly associated with adverse drug events and preventable admissions to hospital (Leendertse *et al.*, 2008; Hohl *et al.*, 2001). Figure 6.11 shows data from a primary care database study of high-risk prescribing in people particularly vulnerable to adverse drug events because of age, co-morbidity, or co-prescribing (the population examined is the same 1.76 million patient dataset described in Annex 6.A1). High-risk prescribing was measured using 15 indicators, and the figure shows the percentage of patients receiving one or more such prescriptions by the number of chronic medications prescribed. Just over 4% of patients who only received intermittent medication had received a high-risk prescription in the previous year, compared to over a quarter of those taking 11 or more chronic medications.

However, it is important to recognise that although poly-pharmacy carries risk, it is not always inappropriate (Aronson, 2006) since under-prescribing can cause as much or more harm as over-prescribing (Gallagher and O'Mahony, 2008; Gallagher *et al.*, 2008; Steinman *et al.*, 2006). In practice, although it is possible to measure high-risk prescribing and poly-

pharmacy using routine data (Guthrie *et al.*, 2011), defining whether such prescribing is appropriate or not usually requires a more detailed consideration of an individual patient's circumstances than is possible using electronic data (Boyd *et al.*, 2005; Boyd *et al.*, 2007; Steinman *et al.*, 2010). What this highlights is the importance of making guidelines more person than condition focused, and of ensuring that decision-making takes proper account of patient concerns and priorities (May *et al.*, 2010).

Figure 6.11. Rates of high-risk prescribing in patients particularly vulnerable to adverse drug events by number of chronically prescribed drugs



Source: Guthrie *et al.* (2011).

Summary of impact and cross-cutting issues

Overall, there is good evidence that multimorbidity is associated with a range of negative outcomes including death, poorer quality of life, and worse functional status, as well as with increased health service use. Evidence for poorer quality of care processes is mixed, but there is evidence that people with multimorbidity are at greater risk of care co-ordination problems, ineffective or unsafe poly-pharmacy and of receiving unsafe care. There are two important issues cutting across different outcomes. First, the association between multimorbidity and different outcomes is variable, in the sense that morbidities and patterns of multimorbidity associated with poor quality of life may not be strongly associated with mortality or hospital admission (Perkins *et al.*, 2004). For example, osteoarthritis and skin

conditions may have major impact on quality of life and are likely to have some impact on medication use and ambulatory consultation, but are unlikely to be strongly associated with either hospital use or mortality. Second, it is unclear whether multimorbidity is consistently associated with these outcomes in an additive way or a multiplicative way (*i.e.* whether worse outcomes are simply the sum of the impact of the underlying individual conditions, or if the sum is greater than the parts), although for quality of life and functional status, there is some evidence that the impact of multiple conditions is greater than the sum of the impact of the individual conditions (Kadam *et al.*, 2007; Rijken *et al.*, 2005). There is a need for further research to better understand these relationships. Overall, the impact of multimorbidity across a range of outcomes is considerable, and there are significant implications for health service organisation and care delivery.

Implications for the creation of clinical evidence and guidelines

Evidence of effectiveness of specific technologies and interventions is largely based on randomised clinical trials (RCTs). Most such trials typically have narrow inclusion and broad exclusion criteria because trial designers seek to maximise internal validity and to minimise trial costs by excluding people less likely to benefit from treatment. However, the selection of patients with only one condition, or the exclusion of the multimorbid, the elderly or those with poor functional status reduced external validity, which is the generalisability of the findings to real-world populations where most people have multimorbidity (Van Spall *et al.*, 2007). For example, the proportion of people with chronic obstructive pulmonary disease (COPD) in a population survey eligible to be included in the main trials underlying current guidelines ranged from 0-20% (median 5%) depending on the trial criteria (Travers *et al.*, 2007). Although there are significant cost implications, there is therefore a need for trials to be conducted in more representative populations (van Weel and Schellevis, 2006).

