Crohn's disease and ulcerative colitis: divergent trends in hospital admission rates 1989/90 to 1999/2000

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The aims of this study were to determine time trends in hospital admissions in England, operative rates and case fatality rates, for ulcerative colitis and Crohn's disease from 1989/90 to 1999/2000. We used Department of Health Hospital Episode Statistics and ONS mortality data. Between 1989/1990 and 1999/2000 age-standardised admission rates for Crohn's disease rose by 14 per cent while admissions for ulcerative colitis rose by 6 per cent. The percentage of admissions involving a surgical operation rose by 40 per cent for ulcerative colitis, but by only 1 per cent for Crohn's disease. In-hospital fatality rates were low for both conditions and no clear statistical trends emerged. During the 1990s the hospital admissions rate for Crohn's disease increased significantly, whereas the admissions rate for ulcerative colitis increased only slightly. A higher percentage of patients admitted with ulcerative colitis underwent surgery during admissions than those admitted with Crohn's disease.

Introduction

Although relatively uncommon, inflammatory bowel diseases are chronic conditions. Therefore they result in considerable morbidity for sufferers and account for a significant proportion of the workload of NHS medical and surgical gastroenterology departments. A significant increase in the incidence of inflammatory bowel diseases in Western Europe and North America occurred in the middle part of the twentieth century. However, it is less clear whether the annual incidences of Crohn's disease and ulcerative colitis are still rising, have reached a plateau, or are falling.[1–8] Further details of Crohn's disease and ulcerative colitis are given in Box 1.

Epidemiological studies are useful both for investigating possible aetiological factors and also for determining the extent of health provision required. Data on hospital admissions, although limited in their scope, can also provide information about the impact of inflammatory bowel disease on the NHS and about changes in medical practice. The aim of this study was to investigate time trends in the rates of hospital admissions in England for both Crohn's disease and ulcerative colitis over the last decade of the twentieth century. In addition, data were collected on the rates of surgical intervention, and on in-hospital fatality. The study period extended from 1989/90 to 1999/2000, and data were collected from the Hospital Episodes Statistics (HES) service, which provides data on all National Health Service (NHS) hospital admissions in England.[9]

Methods

Data on hospital admissions were obtained from the Hospital Episode Statistics (HES) system. This service was started in April 1987 and is administered by the Statistics Division of the Department of Health.

Box One

Crohn's Disease and Ulcerative Colitis

Crohn's disease and ulcerative colitis are both forms of inflammatory bowel disease.

Crohn's disease usually occurs in the lower part of the small intestine, but it can affect any part of the digestive tract, from the mouth to the anus. The inflammation extends deep into the lining of the affected organ. The inflammation can cause pain and can make the intestines empty frequently, resulting in diarrhoea.

Theories about what causes Crohn's disease abound, but none has yet been proven. The most popular theory is that the body's immune system reacts to a virus or a bacterium by causing ongoing inflammation in the intestine.

The most common symptoms of Crohn's disease are abdominal pain and diarrhoea. Rectal bleeding, weight loss, and fever may also occur. Bleeding may be serious and persistent, leading to anaemia. Children with Crohn's disease may suffer delayed development and stunted growth.

The most common complication of Crohn's disease is blockage of the intestine. Blockage occurs because the disease tends to thicken the intestinal wall with swelling and scar tissue, narrowing the passage. Crohn's disease may also cause sores, or ulcers, that tunnel through the affected area into surrounding tissues. The areas around the anus and rectum are often involved. The tunnels, called fistulas, are a common complication and often become infected.

Treatment for Crohn's disease depends on the location and severity of disease, complications, and response to previous treatment. The goals of treatment are to control inflammation, correct nutritional deficiencies, and relieve symptoms like abdominal pain, diarrhoea, and rectal bleeding. Treatment may include drugs, nutritional supplements, surgery, or a combination of these options. At present, treatment can help control the disease, but there is no cure.

Ulcerative colitis is a disease that causes inflammation and sores, called ulcers, in the top layers of the lining of the large intestine. The inflammation usually occurs in the rectum and lower part of the colon, but it may affect the entire colon. The inflammation makes the colon empty frequently, causing diarrhoea. Ulcers form in places where the inflammation has killed colon-lining cells; the ulcers bleed and produce pus and mucus.

