Trends in mortality and hospital admissions associated with atrial fibrillation in England and Wales

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Atrial fibrillation is an important risk factor for stroke, affects about 0.4–1 per cent of the population, and is increasing in prevalence. In 1998 atrial fibrillation was mentioned on 1.5 per cent of death certificates for stroke and 3.8 per cent of death certificates for ischaemic heart disease. From 1968 onwards, death registration rates for atrial fibrillation declined steadily until 1983/4, remained constant until 1994, and then nearly doubled by 1999. Much of the increase is attributable to changes in death rates in the age group 85 years and over. Hospital discharge rates have doubled in the four years since 1995/96. The highest discharge rates are seen in the age group 85 years and over and rates in men are consistently higher than those in women. Against a background of declining death rates from stroke, coronary heart disease and rheumatic and valvular heart disease, the sustained rise in mentions of atrial fibrillation on death certificates seen since 1994, is likely to have multi-factorial aetiology, but two major factors are an increasing prevalence of atrial fibrillation and better awareness of it's consequences among clinicians .

Introduction

Up until the beginning of the 1990s, atrial fibrillation (Box 1) was considered by many clinicians to be a relatively innocuous condition. However, epidemiological and clinical studies have since confirmed that atrial fibrillation is an important risk factor for stroke, increasing the risk of stroke by three to seven fold.[1,2,3,4] The annual risk of stroke in people with atrial fibrillation has been estimated to be between 4–8 per cent depending on comorbidities.[5] About 15–25 per cent of strokes are due to cardio-embolism and atrial fibrillation is responsible for about half of these events. In patients with pre-existing non-valvular atrial fibrillation, 66–75 per cent of strokes are cardioembolic in mechanism. Because the prevalence of atrial fibrillation increases with age, the proportion by which the incidence of strokes in people with atrial fibrillation would be reduced if atrial fibrillation was not present also increases significantly with age, from 1.5 per cent at age 50–59 years to 23.5 per cent for those aged 80–89 years. In contrast, the proportion by which the incidence of strokes resulting from other cardiovascular conditions could be reduced if these conditions were prevented does not vary much with age.[1] Hence, as the population of the United Kingdom ages, the public health importance of atrial fibrillation as a cause of stroke and subsequent death and disability will increase.

There is little published information on the mortality associated with atrial fibrillation at the population level. Most information is derived from cohort studies such as the Framingham Heart Study and from small investigations which have looked at highly selected populations enrolled in clinical trials or in hospital based studies. [6,7] These studies have shown that all cause mortality and mortality associated with a first or recurrent stoke is significantly higher in people with atrial fibrillation.

Box one

What is Atrial Fibrillation?

Atrial fibrillation is an irregularity of the heart rhythm which causes the heart to pump inefficiently. It is a cause of heart failure or stroke.

The main conditions associated with atrial fibrillation are high blood pressure, rheumatic heart disease, heart failure, coronary heart disease and hyperthyroidism.

Atrial fibrillation is often subdivided into valvular and non-valvular types, depending on whether there is an abnormality of the heart valves.

Atrial fibrillation can be treated by cardioversion (electric shock treatment to the heart) or more commonly by drugs which control the heart rhythm, such as digoxin.

People with atrial fibrillation are at increased risk of strokes. Drugs such as warfarin and aspirin are recommended for these patients to help reduce this risk.

We examined trends in mortality associated with atrial fibrillation coded as the underlying cause of death for the period 1968–99 in the population of England and Wales. Additionally for 1993–99, the period for which multi-cause coding of mortality data is available, we analysed death registrations for which atrial fibrillation was mentioned anywhere on the death certificate. We also examined trends in hospital admissions for atrial fibrillation to NHS hospitals in England during the period 1995/96 to 1998/99.

Methods

Death registration rates

All deaths occurring in residents of England and Wales in which atrial fibrillation was coded as the underlying cause of death during the period 1968–99 were examined. Box 2 shows the codes that were used to select deaths associated with atrial fibrillation. In addition, from 1993 onwards, the death registrations contained details of all conditions mentioned on the death certificate (multi-cause coded data) as well as the underlying cause of death.