Additionally, there are implications for the translation of evidence into clinical guidelines (Boyd *et al.*, 2005; van Weel *et al.*, 2006; Dawes, 2010). As currently framed, guideline recommendations are usually framed in terms of single diseases and few take any account of other conditions that people may have. Where this does happen it is typically where there is overlap in recommendations (for example, cross-reference between diabetes and cardiovascular guidelines in terms of cardiovascular risk management) (Boyd *et al.*, 2005). Guidelines are also typically framed in terms of recommendations to act, rather than recommendations about when to stop or to not use treatments, or how to balance competing recommendations. A consequence is that patients with multiple conditions may rapidly acquire high levels of poly-pharmacy where every individual drug is guideline

recommended, but the overall drug burden is both difficult for patients to manage (May *et al.*, 2010; O'Brien *et al.*, 2010) and potentially harmful in itself (Boyd *et al.*, 2005; Steinman *et al.*, 2006; Steinman *et al.*, 2010). Developing clinical guidelines which are tailored to the particular set of conditions that an individual has will require explicit cross-referencing between guidelines at a minimum, and explicit considerations of the comparative magnitude of benefit and harm of different recommendations.

Implications for health system organisation and delivery of care

People with multimorbidity have worse quality of life, functional status and outcomes, make more use of health care (in terms of both more consultations/admissions and using more providers), experience greater problems with co-ordination and error. A key challenge they pose health care systems is therefore how to improve the continuity of their care. Continuity has three dimensions (Box 6.1) encompassing information flows between providers, agreement about how individuals and conditions should be managed (including a clinician or team taking clear responsibility for co-ordination), and the development of longitudinal personal relationships (Guthrie *et al.*, 2008; Haggerty *et al.*, 2003). Longitudinal relationships are particularly important in helping clinicians balance biotechnical rationales for care with ones that are based on an individual's biography, being sensitive to an individual's priorities and preferences as they change over time (Gunn *et al.*, 2008).

There are many possible ways in which health systems can seek to improve one or all of these dimensions of continuity, and key interventions are briefly discussed below although reviewing any of them in detail is beyond the scope of this review.

1. Strengthen primary care and generalism, and facilitate integration of generalist and specialist care.
2. Create new, more intensive services for selected patients or at particular points in the care pathway.
3. Self-management support interventions.
4. Interventions to address common combinations of particular conditions.

Box 6.1. Three main dimensions of continuity of care

Informational continuity

Formally recorded information shared between providers is the core, but is complemented by tacit knowledge of patient preferences, values, and context that is usually held in the memory of clinicians with whom the patient has an established relationship

Management continuity

Shared management plans or care protocols at a minimum to provide a sense of predictability and security in future care for both patients and providers, but also a provider or practice taking explicit responsibility for organising and co-ordinating follow-up, and mediating specialist recommendations where necessary.

Relationship or personal continuity

Built on accumulated knowledge of patient preferences and circumstances that is rarely recorded in formal records, and on interpersonal trust based on experience of past care and positive expectations of future competence and care. Informational and management continuity have a non-personal minimal core, but taking responsibility for co-ordination and integration is likely to be usually based on relationships with individual providers or sometimes practices/small teams.

Source: Adapted from Guthrie *et al.* (2008).

Strengthen primary medical care and generalism, and facilitate integration of generalist and specialist care

Responsibility for co-ordinating the care of people with multimorbidity, and managing the individual rather than their individual diseases is most likely to be taken by a generalist rather than a specialist clinician (although where one disease dominates, then single disease specialists can take this role). Generalists include primary care physicians, general internists (although these are declining in numbers in many countries), general paediatricians and geriatricians. However, as shown above using Scottish data, approximately half of people with two or more conditions are aged under 65 years, as are almost two-thirds of people with multimorbidity that includes a mental health condition. Age-defined specialists such as geriatricians and physical health specialists like general internists will therefore be potentially limited in their scope of practice for many people with multimorbidity. In at least some circumstance, “specialist” generalist care will be more appropriate than primary care generalist care, for example in the care of children or the elderly with the most complex physical needs.

The key issue is that generalists will usually be best placed to co-ordinate care when it is very complex, and although geriatricians and others will sometimes be the most appropriate generalist, primary care clinicians

are likely to be best placed to deliver continuity across all three of its dimensions for people with multiple conditions, since specialists are usually reluctant to provide care or co-ordination outside their areas of technical expertise (Starfield *et al.*, 2005; Gunn *et al.*, 2008; WHO, 2008). There is evidence that countries with a strong primary health care system have better health outcomes (Starfield *et al.*, 2005; Macinko *et al.*, 2003), but primary care is often a relatively weak and underdeveloped part of health care in many countries, and even countries with existing strong primary care systems face significant challenges from aging populations and increasing multimorbidity. Primary medical care training is typically shorter than that of specialists, with training in medicine of the elderly only one component among several (if present at all), and experience of chronic disease management and ambulatory care co-ordination relatively limited at best.

