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Evidence Review

The Impact of an Ageing Population on End of Life Care Costs

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The Personal Social Services Research Unit (PSSRU) at the London School of Economics and Political Science is a leading social care research group. Since its establishment in 1974 at the University of Kent, PSSRU has had considerable impact on national social care and mental health policy and practice in the UK and in a number of other countries.

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Introduction

While it can be said with some confidence that an ageing population will increase health and social care spending, there is greater uncertainty as to how great the burden on public expenditures will be, or what policymakers can do to respond to these changes. This report undertakes a widespread evidence review in order to summarise the most consistent findings, and highlight the likely impacts that an ageing population will have on end of life care costs. An important aspect of this review is to investigate the proportionate impact of population ageing on end of life care, and how this could influence future health and social care costs within the UK.

Key points emerging from the evidence review:

- It is inadequate to use just one common factor (e.g., age cohort, mortality rate, etc.) when approximating or projecting the future resource needs of an ageing population. Population ageing is a complex process, and is best modelled dynamically.
- The majority of the economic evidence finds that population ageing is likely to increase acute care expenditures moderately, and more strongly increase expenditures in long-term and social care. However, this ageing-related expenditure growth will not be sudden, with overall health expenditure in the UK expected to increase along a gradual slope by 2-3 per cent of GDP by 2060 (if current policy arrangements stay unchanged).
- Ageing related health expenditure increases are strongly associated with how age and health interact with the main driver of health expenditure growth, medical technology. However, there are a number of other underlying demographic and non-demographic reasons for these increases, which are elaborated upon within this report.
- When considering health care cost drivers, it is important to understand that there are two distinct drivers of population ageing which have rather different implications for expenditure. One is that each cohort is living longer than the previous one as life expectancy rises. The other is that each cohort entering old age will be larger than the previous cohort in the coming years because of high fertility rates in the post war years (i.e., the baby boom). Many of the issues discussed in this report (i.e., proximity of death, compression of morbidity, etc.) relate only to the first of these two drivers.
- When reviewing end of life care costs, it is important to consider proximity to death and how this impacts acute and long-term care costs differently. The literature suggests that including proximity to death in acute care cost projections leads to

significant reductions in age-based estimates. However, ageing-related long-term and social care costs would not see a similar reduction.

- End of life care costs are unlikely to significantly increase due to an ageing population based on two considerations: (1) the age of death continues to be pushed back, reducing the number of deaths in a given year and allowing future cost discounting; and, (2) if death occurs later in life it is beneficial in cost terms, as acute care expenditures are lower when death occurs at older ages. In addition, lowering the costs associated with medical treatment near the end of life (e.g., increasing the capacity for long-term and palliative care management) has the potential to significantly reduce acute health expenditure growth.
- Another factor likely to reduce the impact of population ageing would be ongoing compression of morbidity in the UK, as overall ill-health is likely to continue to decrease (i.e., less cognitive impairment and greater self-perceived health). However, some concern exists with the level of overall disability (i.e., severe disability is decreasing but less severe disability is not) which may be associated with the growth in obesity, and other chronic conditions.
- Medical technology is consistently acknowledged as the greatest driver of health spending at end of life, but not all technological interventions have a negative cost impact. Medical technology aimed at treating the symptoms of a condition are generally cost-increasing (e.g., drugs for chronic conditions), while interventions that prevent or cure diseases are generally cost-reducing (e.g., hip replacement). Investments in medical technology will be a key cost driver at end of life when patients have limited life expectancy.
- In acute care, the ageing population is unlikely to cause capacity issues based on past trends, as the numbers of admissions and bed-days continue to fall for successive age cohorts, and for the most elderly in the UK.
- In long-term and social care, an ageing population would be likely to increase demand for care and services, even after controlling for proximity to death. Prioritising medical innovations that improve quality of life and functioning at end of life, and assisting individuals to remain living at home, have the greatest potential to lead to cost savings.
- Multi-morbidity and dementia are highly associated with increased health expenditure at end of life, and adapting the care system to better serve these individuals may allow greater cost-containment during a period of population ageing.
- As the demand for unpaid care is expected to increase as the population ages, a lack of care-giver supply will have ramifications for the future quality and supply of end of life care.