Box two

ICD Revision	Period	Code	Description
ICD–8	1968–78	427.9	Symptomatic heart disease, Other disorders of heart rhythm.
ICD–9	1979–99	427.3	Cardiac dysrhythmias, Atrial fibrillation and flutter

Age and sex specific death rates were calculated using the ONS mid year population estimates for England and Wales for the relevant year as denominators. To derive summary rates, death rates were directly age and sex standardised (a technique that makes allowances for changes in the age structure of the population) using the European standard population.

For deaths occurring during 1993–99, for which multi-cause coding of deaths is available, the death registrations were analysed as below:

- Atrial fibrillation coded as underlying cause of death and associated with the most common mentions of other conditions.
- Atrial fibrillation as any mention (other than underlying cause of death) and the most common underlying causes of death with which it was mentioned.

In addition trends in mortality associated with stroke and rheumatic heart and valvular heart disease were examined. The rationale for this is that atrial fibrillation has been shown to be a predisposing factor for ischaemic stroke and it is also strongly associated with valvular heart disease, which up until the second world war was most commonly caused by rheumatic heart disease. Thus trends in these conditions might help to explain trends observed in mortality rates due to atrial fibrillation.

Hospital admission rates

Hospital episodes statistics (HES) for England during the period 1995/96 to 1998/99 were obtained from the HES information service of the Department of Health. All first consultant episodes in which atrial fibrillation (ICD10 code I48X) was given as the primary diagnosis or as any secondary diagnosis were selected for analysis. For contract monitoring purposes the HES system divides a patient's stay in hospital into FCEs, (Finished Consultant Episodes). A patient may have many FCEs during a hospital stay (provider spell). The admission and discharge dates for all FCEs in a single provider spell will be the same. It is assumed that the primary diagnosis for the first FCE in a string is the principal reason for admission. It is also assumed that if atrial fibrillation was given as the primary diagnosis the patient was admitted for treatment of this condition or its consequences. If given as a secondary diagnosis it is assumed that atrial fibrillation contributed to the patient's morbidity but was not the main reason for admission. The data was divided into all ordinary (overnight admissions) and day case admissions and each group directly age standardised using the method described above.

Results

In 1993 atrial fibrillation was mentioned in 5,735 death registrations and it was coded as the underlying cause of death in 1,578 registrations. By 1999 this had risen to a total of 9,336 mentions and it was coded as the underlying cause of death in 2,597 of these registrations.

Trends In death registrations associated with atrial fibrillation

Figure 1 illustrates the trend in annual directly standardised deaths rates for which atrial fibrillation was coded as the underlying cause. Between 1968 and 1982, the death rate from atrial fibrillation fell by half. The rate then remained relatively constant until 1993 when it began a sustained rise and had nearly doubled again by 1999. The trends in death rates are very similar for both males and females with only small differences between them.

Figure 2 and Figure 3 illustrate the trends in age specific mortality rates over the period. The most striking feature is that the death rates are strongly age dependent in both sexes. The results confirm that much of the change in death registrations is caused by changes in the age group 85 years and over. Higher death rates in this age group in women also explains the female excess in the overall mortality rate. The appearance of the charts also suggests that there may be birth cohort affects.

Figure 1 Death rates per 100,000 directly standardised by age for England and Wales 1968–99. Atrial fibrillation coded as the underlying cause of death

Analysis of death registrations in which atrial fibrillation was coded as the underlying cause of death (Figure 4 and Figure 5) shows that the proportion of registrations in the age group 85 years and above has increased over time, particularly in women.

Figure 2 Trends in age specific mortality rates for males. Atrial fibrillation coded as the underlying cause of death