From this perspective, the US definition of the patient-centred medical home is useful (Box 6.2; Crabtree *et al.*, 2010; Starfield *et al.*, 2004). This embeds existing definitions of primary medical care in terms of first contact, continuous and comprehensive care in the context of a longitudinal relationship (WHO, 2008). However, it also makes more explicit statements of physicians' responsibility for care co-ordination and integration, communication including the meaningful use of health information technology, the quality and safety of care, and improved access, as well as recognition of the importance of payment systems and aligning incentives for primary care practices to facilitate these.

Evaluation of demonstration projects implementing primary care medical homes in the United States has shown how large the changes needed are, and the difficulty experienced by practices in moving even part-way towards the ideal (Crabtree *et al.*, 2010; Stewart *et al.*, 2010; Nutting *et al.*, 2010; Jaen *et al.*, 2010). Primary care is typically stronger in most other developed countries, but usually in terms of existing systems better delivering the first three of the US principles. Extending primary care to encompass the additional co-ordination and quality dimensions is likely to be challenging in most countries, and may require both changes to the training of new primary care physicians and nurses (for example, to explicitly include care co-ordination or have additional medicine in the elderly experience) and changing the practice of the existing workforce.

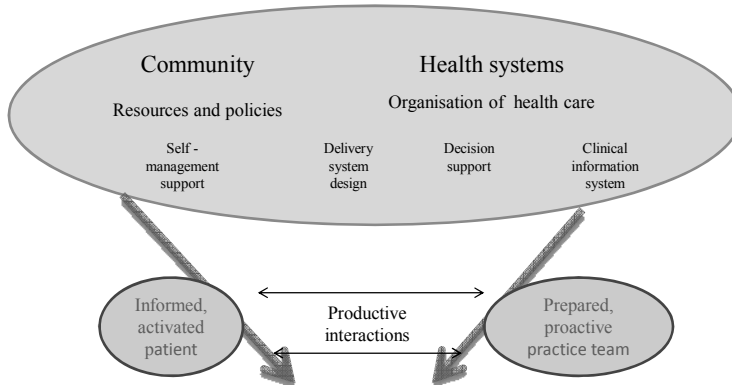
However, it is also important to recognise that high quality health care requires an appropriate balance between primary care and specialists, and ideally close integration between them. A commonly used model used in improving continuity for people with chronic illness is the Chronic Care Model, which is also likely to be applicable to multimorbidity (Figure 6.12; Wagner *et al.*, 1998; Improving Chronic Illness Care, 2011).

Box 6.2. Summary of the Joint Statement of Four Physician Organisations¹ on Principles of the Patient-Centered Medical Home

1. **Personal physician:** Each patient has an ongoing relationship with a personal physician trained to provide first contact and continuous and comprehensive care.
2. **Physician-directed medical practice:** The personal physician leads a team of individuals at the practice level who collectively take responsibility for the ongoing care of patients.
3. **Whole-person orientation:** The personal physician is responsible for providing for the entire patient's health care needs and taking responsibility for appropriately arranging care with other qualified professionals.
4. **Co-ordination and/or integration of care:** Care is co-ordinated and/or integrated across all elements of the complex health care system (*e.g.*, subspecialty care, hospitals, home health agencies, nursing homes) and the patient's community (*e.g.*, family, public, and private community-based services). Care is facilitated by registries, information technology, health information exchange, and other means.
5. **Quality and safety:** Quality and safety are hallmarks of a medical home, achieved by incorporating a care-planning process, evidence-based medicine, accountability, performance measurement, mutual participation, and decision making.
6. **Enhanced access:** Enhanced access to care is available through systems such as open scheduling, expanded hours, and new options for communication between patients, their personal physician, and practice staff.
7. **Payment:** Payment appropriately recognises the added value provided to patients who have a patient-centered medical home beyond the traditional fee-for-service encounter.

1. American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, American Osteopathic Association. Adapted from American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP), American College of Physicians (ACP), American Osteopathic Association (AOA), Joint principles of the patient-centered medical home, February 2007, www.aafp.org/pcmh/principles.pdf.

Source: Crabtree *et al.* (2010).

