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The nature of healthcare costs and financial risk in commissioning

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Key Words: health care costs, financial risk, underwriting cycle, NHS, UK, USA, Canada, GP commissioning, long-term cycles, emergency admissions

Key Points

- A cycle of profit and loss which commenced in the early 1960's exists in the US health care insurance industry
- Each cycle appears to be initiated by a step-like increase in costs which occurs at an interval of between 3 to 8 years (5 to 7 being most common)
- A similar pattern also operates in the UK
- These step-like increases appear to coincide with step changes in admissions, case mix and complexity
- Biological rather than organisational factors appear to be involved
- Even after accounting for the impact of randomness on commissioning costs (and hence the need for GP consortia population to be greater than 100,000 head), the underlying changes in patterns of disease will confound planning at any population level.
- The area is poorly understood but implies a cycle of financial risk in commissioning

Abstract
The health insurance industry in the USA has noted a cycle of underwriting gains and losses which appeared to commence in the early to mid 1960's. After adjusting for inflation, unexplained step-like increases in total cost appear to have occurred somewhere around 1962, 1966, 1974, 1979, 1986, 1990, 1998 and 2002. A similar pattern relating to medical emergency admissions has operated in the UK for at least 20 years. The implications of this behaviour to the financial risk inherent in commissioning in England are discussed. Data from the USA and Canada is used to complement the previous studies in the UK to explore causes for this behaviour.

Introduction
Following a decade of unprecedented growth in health care funding in the UK the financial crisis is forcing the government to rethink its strategies for cost containment. Both they and

the previous government recognised that the involvement of GPs is crucial to driving the necessary change in the processes of health and social care which will be required to both achieve cost reductions but also to re-focus care around the patient.

The previous government attempted to implement Practice Based Commissioning (PBC) while the current government is attempting to implement GP commissioning. In both variants, the budget for a large part of the health care costs for a population is placed into the hands of GP's who then carry both the risks and rewards associated with the management of the budget and the implementation of various schemes for cost containment and efficiency (Department of Health 2010, Smith & Thorlby 2010).

A series of articles in this journal has already pointed out that there is a high degree of chance-based risk involved with any health care budget and an additional component of environment-based risk associated with acute emergency admissions (Jones 2008a-c, 2009a,d). However, the issue of differences in the trajectory of health care funding versus fundamental health care costs also forms part of the overall financial risk associated with commissioning in general and future GP commissioning.

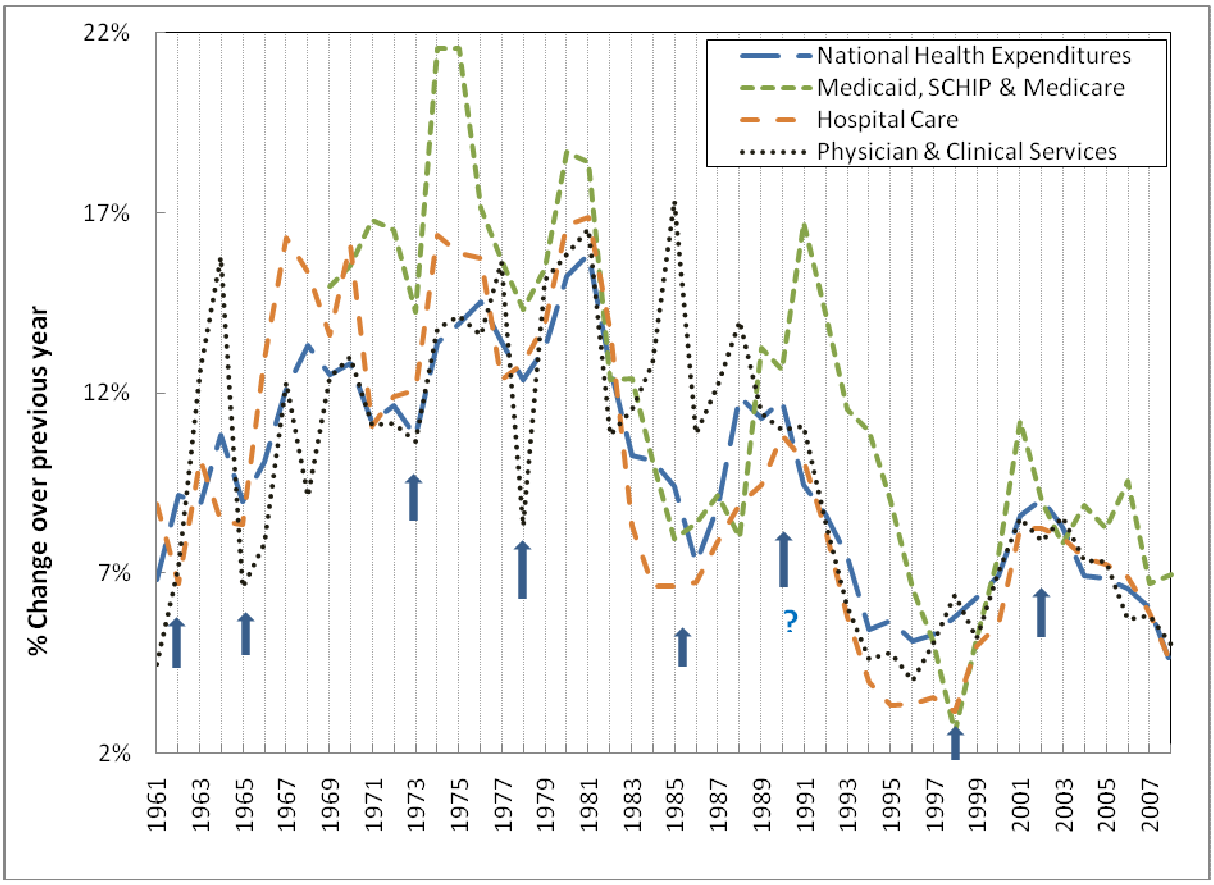
Of relevance to this issue is a curious repeating cyclic pattern of medical emergency admissions noted in the UK over the past 20 years (Jones 2009b-d, Jones 2010a-g). Each cycle commences with a large (approx 10%) step-like increase in medical admissions which is followed by several years of further but diminishing increases and then a decline in admissions which continues until the onset of the next step-increase. The last two of these cycles commenced in 2002 and 2007. Interestingly a similar pattern also appears to exist in the USA.