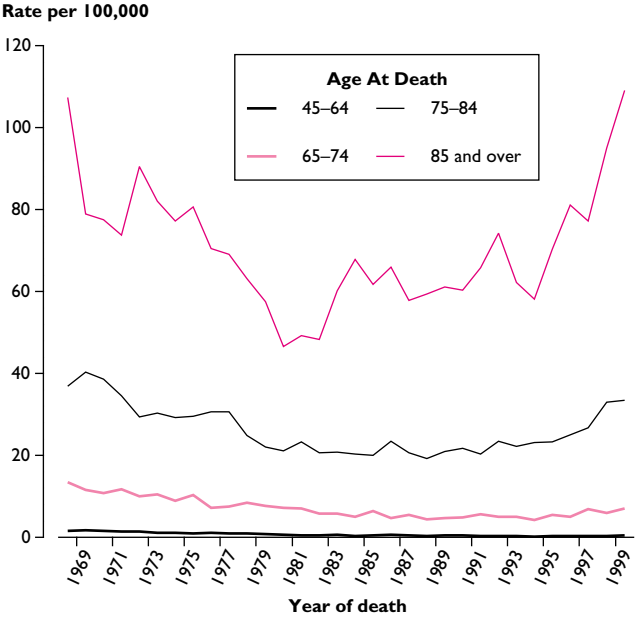
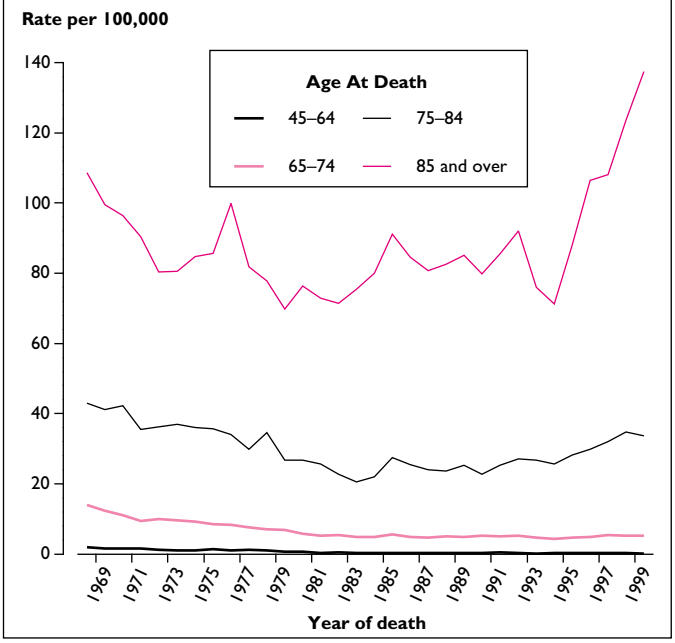


Figure 3 Trends in age specific mortality rates for females. Atrial fibrillation coded as the underlying cause of death



Trends in death registrations associated with strokes and valvular heart disease

If the decline in mortality associated with atrial fibrillation is caused by the declining prevalence in chronic rheumatic heart disease it might be expected that trends in registration rates associated with both conditions will be similar. During 1968 to 1998, directly standardised death rates for both cerebrovascular disease (Figure 6) and rheumatic heart disease and valvular heart disease (Figure 7), fell by half in both males and females. However, stroke mortality was higher in males in contrast to mortality from rheumatic and valvular heart disease, which was higher in females and of a similar magnitude to that of atrial fibrillation.

Figure 4 Proportions by age group of death registrations with atrial fibrillation coded as underlying cause of death. Changes over time for males

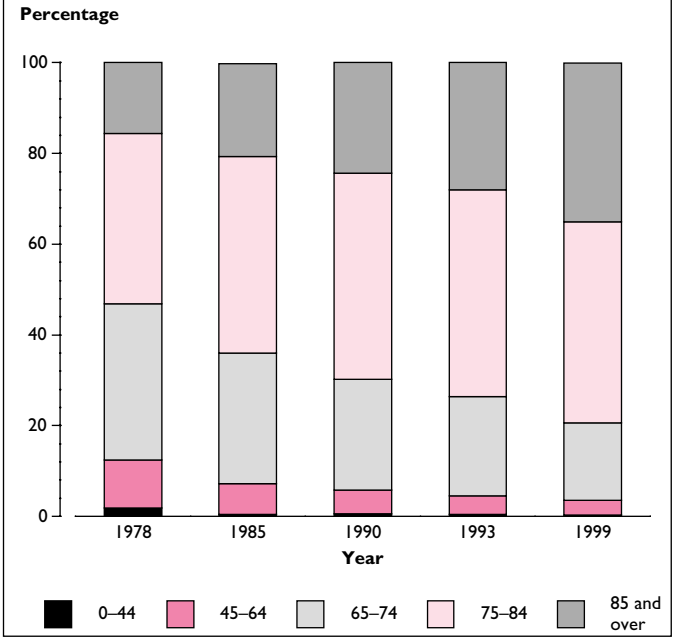
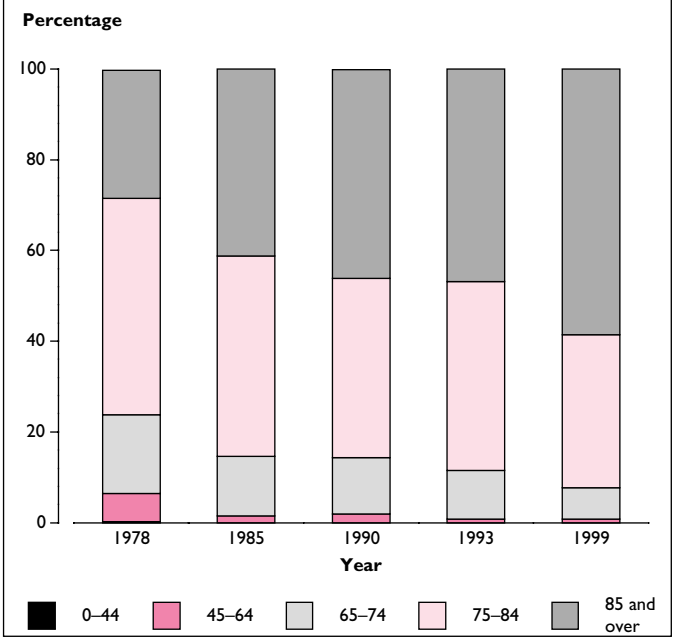