The most common symptoms of ulcerative colitis are abdominal pain and bloody diarrhoea. Patients also may experience fatigue, weight loss, loss of appetite, and rectal bleeding. About half of patients have mild symptoms. Others suffer frequent fever, bloody diarrhoea, nausea, and severe abdominal cramps. Ulcerative colitis may also cause problems such as arthritis, inflammation of the eye, liver disease (fatty liver, hepatitis, cirrhosis, and primary sclerosing cholangitis), osteoporosis, skin rashes, anaemia, and kidney stones. No one knows for sure why problems occur outside the colon. Scientists think these complications may occur when the immune system triggers inflammation in other parts of the body. These problems are usually mild and go away when the colitis is treated.

Treatment for ulcerative colitis depends on the seriousness of the disease. Most people are treated with medication. In severe cases, a patient may need surgery to remove the diseased colon.

The HES system records information on inpatient care delivered by NHS hospitals in England. In the 1999/2000 financial year, the HES system collected nearly 12 million records, detailing episodes of inpatient treatment delivered in NHS hospitals in England. Inpatient care in private hospitals is not covered, although private patients treated in NHS hospitals are included.

HES data are based on 'Finished Consultant Episodes', defined as the period during which an inpatient is under the care of a particular physician. For this study, only first episodes (i.e. the admitting episode) were used to calculate admission rates. HES were coded using the International Classification of Diseases Ninth Revision (ICD-9) until April 1995; thereafter, HES were coded using the International Classification of Diseases Tenth Revision (ICD-10).

This study used data over an eleven-year period from 1989/90 to 1999/2000. Data for 1998/99 and 1999/2000 have not yet been adjusted to account for shortfalls in the number of records submitted, or for missing or invalid clinical information.

Hospital Admission Rates

Admissions were selected according to the primary diagnosis (the first of seven diagnosis fields in the HES data set). Data were extracted for HES episodes with a primary diagnosis of Crohn's disease (ICD-9 555 and ICD-10 K50) and ulcerative colitis (ICD-9 556 and ICD-10 K51). Day case admissions were excluded.

Hospital admission rates per 100,000 population by age and sex were calculated by dividing the number of admissions by the mid-year population estimates for England. The HES are presented by financial year while population estimates are by calendar year. Admission rates were calculated using the mid-year population estimate for the calendar year overlapping the majority (9 months) of the financial year. Age-standardised hospital admission rates were calculated by applying rates for each 5-year age group up to age 84 and then 85 and over to the European Standard Population.

Operative Rates

All hospital admissions where a surgical procedure was recorded (excluding endoscopic procedures – G14–G19, G43–G47, G54–G57, G64–G67, G79–G82, J24–J25, J38–J45, H20–H30) were identified. Day case procedures were again excluded. The percentages of admissions involving surgery, by age and sex, were calculated and age-standardised, using the age distribution of the hospital admissions for each condition in 1989/90 to determine the age distribution of the standard population.

In-Hospital Fatality Rates

HES data cannot be used to determine the cause of death of a patient in hospital. For example, a patient admitted with Crohn's disease may have died from another cause, such as a myocardial infarction. However, despite this limitation, case-fatality rates based on HES data are a measure of the outcome of hospital admission. Hospital admissions ending in death were identified and these data were used to calculate the in-hospital case fatality rates by age and sex. These were age-standardised as described above for the percentage of admissions involving surgery.

Statistical Analysis

For each data set, 95 per cent confidence intervals were calculated. If there was an upwards or downwards trend over the study period, then the confidence intervals for the first and last years of the study were compared. If the confidence intervals did not overlap then it was concluded that the trend was statistically significant.

Results

Hospital Admission Rates

Between 1989/90 and 1999/2000 the absolute number of hospital admissions for Crohn's disease rose from 7,648 to 8,834 (a 16 per cent increase) and the absolute number of admissions for ulcerative colitis rose from 5,971 to 6,594 (a 10 per cent increase). Age-standardised admission rates by disease, year and sex are shown in Table 1.

Age-standardised admission rates for Crohn's disease increased significantly from 15.5 per 100,000 to 17.6 per 100,000 (a 14 per cent increase) over the study period. A similar increase was seen in males (a 15 per cent increase) and females (a 14 per cent increase). Age-standardised admission rates were consistently higher in females than in males with a female to male ratio of 1.5 to 1 in 1999/2000.