After adjusting healthcare costs for underlying inflation the health insurance industry in the USA has experienced a cycle of underwriting gains and losses which appeared to commence in the early to mid 1960's. Unexplained step-like increases in the total insurance costs have occurred somewhere around (inflation adjusted step-change as a percentage in brackets): 1962 (3%), 1966 (15%), 1974 (5%), 1979 (5%), 1986 (6%) and 1998 (5%) (Born & Santerre 2005). A further 3% step change may have occurred in 1990 but appears as an extended shoulder rather than a clear step-change. A variety of stakeholder, policy and economic theory-based behaviours have been proposed but the observed behaviour has never been adequately explained (Born & Santerre 2005, Kipp, Cookson & Mattie 2003).

Unknown to the insurance industry, the cycle of gains and losses was also reflected in the totality of healthcare costs seen across the USA. This is illustrated in Fig. 1 where the arrows show the point of onset of the step-like increases in insurance cost while the lines on the chart represent the behaviour of components of overall health care costs in the USA. The components of cost have been chosen to reflect aspects of care ranging from acute, primary and to total cost of care for the elderly (Medicare). The percentage changes in Fig.1 are not inflation adjusted and are therefore larger than the percentage increases quoted above. Based on the above cycle another step-increase in health care costs should have occurred at some point around 2002 and there is evidence from both the USA and Canada that such a fundamental event did occur on the North American continent (Clarke & Colbert 2009,

Nagamine et al 2006, 2010), i.e. a common pattern is emerging across countries and continents.

Figure 1: Changes in growth of health care costs in the USA



Footnote: Arrows show the point at which the population covered by private health insurance experienced an unexpected inflation-adjusted step increase in real cost. SCHIP = State Childrens Health Insurance Program. Data for the components of US health care expenditure is from: http://www.cms.hhs.gov/NationalHealthExpendData/02_NationalHealthAccountsHistorical.asp#TopOfPage

Economists are also interested in the growth in health care expenditure and a recent review of the factors contributing to the growth over the past three decades concluded that demography (i.e. the ageing population) plays only a minor to insignificant role while elusive to measure factors such as technology play a dominating role (Dybczak & Przywara 2010). The contribution of 'technology' to increasing costs can only be inferred after stripping out other factors such as income, GDP, etc. What may more correctly be called the poorly understood 'residual factors' dominate the growth trajectory. Some economists have noted the need to introduce what are called 'structural breaks' into the trend analysis (Dybczak & Przywara 2010). No linkage appears to have been made between the underwriting cycle of gains and losses and the need for so-called 'structural breaks' in the trends in health care expenditure.

