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Trends in elderly diagnoses: links with multi-morbidity

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Abstract

In England since 1998/99 there has been a rapid expansion in the proportion of total admissions arising from the elderly (age 75+). This is exclusively due to the medical specialties and cannot in any way be described by the demographic shift over that time period. A group of 90 diagnoses have been identified which account for the bulk of this shift and this group matches with diagnoses known to be associated with high levels of multi-morbidity. A potential common cause for this increase is explored.

Key Words

Elderly, multi-morbidity, cardiovascular, respiratory, digestive, wounds and injury, infectious outbreaks

Introduction

An earlier article in BJHCM highlighted the rapid expansion in the proportion of total admissions in England which are due to the elderly (age 75+). These are exclusively due to the medical specialties and cannot be explained by demographic shifts (Jones 2013d). The World War II baby boom (Jan-46 to Sep-49) are still only in their mid- to late-60's and the consequences on this demographic shift are largely yet to be fully experienced. An increasing burden of infectious disease was proposed to account for this seemingly inexplicable shift. This article will explore these issues in greater detail looking at individual diagnoses. Since disease and morbidity is not restricted to the artificial boundary of elective and emergency admission types this study will investigate the trends in total admissions.

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Key Diagnoses

Having previously demonstrated that the rapid expansion in elderly admissions is largely medical in nature it would be useful to determine if particular diagnoses are involved or if this is am more general phenomena. The previous analysis which was conducted at specialty level is further expanded in Table 1 where the age 75+ diagnoses with highest number of admissions and also showing the highest expansion in share of total admissions have been identified. Ninety out of 1,300 common diagnoses can be seen to account for the bulk of this shift. These 90 diagnoses accounted for 771,000 age 75+ admissions in 1998/99 expanding to 1,732,000 by 2011/12. In 1998/99 they accounted for 34.7% of age 75+ admissions rising to 42.4% by 2011/12. They are increasing their share of total admissions by 0.9% percentage point increase per annum which given the pressures on the NHS budget is significant. No wonder the policy makers' are desperately searching for solutions among the supposedly broken processes of care and in England are seeking to find a 'saviour' in the private sector.

What is even more disconcerting is that the diagnoses in Table 1 are highly specific for a limited set of conditions, namely, cancers, and diseases affecting the circulatory system, lungs, urinary tract, skin, digestive system and nervous system including the brain; as well as wounds & fractures. How do we understand these findings and may there be links to the wider issue of multi-morbidity in the elderly?

Multi-morbidity

Multi-morbidity has long been known as the key factor in illness affecting the elderly and is a true international phenomena (Marengoni et al 2011). Amongst deprived populations, multiple morbidity occurs 10-15 years earlier than in affluent areas (Lawson et al 2013). There are some 47 common morbidities/pathologies applicable to those aged 65+ (Orueta et al 2013) and in one study in general practice in Madrid during 2007 for patients aged 14+ some 42% had at least one chronic condition and 25% were multi-morbid (Garcia-Olmosw et al 2012). Multi-morbidity appears to occur in condition clusters. For example, patients aged 80+ who have ischaemic heart disease, cerebrovascular diseases, chronic renal failure or congestive heart failure are characterized by the highest levels of multi-morbidity with 28% to 42% (depending on the condition) having the primary condition plus five or more morbidities. This group of high multi-morbidity primary diagnoses are all in Table 1.

Multiple morbidity increases with age up to 80-84 and with deprivation score. It ranges from an average of 1.8 morbidities per person for those aged 65-69 in the least deprived quintile through to 3.5 per persons aged 80-84 in the highest deprivation quintile. Multiple morbidity in those aged 85+ is lower at

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Table 1: Top 90 diagnoses responsible for the rapid expansion in elderly admissions age 75+