Age-standardised admission rates for ulcerative colitis showed a more complicated pattern with a steady rise from 11.9 per 100,000 in 1989/90 to 14.2 per 100,000 in 1994/95 (a 19 per cent increase) with a gradual decline thereafter to 12.6 per 100,000 in 1999/2000 (a 6 per cent increase overall). The pattern of increase and subsequent decrease in admission rates was similar in males and females. The overall increase in admission rates over the study period was statistically significant in males but not in females. Statistical comparison of admission rates in 1989/90, 1994/95 and 1999/2000 revealed that the increase in admission rates up to 1994/95 was statistically significant in both males and females as was the subsequent decline to 1999/2000. In contrast to Crohn's disease, there was a slight male predominance in the admission rates for ulcerative colitis with a male to female ratio of 1.1 to 1 in 1999/2000.

Table 1 **Age-standardised hospital admission rates per 100,000 population, by condition and sex, 1989/90 to 1999/2000**

England

	Years											% change 1989/90–1999/2000
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000	
Crohn's disease												
All	15.5	14.5	15.7	16.0	16.5	15.6	15.7	15.1	16.8	16.8	17.6	13.7
Males	12.5	11.2	12.4	12.5	13.1	12.4	12.4	12.2	13.4	13.6	14.3	14.6
Females	18.4	17.7	18.9	19.4	20.0	18.6	18.4	17.9	20.1	20.1	20.9	13.7
Ulcerative colitis												
All	11.9	12.1	13.5	13.6	13.6	14.2	13.7	12.3	13.2	12.5	12.6	6.1
Males	12.3	12.6	13.8	14.1	14.4	15.0	14.0	12.8	13.9	13.2	13.3	7.8
Females	11.5	11.8	13.3	13.2	12.8	13.1	12.5	11.9	12.6	12.0	12.0	4.6

Source: Hospital Episode Statistics

Table 2 **Age-specific hospital admission rates per 100,000 population, by age, condition and sex, 1999/2000**

England

	0–14	15–24	25–34	35–44	45–54	55–64	65–74	75–84	85 and over
Crohn's disease									
All	5.7	24.7	28.6	21.1	18.5	17.5	14.8	15.4	9.0
Males	6.5	20.8	21.5	15.9	14.6	15.1	10.7	12.3	8.4
Females	4.9	28.8	36.1	26.5	22.3	19.9	18.3	17.4	9.3
Ulcerative colitis									
All	3.3	12.8	14.5	14.5	14.8	16.3	20.4	23.1	16.7
Males	3.1	12.2	13.8	14.4	16.8	18.5	24.9	23.8	21.3
Females	3.4	13.4	15.3	14.7	12.7	14.1	16.4	22.6	15.0

Source: Hospital Episode Statistics

Age-specific hospital admission rates are shown in Table 2. In Crohn's disease the admission rates peaked in the 25–34 age group in both males and females. In ulcerative colitis, there was a gradual increase in the admission rates up to the 75–84 age group. This pattern was more marked in males; in females there was a slight peak in the 25–34 age group with a second peak in the 75–84 age group.

Operative Rates

The percentages of admissions including an operative procedure are shown in Table 3. Over the 11-year study period there was little change in the percentage of hospital admissions for Crohn's disease that involved a surgical operation. However in ulcerative colitis there was a significant increase in the percentage of admissions involving surgery, rising from 18.1 per cent in 1989/90 to 25.3 per cent in 1999/2000 (a 40 per cent increase). Similar patterns were seen for both males and females. The peak age for admissions involving surgery was in the 45–54 age group for Crohn's disease and in the 35–44 age group for ulcerative colitis (Figure 1).

In-Hospital Fatality Rates

The absolute numbers of recorded fatalities due to inflammatory bowel disease were small. The age-standardised in-hospital fatality rates for both Crohn's disease and ulcerative colitis (Table 4) fluctuated from year to year with no clear trends emerging. In-hospital fatality rates for Crohn's disease were lower than those for ulcerative colitis throughout the study period.

Discussion

Inflammatory bowel diseases are often thought of as being diseases of the twentieth century, with only a few case reports recorded before the end of the nineteenth century. The majority of the increase in the incidence of inflammatory bowel diseases in Western Europe and North America occurred in the middle part of the twentieth century, although this is thought to be due, in part, to increased physician awareness of these diseases.