Two alternative explanations have been presented to explain the pattern in admissions and costs seen in the UK. The first explanation suggests that increases in efficiency are increasing

the capacity of hospitals to admit and this leads to a reduction in the admission threshold which then increases emergency admissions (Blunt, Bardsley & Dixon 2010). The second explanation suggests that periodic outbreaks of a previously unrecognised type of infectious disease may be responsible (Jones 2009b-d, 2010a-g). A basket of diagnoses specifically related to immune function (infection and inflammation) appear to be associated with each outbreak (Jones 2010d-g).

This paper will investigate the alternative explanations for the above mentioned changes in costs and will discuss this in relation to the uncertainty associated with the financial risk in commissioning in general and hence the perceived success or otherwise of future GP commissioners. In particular, data from the USA and Canada will be used to demonstrate remarkable similarities with the UK.

Methods

Data was obtained from the following sources:

Canada (Alberta) – A monthly time series of emergency admissions. Specialty data was available for the period April 1992 to March 2009 while ICD-10 data for primary diagnosis was only available from April 2002 to March 2009. ICD-10 data covered a list of 85 diagnoses for emergency admission to medical specialties or paediatrics and excludes long stay >180 days admissions. Data extracts kindly provided by the Data Integration, Measurement & Reporting Division; Alberta Health Services.

Canada (Quebec) - Annual time series of health care costs from 1990 to 2007 from the Health & Social Services website; Sante et Services Sociaux Quebec; Évolution des services, des médecins actifs et de la population, 1990 à 2007 (Graphique), Februray 2009 (http://msss.gouv.qc.ca/statistiques/stats_sss/index.php?id=88,0,0,1,0,0).

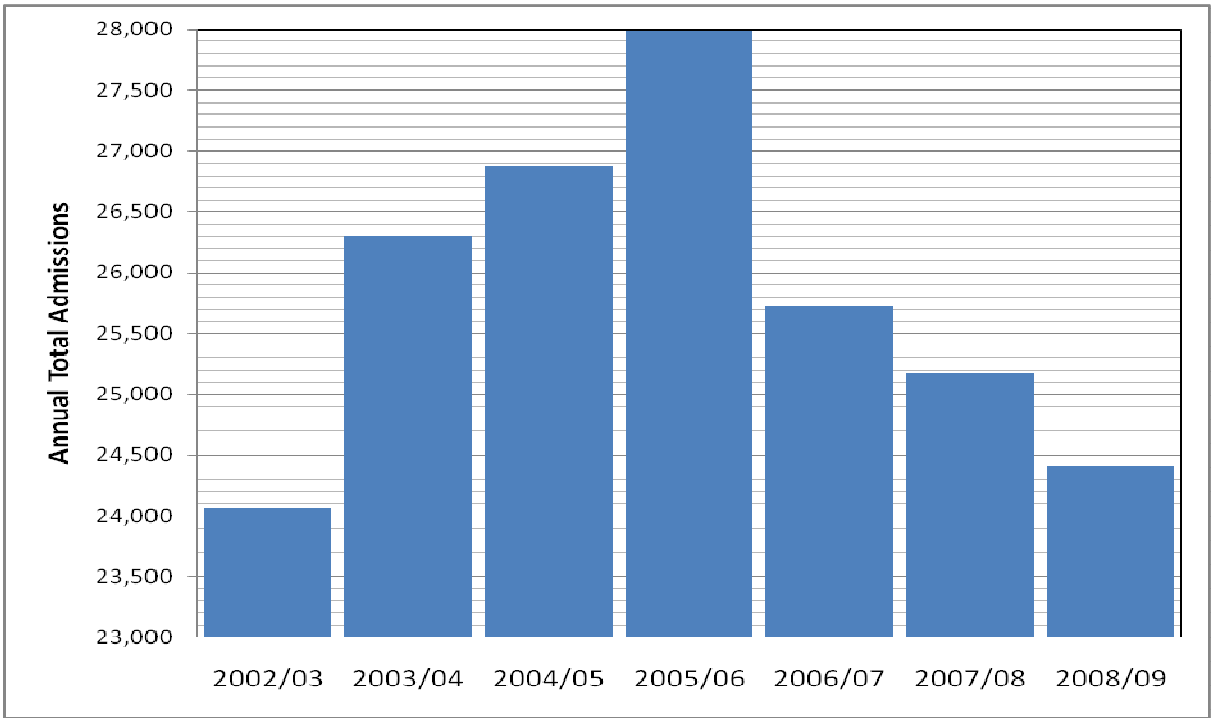
Total healthcare costs relative to GDP in the USA from 1929 to 1993 from Herron (1994) and detailed costs by type of service and source of funds for the period 1961 to 2008 from the Centers for Medicare and Medicaid Services website; (http://www.cms.hhs.gov/NationalHealthExpendData/02_NationalHealthAccountsHistorical.asp#TopOfPage). Annual total medical admissions (DRG which do not contain a procedure), for individuals covered by Medicare from 2001 to 2009 were kindly provided by The Advisory Board Company, Washington DC. Short stay admissions are excluded from this data set as they are covered by an emergency department diagnosis and assessment tariff.