Following the evidence review, three end of life interventions are described, each with the potential to reduce health expenditures. Investments in palliative care teams, advance care planning, and care integration for individuals with multi-morbidity, are provided as examples of health delivery innovations at the end of life that are likely to mitigate some of the rising costs of an ageing population.

In summary, the cost of population ageing at end of life would be a greater concern if the health and social care system failed to adapt to the needs of an older and more complex patient cohort. However, there are several positive signs that the UK will continue to move health resources to areas where they are needed, and may reduce expenditures on more inflationary cost drivers such as medical technology (e.g., health technology assessment) and income (e.g., health human resource spending). The expectations of the individual will also need to be managed, which is likely to be best achieved by a more integrated, and person-centred approach to health and social care.

Evidence review

The focus of the initial evidence review is to determine the likely demographic and non-demographic factors emerging from an ageing society, any underlying economic considerations, and how these may impact end of life care. The central themes emerging from this review will then be discussed in greater detail in the key topics section of the report.

The cost of ageing in the UK

Two recent reports by the King's Fund (2013) and the Office for Budget Responsibility (2015) found that public finances are likely to be pressured over the next 50 years, but differ in how they consider the fiscal impacts of population ageing. The King's Fund (2013) found the main cost drivers to consist of: demographic factors; growth in national wealth (i.e., income effects); costs of providing care (i.e., relative price/productivity effects); and advances in medical technology. The King's Fund omits population ageing from this list, suggesting that while it remains a factor, life expectancy gains typically delay, rather than increase, the care costs associated with death (i.e., compression of morbidity). The report provides evidence that pressures on health care expenditures will likely relate to factors other than population ageing, and that increased health spending is not necessarily a problem as long as higher expenditure leads to better overall population health and well-being (CHSRF 2003, Dixon *et al*. 2004, Smith *et al* 2000, Seshamani and Gray 2004). While health spending will generally rise with age (dramatically increasing at end of life), the evidence suggests that these costs

are delayed as more years are spent in healthy life. In addition, living proportionately longer before death may lower health care costs (Lubitz *et al*. 1995). However, this would have a proportionate increase on social care costs (CHSRF 2003).

Alternatively, in its review of the potential fiscal impact of future government activity, the Office for Budget Responsibility (OBR) (2015) found that public finances were likely to be greatly pressured over time as a result of population ageing. The OBR suggests that an ageing population (e.g., increasing life expectancy, low fertility rates, and the 'baby boom') will lead to greater dependency on the working age population. The main pressures related to health and social care spending as indicated in the OBR projections: general health spending increases as the population ages (growth of 1.8 per cent of GDP in the period to 2064-65); and long-term social care cost increases (growth of 1 per cent of GDP in the period to 2064-65). Importantly, the OBR assumes within its central projection that the amount of health spending will be held constant as a share of GDP for each age group.

The King's Fund and OBR reports would seem to agree that demographic effects in the UK have not explained the majority of health spending increases of the past (i.e., these were due to residual factors such as medical technology and relative price/productivity effects). However, the OBR diverges from the King's Fund by anticipating (and projecting) that demographic factors (in particular, the 'baby boom') will account for considerably more public expenditure growth than would be expected from reviewing past trends.

The cost of ageing in the UK (International Comparison)

A number of large-scale comparison reviews related to the costs of ageing have been performed internationally, allowing further insights into the likely key drivers of health and social care expenditure in the UK and abroad. Reports by the European Commission (2015), OECD (2013) and Australia's Productivity Commission (2013) were reviewed to understand how the costs of ageing have been assessed globally.