Figure 5 Proportions by age group of death registrations with atrial fibrillation coded as underlying cause of death. Changes over time for females



Multi-cause of death coding

When atrial fibrillation is coded as the underlying cause of death, cerebrovascular disease, acute ischaemia of the intestine, heart failure, broncho-pneumonia/pneumonia and arterial embolism are the five most commonly co-mentioned conditions on the death certificate (Table 1). Cerebrovascular disease was a co-mention on 52 per cent of death certificates and heart failure was a co-mention on 38 per cent of death certificates. This data is consistent with the known associations of atrial fibrillation with ischaemic stroke, heart disease, and systemic thrombo-embolic disease.

Table 2 shows the results of analysing the death registrations by underlying cause of death for which atrial fibrillation was a co-mention. The five most common underlying causes of death were coded as Ischaemic heart disease, cerebrovascular disease, heart failure, broncho-pneumonia/pneumonia and chronic obstructive pulmonary disease. Ischaemic heart disease was coded as underlying cause of death in 39 per cent of the registrations and cerebrovascular diseases coded as underlying cause of death in 14 per cent of the registrations. In most morbidity studies ischaemic heart disease is one of the principal associations with atrial fibrillation (up to 70 per cent of cases in some studies). It is likely that in many of the cases in which cerebrovascular disease was given as the underlying cause of death, atrial fibrillation was the 'true' underlying cause but not identified as such because of the way that the original death certificate had been completed.

Trends in hospital admissions

Before 1995–96, the data on atrial fibrillation derived from the Hospital Episode Statistics appears to be incomplete. Thus only data from 1995–96 onwards was analysed. As shown in Table 3 there was a striking increase in admission rates until 1998–99. This was seen in both sexes, although male rates were approximately double that for females. There was a two fold increase for admissions in which atrial fibrillation was given as the primary discharge diagnosis or as any secondary diagnosis. Day case discharge rates for atrial fibrillation also increased during this period. Increasingly, cardiologists are recommending direct current cardioversion for certain forms of atrial fibrillation and admission for this procedure might inflate discharge rates for atrial fibrillation (this procedure is often performed as a day case). However, although the day case hospital discharge rates for atrial fibrillation are increasing they account for only 14–18 per cent of the admissions. Table 4 illustrates the trends in age specific discharge rates. For both males and females the discharge rates are highly age dependent. In all age groups there has been an approximate doubling in discharge rates since 1995–96.

Figure 6 Death rates per 100,000 directly standardised by age for England and Wales 1968–98. Cerebrovascular disease (ICD8/ICD9 431–437) coded as the underlying cause of death