Step-Changes in North America

Trends in emergency admissions and occupied bed days by specialty in the province of Alberta, Canada (1993 to 2009) indicates three step-like changes specific to the medical group of specialties occurring near the start of 1993, 1998 and somewhere around May to September of 2003 (data not shown). The infectious disease hypotheses can be tested by taking the cluster of 85 diagnoses identified in England (Jones 2010d-f) and applying them to Canadian admissions. The results of this analysis are given in Figs. 2 & 3. As can be seen the diagnoses applicable to England appear to characterise the step-like increase and shape of the trend over time (Jones 2010d-f). The step-change in admissions shows age and gender

specificity (Fig. 3) as has been demonstrated in England (Jones 2010e) and this behaviour is unlikely to arise from a general change in hospital admission thresholds. Unlike the UK where a further step increase occurred in late 2007 there is no evidence for a step change (in Alberta) since the 2003 event.

Figure 2: Emergency admissions (0-19, 65+) to a cluster of 85 diagnoses in Alberta, Canada



Footnote: ICD-10 coded primary diagnosis was only available from April 2002 following the switch from ICD-9. The step change was also confirmed using a longer time series of monthly data at specialty level. The step between 2002/03 and 2003/04 is equivalent to 14.5 standard deviations of assumed Poisson variation around the 2002/03 base-line. Admissions rise to a peak some 2 years later and then step-down. The large step-down has been proposed to be some form of switch to a dormant state. See Jones (2010f,g) for a more detailed study of similar behaviour in the UK.

A time series for Canadian hospitals over the period 1998 to 2007 also showed a 7% step increase in the average acuity of medical group patients in 2003 compared to 2002 (Clarke & Colbert 2009) and this step corresponds with the early 2003 step occurring in Alberta. In addition, a study on the rates of infection and inflammation subsequent to trans-rectal ultrasound guided prostate biopsy over the period 1996 to 2005 in the province of Ontario also shows a step change in both factors between the years 2002 and 2003 (Nam et al 2010). This is consistent with the observed increase in post-surgical inflammation and infection noted for England (Jones 2010d,e).

A time series of medical costs in the Canadian province of Quebec shows a 12% increase in costs (not inflation adjusted) in 2003 compared to 2002 and again in 2007 compared to 2006. Other steps can be discerned in 1993 and possibly also in 1999. The 2007 cost increase in this province appears to offer indirect evidence for the 2007 outbreak in parts of Canada and will therefore require further study.