Figure 6.12. The chronic care model

Source: Adapted from the The MacColl Institute 1996-2011. The Improving Chronic Illness Care program is supported by The Robert Wood Johnson Foundation, with direction and technical assistance provided by Group Health's MacColl Institute for Healthcare Innovation.

The Chronic Care Model highlights the importance of both the community and health systems, with a number of elements including self management support and encouraging patients to be informed and active, and changes to the organisation of health care through delivery system redesign, decision support and clinical information systems to create integrated professional teams. It is beyond the scope of this chapter to consider all of these in detail, but self management support and delivery system redesign for common co-morbidities are discussed in more detail below.

Create more intensive services for selected patients or at particular points in the care pathway

The needs of people with chronic illness and multimorbidity vary over time. As an example, an older person with multiple conditions admitted to hospital with a hip fracture will have short to medium term needs for increased levels of personal, nursing and medical care after discharge. Failure to meet these needs is likely to be associated with higher rates of hospital readmission, admission to nursing home care, and mortality. There is a considerable body of evidence of specific interventions to support care transitions (usually in the frail elderly at hospital discharge) or to provide intensive case management of people identified as at particular risk of emergency hospital admission (usually in older people with multiple conditions). These interventions typically involve a nurse, social worker or

allied health professional providing care co-ordination and sometimes preventive care or treatment (Beswick *et al.*, 2008; Hutt *et al.*, 2004; Roland *et al.*, 2005; Gravelle *et al.*, 2007).

In England, (weak) evidence of a beneficial impact of nurse-led case management in elderly people at high risk of hospital admission (Kane *et al.*, 2001; Kane *et al.*, 2003) led to nationwide implementation of “community matrons” to deliver this service, but evaluation did not show any evidence of a beneficial impact (Gravelle *et al.*, 2007; Boaden *et al.*, 2005). More broadly, Beswick *et al.* systematically reviewed 89 trials of community-based complex interventions to support older people in living at home (Beswick *et al.*, 2008). The trials included examined a number of interventions including nurse-led case co-ordination in older people being discharged from hospital, falls prevention programmes, and geriatric assessment of older people living at home. The meta-analysis found that compared to controls, people in the intervention groups had a significantly lower relative risk of “not living at home” of 0.95 (95% CI 0.93-0.97; driven by a reduction in nursing home admission), and of hospital admission of 0.94 (95% CI 0.91-0.97). There was no evidence that more intensive interventions were more effective than less intensive ones. Interestingly, trials done since 1993 had consistently smaller effect sizes, which the authors believed was because of improvements in care co-ordination in “usual care” resulting from publication of earlier trials. The authors concluded that interventions to improve assessment and care co-ordination of elderly people were effective and were likely to have the largest effects in systems which currently performed poorly in terms of care co-ordination. However, their addition to health care systems which had already incorporated elements of these into routine practice might not be worthwhile (Beswick *et al.*, 2008).

Self-management support

No matter how health systems are organised the problems associated with multimorbidity are mainly dealt with by people in their own homes in the context of their everyday lives. As Bodenheimer *et al.* (2002) point out, “*the question is not whether people with chronic conditions manage their illness, but how they manage*” (p. 2470).

Definitions of self-management include reference to a person’s ability to manage symptoms, treatments, physical and psychosocial consequences and lifestyle changes necessary to live with a chronic condition (Bayliss *et al.*, 2003; Lorig and Holman, 2003). They suggest good self-management is when people: have an understanding of their conditions and treatment; are able to manage their medication; self-monitor their symptoms and other indicators of disease; recognise and manage the impact of illness on their

physical function, their emotions and how they manage their social roles (thus balancing their “lines of work”); are able to reduce other risks to their health; and are able to interact and work with health professionals collaboratively (Battersby *et al.*, 2010).

The extent to which people are successful “self-managers” depends on the resources and skills they have available to them. The basic tenant of self-management support is that:

- Good self-management skills can be learned;
- People can learn to recognise and draw together the resources they have or available to them;
- Support concerns itself more broadly than “illness work”, the medical aspects of the illness, to deal with the broader impact of the illness on daily life and on life roles; it is problem-based (Lorig and Holman, 2003); and
- Support extends beyond behaviour change to encompass the emotional and social adjustments people have to make (Newman *et al.*, 2009).