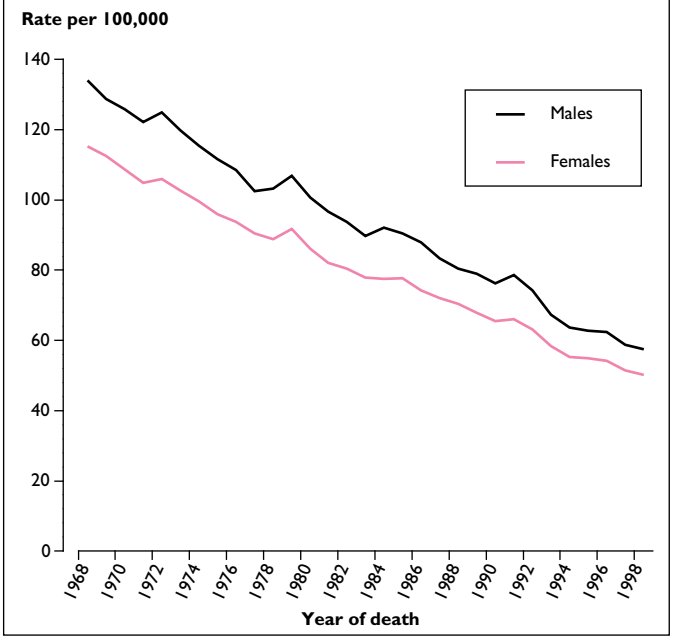


Figure 7 Death rates per 100,000 directly standardised by age for England and Wales 1968–98. Valvular heart disease (ICD8/ICD9 390–398, 424) coded as the underlying cause of death

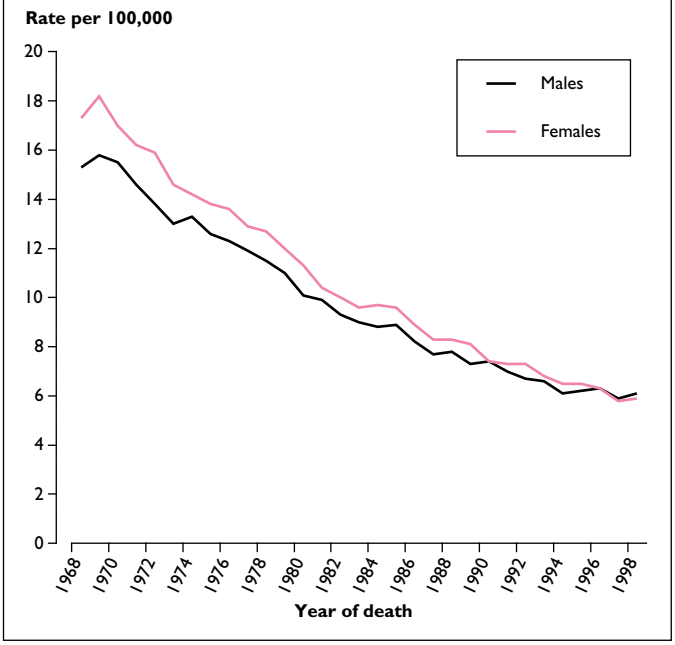


Table 1 Most common mentions as a proportion of all death registrations in which atrial fibrillation (ICD9 4273) was coded as the underlying cause of death. Data Pooled For 1993–99

ICD–9	Description	Number	Percentage
4273	Atrial fibrillation and flutter	14,065	100
431–437	Cerebrovascular disease	7,257	51.6
428	Heart failure	5,316	37.8
485	Bronchopneumonia	1,552	11.0
557	Acute vascular insufficiency of intestine	834	5.9
797	Senility without mention of psychosis	783	5.6
496	Chronic airways obstruction, not elsewhere classified	661	4.7
250	Diabetes mellitus	640	4.6
401	Essential hypertension	444	3.2
444	Arterial embolism and thrombosis	432	3.1
519	Other diseases of respiratory system	386	2.7
415	Acute pulmonary heart disease	325	2.3

Table 2 Most common diagnoses coded as underlying cause of death from death registrations, in which atrial fibrillation (ICD9 4273) was mentioned on the death certificate, but was not coded as the underlying cause of death. Data Pooled For 1993–99

ICD–9	Description	Number	Percentage
000–999	All deaths (excluding atrial fibrillation and flutter)	36,334	100
410–414	Ischaemic heart disease	13,998	38.5
431–437	Cerebrovascular disease	4,946	13.6
485–486	Bronchopneumonia/pneumonia, organism unspecified	2,907	8.0
496	Chronic airways obstruction	1,719	4.7
428	Heart failure	1,236	3.4
424	Other diseases of endocardium	789	2.2
443	Other peripheral vascular disease	685	1.9
394	Diseases of mitral valve	666	1.8
162	Malignant neoplasm of trachea, bronchus and lung	589	1.6
402	Hypertensive heart disease	368	1.0

Discussion

Principal findings

There have been no comparable results published on the trends in mortality or discharge rates associated with atrial fibrillation using national data sources. In this respect the present investigation is unique. In 1998 atrial fibrillation was mentioned in a total of 8,674 death registrations. It was mentioned in 1.5 per cent of all registrations for cerebrovascular disease and in 3.8 per cent of registrations for ischaemic heart disease.