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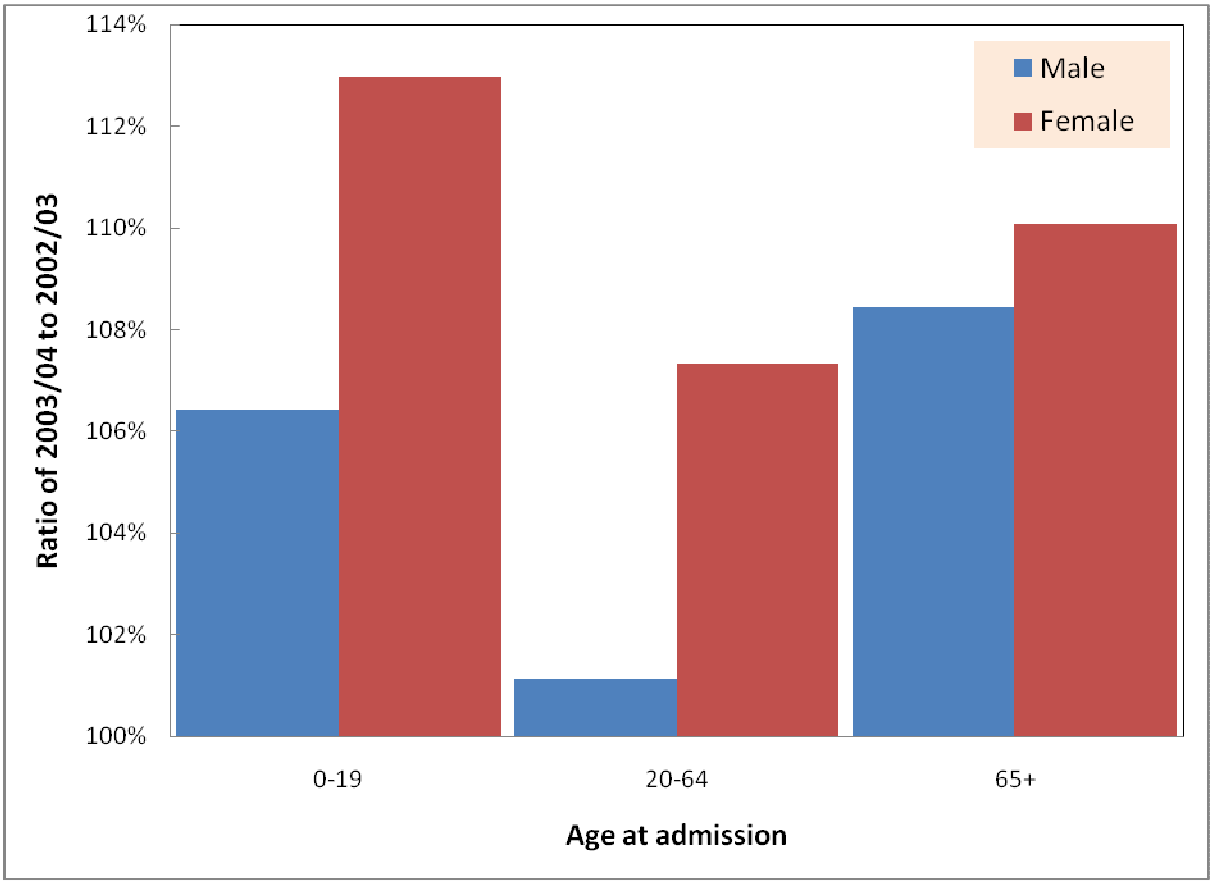
Interpreting the data covering geographic areas as large as the USA and Canada is not without difficulty. The UK occupies only 2.5% of the land surface of the USA yet contains 20% of its population. Hence the studies relating to the proposed outbreaks in the UK relate