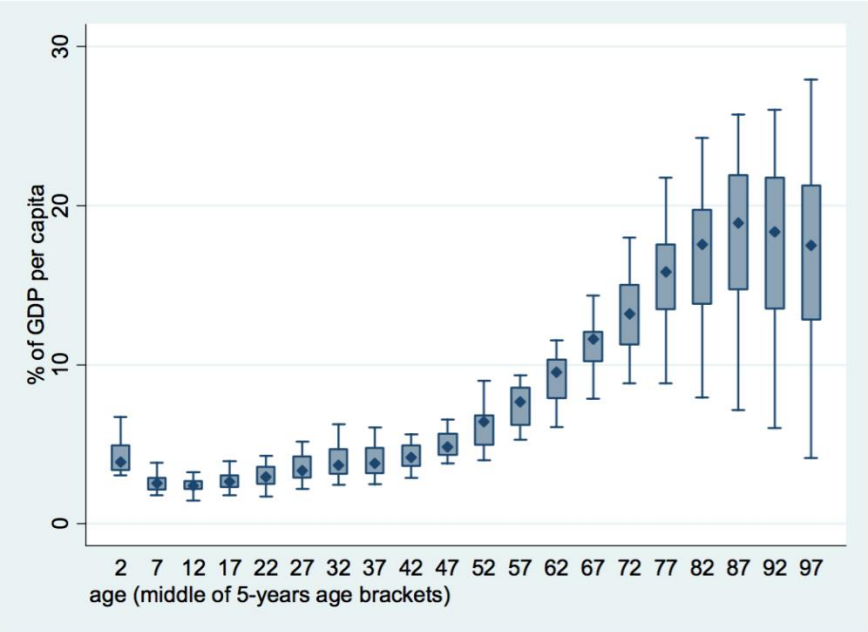
The European Commission (2015) estimates that spending growth related to population ageing in the UK will be close to the EU average, with the age-related expenditure ratio (including pensions, health care, long-term care and education) rising moderately by up to 2.5 per cent of GDP in the period to 2060. However, a number of demographic and macroeconomic assumptions are made in generating the UK estimate. From a health spending perspective, the authors estimate that the UK will face an ageing-related increase of between 1.2 and 2 per cent of GDP in the period to 2060. In making this estimate, the EU study looked at health status, income effects and several non-demographic factors. The report notes that falling mortality rates at all ages, including for older people, are contributing to increasing life expectancy. However, increasing longevity in line with healthy

life years will not necessarily lead to rising health care costs. This leads to a discussion of three potential demographic effects: (1) the expansion of morbidity hypothesis (Gruenberg 1977, Verbrugge 1984, Olshansky *et al*. 1991), which claims that a decline in mortality is accompanied by an increase in morbidity and disability; (2) the compression of morbidity hypothesis (Fries 1980, 1989), which suggests that disability and ill-health is compressed towards the later period of life at a faster pace than mortality; and, the dynamic equilibrium hypothesis (Manton 1982), which suggests a counterbalancing effect of the previous two phenomena (i.e., lower incidence of chronic disease, but decreasing fatality rates leading to longer prevalence of disability). The EU study notes that no clear conclusion can be made from the evidence regarding the above three hypotheses, and it remains difficult to predict the levels of morbidity and therefore potential demand for health services. The authors suggest that proximity to death is a more important determinant of health expenditure than ageing alone, and that living longer, and dying at an older age would likely lead to savings. Finally, the authors include a discussion of medical technology, which evidence suggests accounts for between 27 and 75 per cent of health expenditure growth (European Commission 2015).

In a separate report conducted by the OECD (2013), the authors aim to disentangle general health spending from long-term care expenditure, as well as demographic and non-demographic-related cost drivers. The OECD projections update and refine an earlier OECD (2006) analysis. For the UK, the authors estimate an ageing-related increase of between 2 and 5.9 per cent of GDP in the period to 2060 for health care; and an increase of between 0.5 and 0.9 per cent of GDP in the period to 2060 for long-term care. Therefore, a total ageing related increase is estimated at between 2.5 and 6.8 per cent of GDP in the period to 2060. The high variation relates to the authors' use of both cost-containment and cost-pressure scenarios. The authors note that the cost-pressure projection is helpful as a benchmark, but is not as plausible as the cost-containment scenario. This cost-containment approach assumes government policies will be more effective at controlling expenditure growth driven by non-demographic and non-income related factors (OECD 2013).