Table 3 Hospital discharge rates per 100,000. All ordinary and day case admissions for England 1995–1999. Directly standardised by age. Primary and Secondary diagnoses atrial Fibrillation (AF).

	Primary diagnosis AF		Secondary diagnosis AF		Day case admissions	
Year of discharge	Males	Females	Males	Females	Males	Females
Day case admissions						
1995/96	44.8	23.5	135.6	65.6	3.8	1.4
1996/97	69.7	36.2	195.2	94.6	8.6	3.3
1997/98	92.7	47.5	247.3	122.2	13.8	5.8
1998/99	105.7	51.8	286.2	136.1	18.8	7.3

Death registrations associated with atrial fibrillation halved between 1968 and 1982. The registration rate then remained relatively constant until 1994 when it began a sustained rise and had nearly doubled by 1999. Death registration rates are age dependent with the highest rates observed in those aged 85 years and over. The trend in overall rates are very similar for both males and females with only small differences between them. The results confirm that much of the change in mortality seen from 1968 to 1999 is caused by changes in the mortality experience of the most elderly age groups. Analysis of the death registrations in which there was any mention of atrial fibrillation showed that the most common mentions other than atrial fibrillation were heart failure, ischaemic heart disease, cerebrovascular disease, and broncho-pneumonia/pneumonia.

Table 4 Trends in age specific discharge rates per 100,000 for males and females. Atrial fibrillation as primary diagnosis. (First FCEs only)

Year of	0–44 years		45–64 years		65–74 years		75–84 years		85 and over	
discharge	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1995/96	4.5	1.1	58.0	24.9	149.6	105.5	186.1	172.1	1131.9	427.3
1996/97	6.7	2.0	90.8	39.2	236.6	155.9	284.6	269.4	1735.3	642.4
1997/98	8.4	2.5	117.0	50.6	321.2	210.4	402.8	350.1	2328.4	836.7
1998/99	10.5	2.8	135.7	52.7	365.9	231.8	453.3	388.0	2577.8	944.0

There has been a two fold increase in hospital discharge rates since 1995/96 in which atrial fibrillation was recorded as the primary discharge diagnosis or as any secondary diagnosis. This increase was in both sexes and in all age groups. Age group specific discharge rates are consistently higher in males than in females. Discharge rates, like mortality rates, are highly age dependent and the highest discharge rates are seen in the age group 85 years and above. Hospital discharge rates are higher in males. In the year 1998/99 atrial fibrillation was the primary diagnosis in 0.7 per cent of all admissions for diseases of the circulatory system (ICD-10 codes I00-I99)

Strengths and weaknesses of study

The main strength of this study is that it makes use of 32 years of death registrations for England and Wales, which enables trends to be reliably identified. Secondly, the use of data from England and Wales provides large numerators even though as a coded cause of death atrial fibrillation is uncommon. Thirdly, virtually all deaths are captured by the registration system thus it is unlikely that systematic errors will occur due to missing data. Similarly, four years worth of hospital episode statistics (HES) data for England was used to analyse discharge rates and although data capture may not be complete the number of episodes is large enough to ensure that the trends found should be valid and representative of the whole population.

In any study of this type which analyses death registrations to look at trends in causes of mortality the principal weakness is the problem of disentangling real trends from spurious ones caused by changes in certification practice, and coding frames and rules. During the period selected for this study there were two ICD revisions but fortunately the coding for atrial fibrillation was little affected. From 1984 to 1993 OPCS used a broader interpretation of ICD-9 rule 3 which resulted in a fall in the number of deaths ascribed to one of 11 conditions regarded as terminal, and an apparent increase in deaths from many chronic conditions.[8] The accuracy with which the certifier, usually a doctor, completes the certificate, and the selection of the underlying cause of death by coders up until 1993 are other causes of misclassification. Since 1993 the introduction of automatic cause of death and multi cause coding enables it to be controlled for if necessary in the analysis. HES data also suffers from biases introduced by misclassification,

particularly the use of different rules by coders in the coding departments of NHS Trusts. A further problem with HES data is that it is very difficult in routine analysis of the data to identify multiple admissions for individual patients. The apparent male excess of discharges observed in all age groups may not be so much a reflection of higher incidence and prevalence rates of atrial fibrillation in males in the community as of their likelihood of being admitted to hospital as a consequence of it. However given the large number of discharges these errors will tend to be random and the overall effect will be a reduction in the true size of the effects observed.