Figure 3: Age and gender effects in the 2003 step-change in Alberta



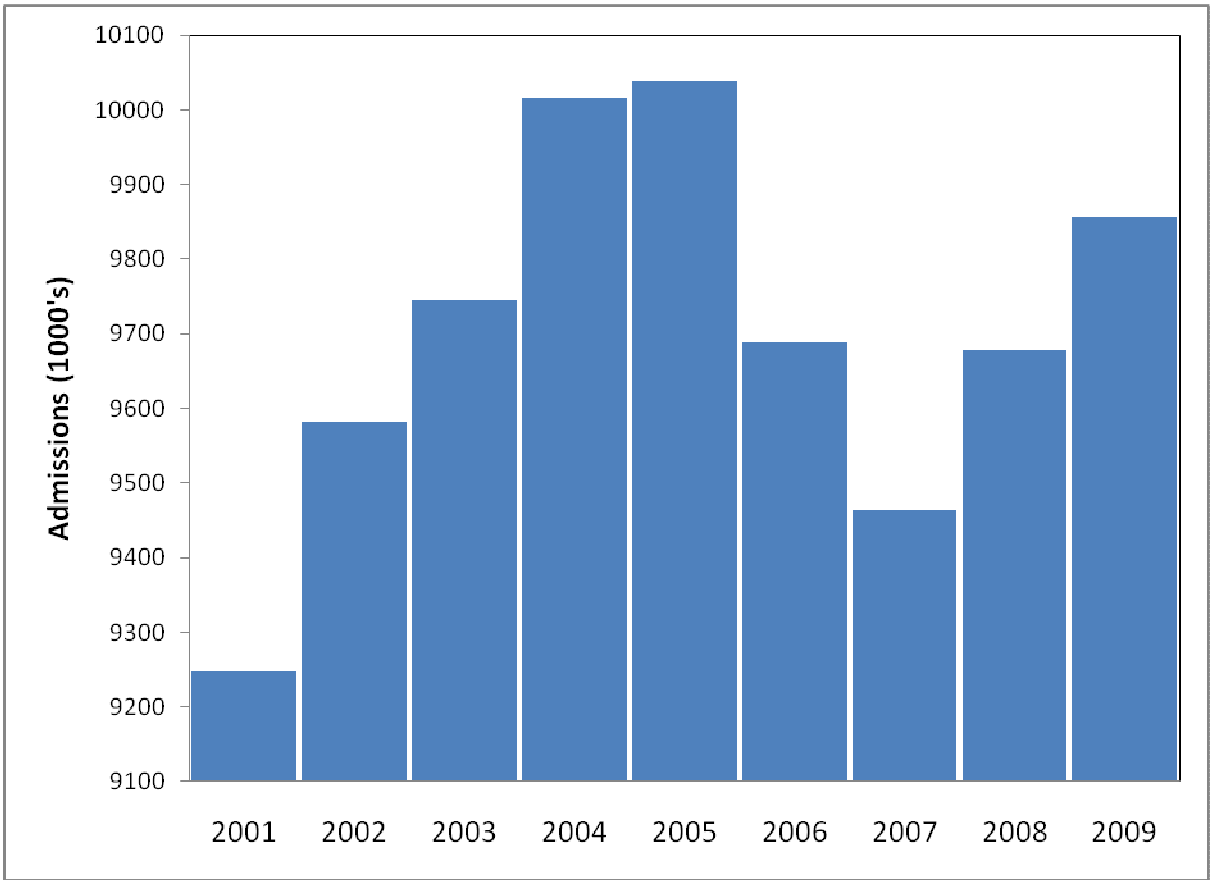
Footnote: The magnitude of the step change in admissions split by age band and gender was determined as the ratio of admissions in the period Apr-03 to Mar-04 against the corresponding admissions Apr-02 to Mar-03.

to a very small geographic area, with very high population density and high levels of circulation within the population. The corresponding spread across the whole of the USA or Canada may be somewhat slower and show regional variation consistent with the spread of an infectious outbreak (Grenfell et al 2001, Mullins et al 2003, Bergmire-Sweat et al 2008). Ontario and Quebec are on the eastern side of Canada (closest to the UK) while Alberta is in the mid-West. Preliminary studies by the author in the UK appear to suggest that the characteristic cycle in admissions over time results from an initial outbreak followed by slower spread to other locations over the next two to three years.

Turning to the USA the changes in health care costs for the population covered by private insurance seen in Fig. 1 do show remarkable congruence regarding the onset of large step-like changes across the different components of total cost. Looking at the trend in total healthcare costs relative to GDP in the US from 1929 to 1993 (from Herron (1994)) it is striking that the step-like increases in costs appears to commence in the early 1960's. In the language of epidemiology this would mark the point that the new disease emerges (Jones et

al 2008). Based on the evidence from Fig.3 and from the UK where the elderly are most affected the line describing Medicare expenditure does seem to support the possibility of a smaller outbreak around 1990. The situation regarding 2002 is less clear although the usual steep decline following a peak does appear to have been interrupted by a shoulder.

Figure 4: Trends in medical admissions for the elderly in the USA



Footnote: Data is for persons covered by Medicare. Enrolment in Medicare grew steadily at around 1.5% to 1.7% p.a. over this period and cannot account for the observed behaviour (see http://www.cms.gov/ReportsTrustFunds/downloads/tr2009.pdf). During the period 2001 to 2008 influenza was virtually absent and cannot account for the pattern.

There are other sources of data to investigate this time period and it should be noted that the pattern of admissions, average cost, average number of co-morbidities and shifts in proportion of admissions via the emergency department for seniors (age 65+) shows evidence for the onset of a step-like change somewhere around 2002 (Nagamine et al 2006). A similar step-like change is also seen for un-insured persons who are typically younger, male and less affluent (Nagamine et al 2010). The increase in inflation-adjusted average costs appears to arise from a sudden change in case mix (diagnoses) and a shift in admissions toward those with higher levels of co-morbidities (a potential at-risk group with a generally lower immune state). Such a shift in case-mix complexity has also been noted in Canada (Clarke & Colbert 2009). However by far the most conclusive evidence comes from the trend in medical admissions for Medicare recipients (age 65+) and this is shown in Fig. 4. This corroborates with the Medicare data in Fig. 1 where the line shows the start of a trend

upward in both 2002 and 2008. Interpolating the annual data in Fig. 4 to a monthly level suggests that the step change occurred in early to mid-2002 and possibly mid-2008.