An important question is how self-management skills are learned. Some will not need to learn them, already having enough personal and social resources and a high level of health literacy to manage the problems that multiple illnesses bring. For others self-management support that elicits or teaches practical skills to manage everyday problems (such as self-monitoring or other skills, changing behaviours through goal setting, implementation intentions, “if-then” plans, and enhancing self-confidence to change, and problem solving; Mulligan *et al.*, 2009) is more effective than traditional, didactic education alone (that is, although patients’ workable understanding of illnesses and their treatment may be necessary it is not sufficient for good self-management; Coulter *et al.*, 2006).

Self-management support can be provided in a different settings (for example clinic or community), in a different forms (for example group-based, one-to-one, internet-based) and by different people (for example trained or untrained facilitators or by clinicians). Group-based self-management support such as the Chronic Disease Self Management Programme (Lorig *et al.*, 2006) and Expert Patient Programme (Health Do. Expert Patient Programme, 2011), is based on a formal curriculum, led by trained lay, volunteer, leaders. The curriculum is designed to teach skills in problem solving, decision-making, finding and using resources, and developing relationships with health professionals. It is thought to operate by changing expectations of outcomes (outcome expectancies) and through

raising confidence (self-efficacy) that improvements and change in what one does is possible. A review of 17 trials conducted in 2007 showed that participation in the programmes result in small improvements in people's confidence to manage their condition (SMD 0.30, 95% CI 0.41-0.19), in self-rated health (WMD -0.20, 95% CI -0.31 – -0.10) and in how often people took aerobic exercise (SMD -0.20, 95% CI -0.27 – -0.12). There were also small improvements in pain, disability, fatigue and depression but the programmes did not improve quality of life or resource use (Foster *et al.*, 2007).

Other approaches to group-based support include the organisation of social support through professionally created peer group interaction (whether face to face or on-line). For example, many medical charities run both face to face and on-line support groups which can offer information, emotional support and help with appraising situations based on members' own experience. A qualitative study suggests that peer support in MND is valued for the practical benefits and information it can provide, and for the camaraderie or emotional support given. Seeing others managing well can provide hope but seeing others managing less well can lead to sadness and to isolation from the group as a defensive measure (Locock and Brown, 2010). Evidence of the effectiveness of professionally facilitated peer support programmes on health or other outcomes is not well summarised.

The problems with self-care that many people with multimorbidity experience (Bayliss *et al.*, 2003), the low reach of self-management or peer support programmes (Kennedy *et al.*, 2005), and the importance of relationship or personal continuity of care for people with multimorbidity means that primary care based self-management support is likely to be needed. Battersby *et al.* propose 12 “evidence-based principles for self-management support in primary care” developed through a nominal group process to identify primary care based practices and processes and then a targeted literature search on each (Battersby *et al.*, 2010). The authors recognise that integrating self-management support into routine clinical practice is difficult and that evidence of its cost-effectiveness is currently lacking and that for this type of intervention measuring effectiveness over short periods of follow-up is difficult. Although promising approaches are being attempted and evaluated (Watt *et al.*, 2008), self management support is currently a highly plausible approach to managing multimorbidity, but as yet with only limited evidence for cost-effectiveness.

Interventions to address common combinations of particular conditions

Depression and physical illness commonly co-occur (Figure 6.4 above) and it appears that the number of conditions and the subsequent functional impairment drive the relationship rather than a particular physical condition or single biological pathway (although research continues to explore potential common causal pathways) (Moussavi *et al.*, 2007, Stegmann *et al.*, 2010). There is a clear dose-response relationship between the number of chronic physical health problems (multimorbidity) and depressive symptoms, which is likely to be mediated via perceived health related quality of life and functional impairment (Gunn *et al.*, 2010). The links between depression and physical illness are likely to be bi-directional (Stegmann *et al.*, 2010; Ormel *et al.*, 2002). Lifestyle factors, treatment compliance and help seeking behaviour all influence the relationship (Prince *et al.*, 2007), and there is strong evidence of the negative effect of deprivation (Mercer and Watt, 2007).