ICD	Description	Increase	ICD	Description	Increase
C18	Malignant neoplasm of colon	0.9%	H35	Other retinal disorders	3.8%
C85	Unspecified types of non-Hodgkin's lymphoma	0.8%	A04	Other bacterial intestinal infections	2.0%
C92	Myeloid leukaemia	0.8%	R29	Symptoms & signs – nervous/musculoskeletal	1.6%
D04	Carcinoma in situ of skin	0.7%	Z74	Problems related to care-provider dependency	1.3%
C83	Diffuse non-Hodgkin's lymphoma	0.7%	E16	Other disorders of pancreatic internal secretion	1.3%
C19	Malignant neoplasm of rectosigmoid junction	0.6%	Z50	Care involving use of rehabilitation procedures	1.2%
Z08	Follow-up after treatment for neopasm	0.6%	A08	Viral and other specified intestinal infections	0.9%
C90	Multiple myeloma and plasma cell neoplasms	0.6%	R47	Speech disturbances NEC	0.9%
C91	Lymphoid leukaemia	0.5%	F01	Vascular dementia	0.8%
C43	Malignant melanoma of skin	0.5%	E87	Disorders fluid,electrolyte & acid-base balance	0.8%
C20	Malignant neoplasm of rectum	0.5%	R56	Convulsions NEC	0.8%
D41	Neoplasm of uncertain behaviour of urinary	0.5%	F03	Unspecified dementia	0.7%
C44	Other malignant neoplasms of skin	0.4%	R69	Unknown and unspecified causes of morbidity	0.7%
C56	Malignant neoplasm of ovary	0.4%	F05	Delirium not by psychoactive substance	0.7%
C67	Malignant neoplasm of bladder	0.4%	D69	Purpura and other haemorrhagic conditions	0.5%
C79	Secondary malignant neoplasm of other sites	0.4%	G30	Alzheimer's disease	0.4%
S01	Open wound of head	1.7%	I22	Subsequent myocardial infarction	1.6%
S06	Intracranial injury	1.7%	I35	Nonrheumatic aortic valve disorders	1.5%
S00	Superficial injury of head	1.5%	I62	Other nontraumatic intracranial haemorrhage	1.2%
S80	Superficial injury of lower leg	1.2%	I65	Occlusion/stenos precerebral arteries,	1.2%
S81	Open wound of lower leg	1.2%	I25	Chronic ischaemic heart disease	1.0%
S09	Other and unspecified injuries of head	1.1%	I61	Intracerebral haemorrhage	0.9%
S22	Fracture of rib(s)sternum and thoracic spine	1.0%	I12	Hypertensive renal disease	0.8%
S32	Fracture of lumbar spine and pelvis	0.9%	I20	Angina pectoris	0.7%
S52	Fracture of forearm	0.6%	I21	Acute myocardial infarction	0.6%
S42	Fracture of shoulder and upper arm	0.6%	I71	Aortic aneurysm and dissection	0.6%
S70	Superficial injury of hip and thigh	0.4%	I83	Varicose veins of lower extremities	0.6%
M25	Other joint disorders NEC	0.9%	I63	Cerebral infarction	0.6%
M79	Other soft tissue disorders NEC	0.7%	I50	Heart failure	0.6%
M54	Dorsalgia	0.5%	T82	Comps cardiac & vasc prosthetic devices	0.5%
M10	Gout	0.4%	I95	Hypotension	0.5%
M51	Other intervertebral disc disorders	0.4%	I70	Atherosclerosis	0.5%
K26	Duodenal ulcer	0.6%	I45	Other conduction disorders	0.4%
K52	Other noninfective gastroenteritis and colitis	0.6%	I77	Other disorders of arteries and arterioles	0.4%
K81	Cholecystitis	0.4%	J47	Bronchiectasis	1.1%
K83	Other diseases of biliary tract	0.3%	J15	Bacterial pneumonia NEC	1.1%
L98	Disorders skin and subcutaneous tissue NEC	0.8%	J69	Pneumonitis due to solids and liquids	0.9%
L57	Skin changes due chronic exposure to sunlight	0.5%	R06	Abnormalities of breathing	0.8%
L82	Seborrhoeic keratosis	0.5%	J81	Pulmonary oedema	0.8%
L03	Cellulitis	0.4%	J90	Pleural effusion NEC	0.8%
N17	Acute renal failure	1.4%	J84	Other interstitial pulmonary diseases	0.7%
N32	Other disorders of bladder	0.5%	J96	Respiratory failure NEC	0.7%
R31	Unspecified haematuria	0.4%	J43	Emphysema	0.6%
R39	Symptoms and signs of urinary system	0.4%	R04	Haemorrhage from respiratory passages	0.6%
N39	Other disorders of urinary system	1.6%	J18	Pneumonia organism unspecified	0.4%
N95	Menopausal and peri-menopausal disorders	0.4%	R91	Abnormal findings on diagnostic imaging of lung	0.3%

Footnote: Data is for Finished Consultant Episodes (FCE) and is from Hospital Episode Statistics (HES) and covers the primary diagnosis as recorded by each hospital for residents of England.