Human West Nile Viral Disease (HWNVD), introduced into the east coast state of New York in 1999 only showed minimal spread up to 2001, however in 2002 it spread in epidemic-like fashion to almost all states (Lindsey et al 2010a). This arthropod borne disease (largely via mosquito bites) has known risk factors relating to immune compromised and elderly individuals and spreads mainly between June and October, i.e. the summer months, when insects are most active. Hence if the proposed outbreak acted to facilitate the epidemic-like spread of HWNVD during 2002 (via immune impairment in the wider population) then we must assume that its spread across the USA must have been largely complete before June of 2002, i.e. the early to mid-2002 suggested by Fig. 4. High incidence of HWNVD in 2003 was then followed by a declining pattern of incidence (Lindsey et al 2010b).

It can be appreciated that a step-increase in inpatient medical costs is only the apex of wider ambulance, emergency department, primary care and community costs. For this reason significant and unexpected step-changes in health care costs should therefore be a feature of those countries where such an outbreak has occurred. However health care costs are an indirect measure since in most countries the annual cost is partly constrained by government budgets and consequent reactive cost cutting measures both in-year and in subsequent years.

It has been recently proposed that the cycle of surplus and deficit seen within the NHS in England is a by-product of the periodic infectious outbreaks discussed here (Jones 2010a-c). Indeed the cost cutting measures seen across the UK in both acute and primary care commencing in late 2008 are most likely to be the as yet un-acknowledged cost pressure arising out of the 2007 outbreak.

It is concluded that something with greater resemblance to an infectious disease outbreak rather than to an increase in organisational efficiency can lead to profound increases in the total costs of healthcare experienced in countries and regions affected by such outbreaks. Indeed we have the possibility of a previously unrecognised pandemic with greater financial consequences that influenza.

Implications to Commissioning

Whatever the ultimate explanation for the curious step-like increases in admissions and health care costs and the resulting cycle in total cost - the fact is that the cycles do exist. The resulting cycle in cost pressures will therefore create a situation where it will be far more difficult to extract cost savings in some years than others. Indeed, just as in the underwriting industry in the USA, there will be a cycle of losses and gains. The NHS does not have the freedom to adjust the cost of premiums to recover the losses and it is at this point that commissioning in general (and future GP commissioning) has and will continue to come unstuck. Indeed it implies the uncomfortable implication that the funding needs to flex in response to the underlying pattern in cost.

The clear message from this work is that even after accounting for the impact of randomness on commissioning costs (and hence the need for GP consortia population to be

greater than 100,000 head); the underlying changes in patterns of disease will confound planning at any population level. Indeed this cycle may partly explain the relative increases in the cost of treatment for various diagnostic groups observed in the US er et al 2010). Commissioning *per se* is therefore an exceedingly complex endeavour. The problem will not be solved by replacing one set of commissioners (PCTs) with another set (GP consortia) and such uncontrollable factors will only be made worse by attempting to commission at the smaller populations covered by GP commissioners.

While it is highly desirable to involve GP's (and indeed many others) in the complex and multi-factorial endeavours needed to contain rising costs and to implement the necessary patient centred pathways in health and social care (Abayomi, Judd & Hackett 2009; Sneldon, Gilchrist & Wright 2009; Kennedy, Lawless & Slater 2009; Wilson & Moffat 2010), it may be necessary to achieve this involvement in a way which avoids exposing them (as the primary budget holder) to a cycle of cost pressures over which they have no control. Alternative structures and policies may therefore be required to achieve the desired objective. A more cautious approach could involve something similar to GP Fund Holding which commenced with the more stable elective-only component of acute health care.

It is often very tempting to ignore new or enigmatic sources of evidence; however, on this occasion a more cautious approach may avoid shipwreck of flagship policies. It explains why commissioning has been so difficult to execute in the real world. To quote the recent white paper "The department is committed to evidence based policy making" (Department of Health 2010). On this occasion far more research is needed to provide the necessary evidence base to enable the policies to work in the real world.

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