The cost drivers reviewed in the OECD (2013) report include: (1) demographic factors (i.e., age structure and health status); (2) non-demographic factors related to income elasticity (i.e., a measure of the responsiveness of health expenditure to a change in income); and (3) residual factors (i.e., relative price/productivity, medical technology and structural effects related to health policies and institutions). In reviewing the relationship between age and expenditure (Fig.1), the OECD study notes that while costs increase later in life they reduce at extreme ages (e.g., 87+). In addition, the paper indicates that health spending relates more to proximity to death than the process of ageing in itself.

Figure 1. Public health care expenditure by age groups (per cent of GDP per capita). Source: Maisonneuve and Martins (2013).



The OECD (2013) report suggests that long-term care spending projections differ substantially from general health care. This is mainly because long-term care aims to make ill-health more bearable, rather than reduce or eliminate ill-health. Long-term care includes palliative care, long-term nursing care, personal care services, health services in support of family care, home help (e.g., domestic services) and care assistance, residential care services, and other social services. Furthermore, the OECD authors show that long-term care spending per beneficiary is broadly independent of age, and only dependent persons will benefit.

As with the OBR, EU, and OECD reports, the Australian Productivity Commission (2013) separates cost factors into demographic and non-demographic factors. In addition, general health expenditure is evaluated separately from long-term care (i.e., aged care). The total projection for general health spending (national and state) is for an increase of 4.3 per cent of GDP in the period to 2060. While long-term care will contribute to a projected rise of 2.6 per cent of GDP by 2060. Therefore, the total ageing-related increase in health expenditure is estimated at 6.9 per cent of GDP by 2060. It should be noted that this is at the high end when compared to the OECD projection for Australia, which suggests an increase between 3.2 and 7.6 per cent by 2060. This is likely due to the Productivity Commission not considering a scenario of cost-containment.

Non-demographic effects listed by the Australian Productivity Commission (2013) include: relative price/productivity; structural effects; medical technology; and expectations about

the quality and nature of health care. The authors indicate that rising expectations may subsequently increase the demand for higher quality health services. However, while expectations are a factor, these may be estimated in the income effects mentioned earlier in this report. As in the OECD report, the Australian Productivity Commission authors comment on using a proximity-to-death analysis, and estimate slight differences in overall projections (increase of .56 per cent of GDP in the period to 2060). Finally, the authors make specific note of the influence of medical technology, and that it would be substantially underestimated if the interaction between ageing and technology effects were to be ignored.

Key topics

The following key topics emerged from a review of the literature on the costs of population ageing, and how these intersect with end of life care costs. The central focus of this section of the report is how end of life care costs may change as the population ages, and not the overall health and social care impacts of an ageing population.

Proximity to death

Acute care service costs will be different based on an individual's proximity to death, being higher if they die ('decedents') than if they survive ('survivors') (Murphy 2012). This may lead to lower than expected care costs over time due to two related factors: (1) if the age of death is pushed back, this reduces the number of deaths in a given year and will make them cost less in future due to discounting and other cost reductions; and, (2) if death occurs later in life it is beneficial in cost terms, as acute care costs are higher for people that die at younger ages (Payne *et al*. 2007, Brockmann 2002).

Recent evidence related to acute care health expenditure lends support to the idea that proximity to death is more important than ageing per se, while much less is know about social and long-term care costs (Murphy 2012). From a review of the literature looking at costs outside the hospital, proximity to death has less of an effect on non-acute costs, and any savings created by very old decedents in acute care may be offset by an increase in long-term care costs. Put simply, proximity to death is important for acute care costs, but ageing is a central reason for increased long-term and social care expenditures. Seshamani and Gray (2004) suggest that the impact of proximity of death on acute health expenditures in England is so great that previous estimates of increased health spending should be halved. Therefore, while both primary and social care would see a slight expenditure

reduction linked to proximity to death, this proportion would be substantially less than for the aforementioned acute care services.