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around 2.8 (least deprived) to 3.2 (most deprived), while the disparity between least and most deprived is more marked in women (Orueta et al 2013). For the elderly aged 65+, diagnoses associated with highest levels of at least four additional morbidities (percentage of persons in brackets) were as follows: Heart failure (79%), bronchiectasis (66%), chronic kidney disease/peripheral vascular disease/ paralysis or muscular dystrophy/transplant recipients (64%), other chronic heart diseases, hematologic chronic disorders, constipation (61%), chronic liver or pancreatic disease (58%), atrial fibrillation (56%), diverticular disease of intestine (54%), disorders of immune system/alcohol problems (53%), ischemic heart disease (52%), cerebrovascular disease/emphysema/chronic bronchitis/chronic obstructive pulmonary disease (51%) (Orueta et al 2013) and all of these are represented in Table 1.

The two Spanish studies were derived from primary care records which included both the diagnoses and prescribed drugs to confirm the type of morbidity. Table 1 is for primary diagnosis following hospital admission (which will be a subset of the GP population). However the extent of overlap is most remarkable or more to the point, should not be seen as remarkable given a possible common exacerbating factor.

A Common Source

Some of the apparent growth seen in the top 90 diagnoses will be an artefact of counting drift specific to England arising from two sources. The first is due to the HRG tariff which inadvertently encouraged a switch in the counting of previous outpatient minor procedures, treatments, injections and tests to become a 'day case' (Jones 2008, 2009). This is illustrated in Table 2 where the bulk of growth in 'day case' can be seen to be non-surgical. The greatest growth occurs after 2004/05 when the HRG tariff became the mandatory tariff and it became financially advantageous for acute hospitals to re-badge outpatient events as 'day case'.

Table 2: Increase in 'day case' admissions in England

Specialty Group	1998/99	2002/03	2005/06	2008/09	2011/12	Increase	% Increase	Per annum
Surgical Specialties	2,018,563	2,119,218	2,266,974	2,856,232	3,142,523	1,123,960	56%	4%
Oncology	290,781	303,826	360,299	435,358	498,794	208,013	72%	5%
Pain Management	86,491	94,628	74,433	139,676	171,516	85,025	98%	7%
Haematology	192,959	255,269	294,473	330,152	400,228	207,269	107%	8%
Medical Group	713,899	818,705	974,865	1,288,365	1,523,129	809,230	113%	8%
Total Non-surgical	**1,284,130**	**1,472,428**	**1,704,070**	**2,193,551**	**2,593,667**	**1,309,537**	**102%**	**7%**

Footnote: Data is from HES. In the surgical group the bulk of the increase in genuine day surgery is mainly restricted to Ophthalmology and Orthopaedics. An increase of around 1% p.a. could be expected due to the demographic shift.

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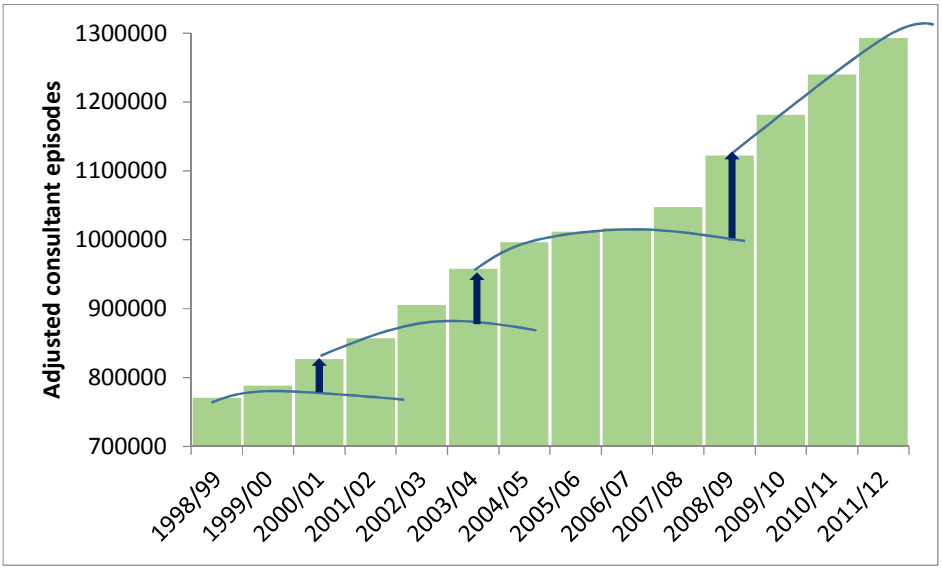
The second source of counting drift arose from the arbitrary 4 hour A&E target which was entirely appropriate for minor injury and illness but probably unachievable for more complex elderly diagnosis (Jones 2010a,b, 2011a,b) and this, along with best practice developments in medical assessment, led to a rapid growth in zero day stay assessment unit 'admissions' which in other countries would be regarded as emergency department attendances (Jones 2010a, 2011a). Details of these adjustments are given in the footnote to Figure 1.