It is less clear whether the annual incidences of Crohn's disease and ulcerative colitis are still rising, if they have reached a plateau, or if they are falling. Studies in Stockholm County, Sweden, showed that between 1955 and 1989 the annual incidence of Crohn's disease initially rose by about 30 per cent per decade but then stabilised in the 1970s at about 5 per 100,000 population.[5] Studies in the Uppsala region of Sweden, between 1965 and 1983, also showed little change in the annual incidence of Crohn's disease, which ranged between 5 and 7 per 100,000 population.[6] However it did show an increase in the annual incidence of ulcerative colitis, from 7 per 100,000 to 12 per 100,000 population, although this was partly due to the increasing inclusion of ulcerative proctitis. In contrast, studies in Cardiff showed no change in the annual incidence of ulcerative colitis between 1968 and 1987, which stayed stable at about 6.4 per 100,000 population.[8]

Data derived from hospital admissions do not provide information on annual incidence, but they do provide information about the impact of inflammatory bowel disease on the NHS and also about changes in medical practice. The Oxford Record Linkage Study showed that between 1970 and 1986 hospital admission rates did not change for Crohn's disease and increased slightly for ulcerative colitis.[10] A study of linked admissions of Scottish children between 1968 and 1983 showed a three-fold increase in the rate of admissions for Crohn's disease but a slight fall in admissions for ulcerative colitis.[7] More recently, inpatient data from Denmark suggest that, during the 1980s, the incidence of Crohn's disease has continued to increase while the incidence of ulcerative colitis has fallen.[11]

Table 3 **Age-standardised percentage of hospital admissions with an operation, by condition and sex, 1989/90 to 1999/2000**

England

	Years											% change 1989/90–1999/2000
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000	
Crohn's disease												
All	31.7	31.5	32.9	33.5	34.2	34.5	34.7	33.7	33.5	32.5	32.0	1.0
Males	33.4	31.8	34.7	33.3	34.9	35.4	35.7	34.5	34.6	34.3	33.3	-0.1
Females	30.7	31.4	31.8	33.5	33.6	33.9	34.4	33.4	32.8	31.5	31.3	1.9
Ulcerative colitis												
All	18.1	21.2	22.8	22.8	25.4	25.0	25.8	26.2	26.3	27.0	25.3	39.9
Males	19.2	23.4	23.4	24.1	26.2	26.3	27.8	27.9	26.9	28.4	26.5	37.7
Females	16.9	18.9	22.0	21.4	24.4	23.2	24.5	24.4	25.5	25.4	23.7	40.1

Source: Hospital Episode Statistics

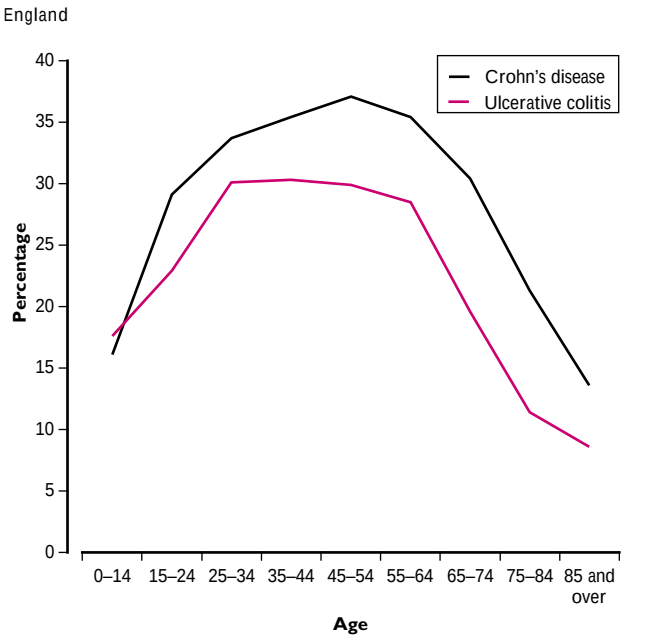
Table 4 **Age-standardised in-hospital fatality rates (per cent), by condition and sex, 1989/90 to 1999/2000**