Compression of morbidity

The compression of morbidity hypothesis (Fries, 1980, 1989) suggests that disability and ill-health will be compressed towards end of life, shortening the period of morbidity before death. Jagger *et al*. (2015) investigate the change in health expectancies at age 65 years or older between 1991 and 2011 to determine if (absolute or relative) compression, expansion, or dynamic equilibrium of morbidity took place in England. The study uses health measures within the Cognitive Function and Ageing Studies (CFAS I and CFAS II) from three geographically defined centres in England (Cambridgeshire, Newcastle, and Nottingham). Jagger *et al*. (2015) find that between 1991 and 2011, life expectancy at age 65 years increased by 4.5 years for men and 3.6 years for women. This was accompanied by reductions in cognitive impairment, increased self-perceived health, and gains in disability-free years. The authors report a compression of morbidity for cognitive impairment and self-perceived health, while disability maintained dynamic equilibrium. The authors suggest that the increasing level of obesity, and other chronic conditions, during previous decades may account for the disability-related dynamic equilibrium (Jagger *et al*. 2015). While Jagger *et al*. (2015) report a positive overall outcome – that ill-health decreased over the last two decades in England showing a compression of morbidity for cognitive impairment and self-perceived health – it was less positive with regard to disability. Importantly, the study found that women are particularly impacted, and spend more time with disability than in earlier years.

In another study, Chatterji *et al*. (2015) conduct a systematic review in order to look at the health status of older adults (60+) and how health has varied in different countries over the past two decades. The authors find that the evidence for compression of morbidity was common in studies using quality assessment criteria, longitudinal data, and focused on high-income countries. However, some studies reported contrasting evidence, and expansion of morbidity was a more common finding if chronic disease prevalence was studied.

Medical technology

Throughout the evidence review, medical technology was consistently acknowledged as the greatest driver of health spending at end of life. Willemé and Dumont (2015) show medical technology accounts for the greatest proportion of historical spending growth at close to 50 per cent. Using UK data, the authors estimate the total contributions to historical growth of total health expenditure of income effects (31 per cent), share of public spending (-1 per cent), age composition (7 per cent), weight (26 per cent) and medical technology (37 per

cent). Income effects were shown to be strongly positive (i.e., higher general incomes leading to higher spending); the share of public spending was weakly negative (i.e., a higher proportion of public financing leading to less spending); age was shown to only contribute weakly to the growth in health expenditure; weight was strongly positive (i.e., higher BMI% led to greater health expenditure); and medical technology had the greatest proportional positive impact on the growth in health expenditure. Looking more closely at the impact of medical technology, the authors found that products that 'radically' innovate are likely to be cost-increasing due to an expansion in the number of people treated, while 'incrementally' innovating products appear to be cost-saving as they substitute for other treatments.

In a review of several cost drivers (including population ageing) within the Canadian context, medical technology was found to be the most significant contributor to the growth in health expenditure (CIHI 2011). However, while the authors suggest medical technology will increase costs in the short term, it can also be a major factor in reducing costs in the medium and long term. For example, it is possible that new medical treatments with high initial costs could reduce spending if they are replacing treatments with longer timelines and greater overall costs. Medical technology can be perceived differently based on two factors: (1) if the medical technology only treats symptoms of a condition then they are generally cost-increasing; and (2) if the medical technology prevents or cures diseases they are generally cost-reducing. The first category is closely associated with chronic diseases and conditions such as diabetes, while the second category would include the introduction of health technologies such as coronary angiography.

End of life care costs

End of life care is a complex process that will typically involve multiple health and social care providers. Georghiou and Bardsley (2014) found several care settings are impacted in a review of the costs of UK care services in the final 90 days of life. While not exhaustive, the study provides a useful approximation of the end of life costs associated with: primary care (GP consultations only); community care (nursing care only); social care (local authority only); hospice care (inpatient); and acute hospital care. In the last three months of life, acute care costs are the largest single sector cost, averaging £4,600 per person. Local authority social care costs were found to average £1,000 per individual who died, while GP consultations cost approximately £150, and district nursing care averaged £280 per death. While person-level hospice or palliative data was unavailable, this was estimated at £550 per death. The study authors note that direct comparisons between different sectors is imperfect. Importantly, Georghiou and Bardsley show that replacing acute care costs with community and palliative care nursing services would be likely to reduce end of life costs.