Possible mechanisms and implications for clinicians and policy makers

It is difficult to explain the trends observed in death registrations associated with atrial fibrillation. The decline in death rates which occurred up until 1983 may have been related to the declining prevalence of rheumatic heart disease during the 20th century. The declining mortality from rheumatic and valvular heart disease observed during this period lends support to this hypothesis, particularly as the greatest falls occurred in the over 85 year olds. However it does not explain the rise in the 1990s. Some of the increase observed from 1993 may have been a result of the changed coding system introduced at this time which used automatic multi cause coding, but it is unlikely to explain the sustained increase observed between 1993–1999. The results of the first clinical trials reporting the benefits of antithrombotic treatment in preventing strokes in patients with atrial fibrillation were published between 1988 and 1994.[9,10,11,12,13,14,15,16] It is likely that these findings increased awareness amongst clinicians of the role of atrial fibrillation as a risk factor for ischaemic stroke, leading to atrial fibrillation being mentioned more frequently in association with cerebrovascular disease. A proportion of deaths which otherwise would be attributed to cerebrovascular disease may therefore have been coded to atrial fibrillation as the underlying cause of death instead.

Apart from artefactual changes in the mortality rates over time produced by changes in certification practice and cause of death coding, it is likely that there has been a real increase in deaths associated with atrial fibrillation. The prevalence of atrial fibrillation appears to be increasing in those age groups most at risk of its consequences. In the USA, annual visits to physicians for atrial fibrillation increased from 1.3 million in 1980 to 3.1 million in 1992, and that crude hospital discharge rates for atrial fibrillation increased from 30.6 per 10,000 in 1982 to 59.5 per 10000 in 1993.[17,18] This data is in agreement with the findings of the present study in which there was a greater than two fold increase in standardised discharge rates for England for atrial fibrillation in both males and females from 1995/96 to 1998/99. The Framingham heart study also found a three fold increase in the prevalence of atrial fibrillation from 3.2 per cent to 9.1 per cent in men aged 65–84 years during the period 1968–89. Thus it is likely that a significant proportion of the increase in mentions on death certificates is caused by a real increase in the prevalence of atrial fibrillation. Although rheumatic heart disease as a precursor of atrial fibrillation is now rare the improvements in survival rates from myocardial infarction and increased use of coronary artery revascularisation procedures are thought to contribute to the increasing prevalence of atrial fibrillation, particularly in the older age groups.[19]

As well as becoming more common, the morbidity associated with atrial fibrillation may be more severe. There is evidence that the stroke risk associated with atrial fibrillation is considerably increased in the presence of comorbidities, and these are also strongly age related.[4,10,11,12,20] Even in patients with atrial fibrillation but without comorbidities, the risk of death is doubled and elderly patients with atrial fibrillation who suffer strokes are often more severely disabled and more likely to die than patients without atrial fibrillation.[6,7] The multi-cause data analysis presented in this study confirms the association between atrial fibrillation and cerebrovascular disease which has been found in numerous studies of morbidity. In this study cerebrovascular disease was a co-mention in 52 per cent of death registrations when atrial fibrillation was coded as the underlying cause of death and conversely atrial fibrillation was a co-mention in 14 per cent of registrations when cerebrovascular disease was given as the underlying cause of death.

It is also possible that part of the increase in mortality and hospital discharge rates found in the present study is produced by major bleeding complications accompanying the increasing use of antithrombotic treatments to prevent ischaemic stroke in patients with atrial fibrillation. In one large trial major bleeding episodes occurred with an overall frequency of 2.3 per cent per year when receiving warfarin and 1.1 per cent per year when receiving aspirin.[21] This trial confirmed that the risk was strongly age related and major bleeds occurred in 1.7 per cent of those aged under 75 years and 4.2 per cent in those older than this. The risk of intracranial bleeding was 0.6 per cent and 1.8 per cent respectively. In the elderly sub group 71 per cent of the intracranial bleeds were fatal. Our analysis of death registrations found no evidence of bleeding complications, such as bleeding peptic ulcer, being common co-mentions with atrial fibrillation on death certificates. However, we cannot exclude the possibility that some of the strokes co-mentioned with atrial fibrillation were haemorrhagic and caused by antithrombotic treatment. Similarly, the hospital discharge rates show similar trends for atrial fibrillation as both primary or secondary diagnosis. It is possible that some of the admissions in which atrial fibrillation was a secondary diagnosis were for bleeding complications of antithrombotic treatment. However the data are likely to be complicated by the possible reluctance of medical practitioners to record that a death or other adverse event was associated with antithrombotic treatment.