England

	Years											% change 1989/90–1999/2000
	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000	
Crohn's disease												
All	0.8	1.1	0.6	0.8	0.8	0.8	0.9	0.7	0.6	0.8	0.6	-24.9
Males	0.8	0.7	0.5	0.8	1.0	0.7	1.1	0.6	0.7	0.7	0.6	-23.8
Females	0.8	1.3	0.6	0.8	0.6	0.7	0.8	0.8	0.5	0.7	0.6	-23.2
Ulcerative colitis												
All	1.2	1.3	1.1	1.2	1.3	1.2	1.3	1.1	1.0	0.9	1.0	-16.4
Males	1.6	1.1	1.0	1.1	1.2	1.0	1.4	1.0	0.9	0.8	0.9	-40.4
Females	0.8	1.3	1.2	1.3	1.4	1.3	1.2	1.1	1.0	1.0	0.9	8.3

Source: Hospital Episode Statistics

Figure 1 **Percentage of hospital admissions with an operation, by age and condition, 1999/2000**



The HES data presented in this study show that there has been an approximately 15 per cent increase in the rate of hospital admissions for Crohn's disease in England between 1989/90 and 1999/2000. In contrast, the rate of admissions for ulcerative colitis has increased little overall, and would appear to have been decreasing since 1994/95. These data would be in keeping with the data obtained from the Danish national registry of hospital inpatients and also with the Cardiff study. However it is at odds with the older Oxford Linkage Study. As the Oxford study was individually linked to exclude multiple admissions by a single patient, it is difficult to make direct comparisons to the HES data presented in this study. However, it is possible that there has been a true change in admission rates since the 1980s. It is also possible that the Oxford population may not be representative of the whole of England.

It is not surprising that the percentage of admissions for Crohn's disease involving surgery has not increased, since current practice is to avoid intestinal resections whenever possible. However, the 40 per cent increase in the number of hospital admissions for ulcerative colitis involving surgery is important. It is unlikely that this increase is due to a marked increase in the severity of ulcerative colitis necessitating surgery. It probably reflects a change in medical management practice in England, leading towards a lower threshold for colectomy. Another contributory factor is the growing popularity of restorative procedures since the 1980s, and more importantly the publication of safety and efficacy data for such procedures in the 1990s.[12–13] Whether there has been a trend towards earlier colectomy or whether there has been an increase in the number of multi-stage operations cannot be determined from these data.

Although problems associated with the use of HES have been reported,[14] it is unlikely that the findings presented in the study can be attributed to artefact alone. There have been no significant changes in the processes of data collection, disease classification or disease coding during the study period. In addition, there have been no major changes in diagnostic criteria for Crohn's disease or ulcerative colitis over the last decade, nor have there been any major changes in imaging procedures. There may have been changes in the completeness of the recording during this period but these are most likely to have affected the early years of this study. Furthermore, as HES data are not linked, repeated admissions by individual patients would be recorded as multiple episodes. However, this would not be expected to affect time trends in admission rates unless there was a change in the ratio of first to repeat admissions during the course of the study.

One explanation for the increase in hospital admission rates is that the threshold for admission has dropped. It is also possible that patients are being discharged earlier but are being readmitted more frequently for the same episode of illness. As the HES data can not be linked to individuals, this would result in an increase in the admission rate. However, this should hold true for both ulcerative colitis and Crohn's disease, and therefore this could not explain the divergent trend in admission rates seen in this study. In addition, it seems unlikely that there has been a significant decline in the threshold for hospital admission in England in light of recent NHS bed shortages. Also, the rise in the proportion of patients with ulcerative colitis undergoing surgery would suggest that more severe rather than less severe cases were being admitted. Some of the increase in admission rates may reflect a rise in prevalence due to, for example, improved survival. Finally, some of the trends may be artefactual and the result of improvements in the completeness and accuracy of HES data.

Conclusions

This study has shown that over the 1990s, the rate of hospital admissions in England has increased significantly for Crohn's disease, but has increased only slightly for ulcerative colitis, having been in decline since 1994/95. A greater proportion of patients admitted with ulcerative colitis are undergoing surgery during admission; however, operative rates for Crohn's disease have remained unchanged. It is unlikely that these trends are entirely artefactual, and they may reflect trends in the prevalence and management of these two diseases.

Key findings

- During the 1990s the hospital admissions rate for Crohn's disease increased significantly, whereas the admissions rate for ulcerative colitis increased only slightly.
- A higher percentage of patients admitted with ulcerative colitis underwent surgery during admissions than those admitted with Crohn's disease.
- In-hospital fatality rates for both conditions remained very low during the study period.

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