End of life spending in acute care

Within the acute care environment, an ageing population would be unlikely to cause capacity issues based on past trends, as the number of admissions and bed days continue to fall for successive age cohorts, and for the most elderly (Wittenberg *et al*. 2015). Using an age, period, and cohort analysis, Wittenberg *et al*. (2015) look at how each factor effects emergency and elective admissions (i.e., patient's age as an effect, patient's year of birth as a cohort effect, and a patient's admission year as a period effect). The authors find that population ageing alone does not explain rising emergency admissions in the NHS between 1997/98 and 2014/15, as there is a lower tendency to admit individuals at any given age. The finding is consistent with what would be expected from the compression of morbidity hypothesis, and also suggests that inpatient care at a given age might decline with increases in life expectancy. Finally, the authors suggest that the main influences on rising emergency and elective admissions are likely to be clinical- and demand-side factors unrelated to population ageing.

Similarly, Werblow *et al*. (2007) used a large Swiss dataset to compare health care expenditure at end of life and found that most components of acute care are driven by proximity to death and not population ageing (i.e., the increased costs of an ageing population are a so-called 'red herring'). However, acute care costs for long-term care patients are shown to be heavily age reliant, no matter whether the patient is a decedent or survivor. The authors suggest that the costs of health care are driven mainly by medical technology, and that this could be more prevalent in long-term care settings when patients have limited life expectancy.

End of life spending in long-term and social care

In both long-term and social care, an ageing population is likely to increase demand for care and services, particularly at the end of life. de Meijer *et al*. (2013) find expenditure on long-term care increases with age even after controlling for proximity to death (i.e., the expensive final years of life). In addition, several studies show that the availability of informal (unpaid) care can decrease formal long-term care expenditure, and because long-term care is labour-intensive, it is difficult to substitute with medical technology. Therefore, if labour productivity in long-term care develops more slowly than in other industries, the relative price of care increases if the income earned remains comparable to other sectors. The authors indicate that the effect of population aging is much stronger for long-term care when compared to acute care, with annual expenditure growth of approximately 1 per cent. Similarly, Worrall and Chaussalet (2015) use economic modelling to show that the proportion of the elderly requiring long-term care will increase in the UK, and expenditure for long-term care would be likely to grow to 1 per cent of GDP.

The studies under review suggest that in order to contain costs in long-term care, efforts should be made to prioritise medical innovations that improve quality of life and functioning, over those that seek only to postpone death. Initiatives that use medical technology to help people to remain living at home (even with complex or chronic diseases) could lead to savings in long-term care, and greater labour participation (de Meijer *et al*., 2013).

Multi-morbidity and dementia

Studies suggest that both multi-morbidity and dementia are strongly associated with increased health expenditures at end of life, and adapting the care system to better serve these individuals may allow greater cost-containment during a period of population ageing. Lehnert *et al*. (2011) found a consistent positive association between age, multi-morbidity and higher health care utilisation and expenditure. Individuals with multi-morbidity need a more complex care environment (inpatient and outpatient), with increased physician and specialist visits, and are likely to have higher prescription costs and to use multiple medications. For each additional chronic condition, health expenditure rises exponentially, indicating multiple chronic conditions interact to make patient care more complex.

Patients with dementia remain in acute care longer, have a higher likelihood of being readmitted, are more likely to fall and have a higher in-hospital mortality rate (CHKS, 2013). In addition, once admitted as an inpatient, a person with dementia (estimated to be 6 per cent of the acute care population) is less likely to return to their own home after a hospital stay. The estimated cost impact in England of dementia within acute care was found to be £265 million, which is composed of increased bed days (£120 million), readmissions (£120 million), and falls (£25 million) (CHKS 2013). Medical treatment for individuals with multi-morbidity and dementia is made more complex by heath care environments that focus on acute and episodic care for single diseases. Therefore, clinical and long-term care design should better reflect the needs of the elderly with multi-morbidity, and particularly for those with dementia.