The high prevalence of co-morbid depression and diabetes/coronary heart disease (CHD), and the clear negative impact on outcomes of people with both, makes this co-morbidity cluster an attractive one to target for intervention. In response, studies are emerging that test the impact of treating depression on co-existing diabetes or coronary heart disease (CHD), and more recently of co-ordinated care management of people with depression and diabetes and/or CHD (Katon *et al.*, 2010; Kinder *et al.*, 2006). Kinder *et al.* found that depression care management of people with co-morbid depression and complicated diabetes was better than usual primary care, but did not improve diabetes control (Kinder *et al.*, 2006). In contrast, a case management intervention focusing on depression, diabetes and CHD improved depression and diabetes/CHD outcomes, and patient satisfaction with care (Katon *et al.*, 2010).

Mostly, depression interventions for either depression alone or in the context of other comorbidities seek to implement care based on the chronic care model (Wagner *et al.*, 1996). This usually includes a model of care that requires a system wide approach to include (Gunn *et al.*, 2006):

1. A multi-professional approach to patient care. Usually a general practitioner (GP) or family physician and at least one other health professional (*e.g.* nurse, psychologist, psychiatrist, pharmacist) are involved with patient care.
2. A structured management plan. In line with introducing an organised approach to patient care interventions should offer practitioners access to evidence based management information. This can be in

the form of guidelines or protocols. Interventions usually include both pharmacological (*e.g.* antidepressant medication) and non-pharmacological interventions (*e.g.* patient screening, patient and provider education, counselling, cognitive behaviour therapy).

3. Scheduled patient follow-ups. Usually one or more scheduled telephone or in-person follow-up appointments to provide specific interventions, facilitate treatment adherence, or monitor symptoms or adverse effects.
4. Enhanced inter-professional communication. Interventions should include mechanisms to facilitate communication between professionals caring for the depressed person. This includes team meetings, case-conferences, individual consultation/supervision, shared medical records and patient-specific written or verbal feedback between care givers.

Interventions based on the chronic care model have been taken up and tested in many countries (Richards *et al.*, 2008) throughout the world with the expectation that they will be cost-effective. Yet a recent systematic review shows that the evidence for this claim is still inconclusive and calls for a more thorough assessment of the costs and benefits of such approaches (de Bruin *et al.*, 2011). The common co-occurrence of depression with multiple chronic physical conditions sets an enormous challenge for health care systems worldwide which have tended to separate physical and mental health care and even when they have attempted to integrate care have focussed on co-morbidity (a single condition such as diabetes or heart disease with depression) rather than the more commonly occurring multimorbidity. Tackling the problems of multimorbidity requires an integrated approach between physical health care and mental health care.

Measuring health service performance for people with multimorbidity

Developing specifications for measures is beyond the scope of this review, so this section focuses on general rather than technical considerations, and on identifying the range of measures rather than recommending particular measures. There are two key requirements to measure health service performance for people with multimorbidity: first to define a population to examine, and a method of measuring multimorbidity; and second to measure relevant aspects of health service performance in that population.

Measuring multimorbidity

As described above, there are multiple existing methods for measuring multimorbidity, and no agreement as to which is best. Relevant choices to be made when deciding how to measure multimorbidity include:

- Which population to measure multimorbidity in (population sample, restricted by age or by particular patterns of service use such as those admitted to hospital).
- Whether to measure using patient self-report, electronic health records, or administrative data. Unless there are population-wide electronic health records available, then population samples are likely to require self-report measures.
- Which conditions to include in a multimorbidity measure. Existing measures vary in the rationale for including conditions in any count, and the number of conditions included. Diederichs *et al.*'s systematic review of 39 measures found that high prevalence of disease was the most common reason for including them, with other less common justifications being a condition's impact on mortality, function or health status. The 39 measures examined varied greatly in the number of conditions included in the measure (from 4 to 102 conditions, mean 18.5) (Diederichs, 2010).
- Whether to use an unweighted count of conditions, or to use a measure weighted in relation to severity or some outcome(s) of interest. The majority of measures examined in the most recent systematic review were unweighted counts (similar to those presented in this chapter for Scottish data), but a range of weighting methods were identified. Most commonly, conditions in measures were weighted according to their association with an outcome of interest, such as mortality, hospital admission, or health care resource use. Less commonly, conditions were weighted by severity measured by patient self-report (for measures where patients both report the presence of selected conditions and their severity) or based on pre-specified criteria such as prescription drug use.

There is no multimorbidity measure that is clearly best for all purposes. Rather, the choice should reflect the purpose to which the measure is to be put, and its feasibility. For prevalence studies, then population sampling and reasonably comprehensive inclusion criteria for conditions to be included are appropriate. For measures to be used to admission rates for people with different levels of multimorbidity across countries, then a weighted measure using administrative data is likely to be more appropriate.