The overall treatment rate with anticoagulants of patients with atrial fibrillation is now higher than the 21–31 per cent suggested by earlier UK studies.[22,23,24] Data from the General Practice Research Database for the period 1994–98 has recently been published.[25] In this study, the proportion of patients with atrial fibrillation treated with oral anticoagulants in males aged 65–74 years increased from 24.8 per cent to 41.4 per cent (1.7 fold increase) and for females it increased from 26.8 per cent to 39.2 per cent (1.5 fold increase). Rates for older age groups also increased. In particular for the age group 75–84 years of age there were 2.2 fold and 1.9 fold increases in anticoagulation over the period for males and females respectively. However, the rates of anticoagulation are still too low to explain more than a small proportion of the death registrations associated with atrial fibrillation.

The results of this study together with evidence from other investigations have implications for clinicians and policy makers. The prevalence of atrial fibrillation is increasing and it is affecting predominantly the older age groups, the proportion of which is rising in all industrial societies. Anticoagulants to prevent strokes are still underused in patients with atrial fibrillation. The National Service Framework for Coronary Heart Disease sets a standard that all eligible patients with atrial fibrillation over 60 years old should be prescribed warfarin or aspirin.[26] The expanding use of antithrombotic treatment, particularly warfarin has implications for the health service. The use of these drugs requires careful and regular monitoring as well as good patient compliance. They are associated with significant side effects which deters some clinicians from using them, particularly in the elderly. There is a need to monitor the impact of these interventions on the overall incidence of stroke and arterial thromboembolism and that associated with atrial fibrillation in particular. The monitoring of death registrations has traditionally been one way of measuring the impact of preventative or treatment interventions on disease. In the case of atrial

fibrillation and stroke, this may be inappropriate and misleading. Nevertheless this study provides useful baseline data on the trends in death registrations associated with atrial fibrillation and confirms in death what has been suspected in life, namely that the condition is associated with stroke, ischaemic heart disease, and heart failure.

Unanswered questions and future research

In conclusion the reason for the recent increase in death registration rates associated with atrial fibrillation is likely to be multi factorial and warrant further investigation. The analysis done on registrations from 1993 onwards which were multi-cause coded could be compared with the results of previous analyses done at the time of coding changes. Research needs to be conducted to examine whether the increasing use of antithrombotic treatment is leading to an increase in major complications. There also needs to be improved recording of adverse drug reactions particularly those leading to deaths and hospital admissions. This would provide useful information on the hazards of warfarin therapy and enable better risk stratification models to be developed to aid the targeted treatment of those patients with atrial fibrillation who are most likely to benefit from antithrombotic treatment.

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Key findings

- Atrial fibrillation is an important risk factor for stroke, affects about 0.4–1per cent of the population, and is increasing in prevalence. In 1998 atrial fibrillation was mentioned on 1.5 per cent of death certificates for stroke and 3.8 per cent of death certificates for ischaemic heart disease.
- There is a female excess in deaths associated with atrial fibrillation throughout the period 1968-1999. The biggest changes in age specific mortality rates associated with atrial fibrillation during the period have occurred in the age groups 85 years and above.
- Mortality rates in England and Wales associated with atrial fibrillation coded as the underlying cause of death have almost doubled since 1993.
- Heart failure, ischaemic heart and cerebrovascular diseases and bronchopneumonia/pneumonia are the most common co-mentions with atrial fibrillation on death certificates.
- Since 1995/96 there has been a 2 fold increase in hospital discharge rates associated with atrial fibrillation as a primary or secondary discharge diagnosis. In 1999 it was given as the primary discharge diagnosis in 0.7 per cent of all admissions to hospital for diseases of the circulatory system.
- The highest discharge rates have been in the age group 85 years and above.

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