Unpaid care

Population ageing is likely to increase the demand for unpaid care, and a projected shortfall in carer support could reduce the quality and supply of end of life care over time. While acknowledging that there is large amount of uncertainty related to the supply of unpaid care, Pickard (2015) suggests that an increased demand for unpaid care will create a 'care gap' from 2017 in England. If this trend continues, the eventual shortfall in carers is estimated at 160,000 by 2032. The main driver of the aforementioned 'care gap' is the demographic trend where the number of older people (including the oldest old) is

increasing faster than those in the younger generation (i.e., parent support ratio). Importantly, recent evidence in England shows that large increases in demand for care have not resulted in corresponding increases in unpaid care-giver supply (Pickard 2015). It should be noted that these projections assume that disability rates by age and gender remain constant in future. Therefore, continued compression of morbidity would reduce the care gap suggested above.

Review of end of life interventions and impact

Emerging from the evidence review, the following is a short summary of end of life interventions and areas of focus that may lead to cost savings. Note that the evidence related to the effectiveness of these interventions comes from a variety of countries and settings.

Palliative care teams

The early introduction of palliative care teams for patients with advanced cancer has been associated with clinical improvements and cost savings. May *et al*. (2015) find economic benefits from the introduction of specialist-led palliative care teams, which identify acute patients that would benefit from pain management, clearer treatment options and advance care plans. Earlier palliative care after hospital admission was associated with larger cost savings, e.g., all patients that received the intervention generated cost savings (compared with having no intervention): if the care was received within 6 days then costs were reduced by 14 per cent, while care within 2 days led to cost savings of 24 per cent. Therefore, prompt palliative care consultation can reduce hospital costs, with earlier interventions offering even greater cost savings.

Advance care planning

In a review of the economic evidence for advance care planning, Dixon *et al*. (2015) find that advance care plans are associated with healthcare savings and reduced demand for hospital care. The use of advance care plans led to cost savings for people in long-term care, as well as for those with dementia living in the community, and in areas that have high end of life care spending.

Integrated care for patients with multi-morbidity

Integrated care promises greater overall efficiency for patients with complex needs through the creation of improved linkages between health and social care system resources. For example, the Symphony Project in South Somerset, England has been developed to improve the amount of collaboration between primary, community, mental health, acute and social care (Kasteridis *et al*. 2015). The project seeks to foster joint responsibility and shared outcomes, through linked financial arrangements for patients with multi-morbidity. This subset of the population was targeted for integrated care as evidence suggests multi-morbidity, rather than age, is a key driver of health and social care costs. While age is positively associated with increased costs at the population level, it is less a factor once the type and number of conditions are accounted for within a population. As a result of this analysis, it is suggested that integrated care arrangements (e.g., care planning and self-management support) would be most effective if developed for people with three or more chronic conditions.

Conclusion

This report undertook a widespread evidence review in order to highlight the likely impacts of an ageing population on end of life care costs. The majority of the economic evidence finds that population ageing is likely to increase acute care expenditures at end of life, but only moderately. However, a stronger proportional increase should be expected for end of life expenditures in long-term and social care.

End of life care costs may not increase substantially due to factors associated with proximity to death, as mortality occurring later in life will reduce health expenditures. Also, ongoing compression of morbidity would be likely to continue to decrease overall ill-health and reduce end of life expenditures. In acute care, the number of admissions and bed days is expected to continue to fall for successive age cohorts, and for the most elderly. However, in long-term and social care, an ageing population is likely to increase the demands on care services.

In order to further reduce the impact of population ageing, the health and social care systems should focus on reducing expenditures on inflationary cost drivers such as unnecessary medical technology. The studies under review suggest that in order to contain costs in long-term care, efforts should be made to prioritise medical innovations that improve quality of life. Initiatives that use medical technology to help people to remain living at home (even with complex or chronic diseases) could lead to savings in long-term

care, and greater labour force participation. End of life interventions such as palliative care teams, care planning, and integrated care for complex patients, suggest there is potential to reduce (or contain) health expenditures during a period of population ageing.

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