Figure 1: Growth in consultant episodes for the top 90 diagnoses



Footnote: Data is from Hospital Episode Statistics (HES). Raw data has been adjusted for growth in 'day case' admission for the 90 diagnoses and Assessment Unit zero day admissions. The increase in Day case admissions (all ages) for each ICD diagnosis over time were multiplied by proportion 75+ FCE while 75+ admissions to specialty 180 (Accident & Emergency) were factored up to account for MAU admissions coded to specialty 300 (General Medicine) and then adjusted down by the proportion of the 90 diagnoses to total 75+ admissions to all diagnoses. The MAU adjustment is relatively small through to 2004 when it increases at the point that the A&E 4 hour target is tightened. The combined adjustment factor starts at zero in 1998/99 and increases to minus 438,700 by 2011/12.

However, returning to the issue of a common exacerbating factor, Figure 1 tracks the adjusted growth in consultant episodes for the top 90 primary diagnoses identified in Table 1. As can be seen growth occurs in three phases with the onset of each phase (marked by a large step-like increase, see arrows) commencing in the years when outbreaks of a presumed infectious immune impairment have been demonstrated to occur. The transition marking the start of each outbreak occurs over an 18 month period (Jones 2012a,b, 2103a,b,f) during which time the infection spreads across the entire UK. Note that the outbreak in 1999 appears to have been confined to Scotland (not in the HES data) and some parts of northern England (Jones 2013c,d) and hence the relatively small step change at this point. In

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England the outbreaks commence in mid financial year in 2002/03 and 2007/08 hence there are part-year effects. A further outbreak commences in 2012 (Jones 2013b) and additional outbreaks have been documented in 1993 and 1996. Each outbreak has its own unique features and hence the 1993 and 2007 outbreaks appeared to be associated with a large increase in GP referral, which is far less in the 2002 outbreak (Jones 2013) and only minor in the 2012 outbreak (unpublished). The 2012 outbreak led to the highest number of deaths and combined with capacity constraints, possibly exaggerated by a period of time when the A&E tariff was too low to cover costs (Jones 2010a, 2011a), led to serious A&E waiting time problems in 20912 and 2013 (Jones 2013b,c).

The immune and auto-immune modulating herpes virus Cytomegalovirus (CMV) has been suggested as a possible cause (Soderberg-Naucler 2012, Jones 2013a,g) and multiple studies in the USA and UK have demonstrated alarming increases (>20%) in *all-cause* mortality for those with high antibody levels or showing a strong inflammatory response to CMV (Roberts et al 2010, Simanek et al 2011, Gkrania-Klotsas et al 2012, Savva et al 2013) and especially in the cardiovascular and respiratory morbidity areas identified in Table 1. The term 'all-cause mortality' implies the ability to influence multiple morbidity/pathology consistent with wider effects seen in Table1. Such multiple pathology is implied by the fact that there are over 100 auto-immune diseases and more than 100 inflammatory diseases/conditions which in susceptible individuals could be amenable to exacerbation by CMV (Castiblanco et al 2013). The cluster of injury and fractures in Table 1 can therefore be seen in the light of the neurological and debilitating effects of this virus (Jones 2013a). While these outbreaks have been shown to lead to the large step-like increases they contribute to further escalation in admissions which eventually tails off around two years after onset (as per the trend lines in Figure 1) and in the absence of further outbreaks could lead to overall growth reverting back to that expected from the demographic shift, i.e. the effects of one outbreak after another become cumulative and this suggests that multi-morbidity may be increasing with time.

Conclusions

This time series of unique infectious outbreaks has now been demonstrated in over 50 publications covering multiple countries, ages, diagnoses and aspects of health care activity, bed occupancy (see references in Jones 2103a,b,f), death (Jones 2013b) and even in a cycle in the gender ratio at birth (Jones 2013e) with catastrophic effects against costs (Jones 2012a). What more needs to be done to get the policy makers interested in something which may represent one of the most powerful forces for cost increase in the NHS?

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The processes of care and in particular failures in general practice, seem to be perceived as the cause of the problem. They are not the cause but merely symptoms of the avalanche of morbidity demonstrated here. Addressing symptoms may save costs but it will not deal with the source of the increase.

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