Relevant measures of health service performance

There are a number of measures of health service performance that are particularly relevant to people with multimorbidity. These include:

- Patient experience of discontinuity and its consequences such as care co-ordination problems, duplication of care and health service error. Although structural measures of health service integration are theoretically feasible, patient survey is likely to be the best way to measure this (Commonwealth Fund, 2011).
- Individual-level measures of the quality and safety of health care for people with multimorbidity. A number of different types of measure are possible. These include primary care health care process and intermediate outcome measures such as those included in the UK Quality and Outcomes Framework and similar programmes internationally (NHS England, 2009; National Committee for Quality Assurance, 2010), and hospital-related measures such as the occurrence of health care associated infections and other adverse events (Drosler, 2008). Primary care measures typically require access to data from electronic health records, although some can be feasibly implemented in patient surveys (Steel *et al.*, 2004, Steel *et al.*, 2008). In contrast, hospital measures can be feasibly implemented using administrative data, although data quality varies across countries (Drosler, 2008).
- Potentially preventable hospital admissions and other patterns of service use which are believed to generally undesirable such as the development of preventable complications of care (Wolff *et al.*, 2002), repeated emergency or “revolving door” admissions, nursing home admission or other institutionalisation (Beswick *et al.*, 2008).
- Mortality, either at all ages or focused on younger people using a potential years of life lost (PYLL) approach (Nolte and McKee, 2004).

In practice, choice of performance measure is likely to balance policy and health system importance and the feasibility of implementation. Choice of multimorbidity measure is likely to be primarily driven by the dataset being used to measure performance. For example, examining potentially preventable hospital admission rates in people with multimorbidity requires measuring both admission and multimorbidity at patient level in the same administrative hospital admissions datasets.

Conclusions

Multimorbidity is so common as to be the norm for the majority of people with chronic conditions. It is strongly associated with a range of adverse outcomes including mortality, reduced functional status and quality of life, increased health services use, and patterns of care which are undesirable including problems with care co-ordination and error, and potentially preventable emergency admissions. Improving primary care and strengthening its care co-ordination role, and better integration between primary and specialist care would both be expected to improve the quality of care for people with multimorbidity, and there is some evidence for the effectiveness of other interventions in particular groups. Although there is no consensus on how best to measure multimorbidity, measurement is feasible in datasets which can also support health system performance measurement. Although there are considerable technical issues that need to be resolved, measuring the quality of care for people with multimorbidity is feasible and would focus attention on health system performance for people with the highest levels of need.

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Annex 6.A1

Description of the Scottish dataset used for descriptive epidemiology

The dataset was provided by the Primary Care Clinical Informatics Unit (PCCIU) at University of Aberdeen, who extract complete anonymised copies of the clinical IT systems of Scottish general practices taking part in the Scottish Programme to Improve Clinical Effectiveness – Primary Care (SPICE-PC). Practices consented to the use of anonymised data for research, and PCCIU operating procedures have been reviewed by the NHS Research Ethics Service who do not require review of individual projects providing that only anonymised data is used. The data used here was extracted in Spring 2007 when 309 practices with 1 751 841 registered patients contributed (approximately one-third of Scottish practices and of the Scottish population). The patients included are representative of the wider population in terms of age, sex and socioeconomic deprivation, although the practices themselves are more likely to be involved in the training of doctors and to have taken part in voluntary quality assurance and improvement programmes (Elder *et al.*, 2007). For each patient, the presence or absence of 40 chronic conditions was measured using Read Code morbidity data with prescribing data where appropriate (for example, since it often remits, asthma was defined as the presence of an asthma Read Code and asthma treatment in the preceding year). Definitions were based on UK Quality and Outcome Framework Business Rules where available, and Read Code groups created by the Information Services Division (ISD) of NHS Scotland where not (NHS England, 2009; ISD Scotland).

A subset of 40 practices with 226 593 registered patients consented to have their data linked to the acute hospital admission dataset (SMR01) held by ISD, and this data was used to examine admission rates for potentially preventable conditions and all other emergency admissions. Potentially preventable admissions were defined using a standard NHS Scotland list of ICD10 codes, and included (among others) specified admissions with heart failure, COPD, asthma, angina, diabetes complications, hypertension, cellulitis, epilepsy.



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