Data sources, bed supply and performance in hospital systems
An Anglo-Czechoslovak comparison

DONALD P. FORSTER, BRIAN FROST, ZUZANA KAMBERSKA, JIRI HOLUB *

Background: There were a number of similarities, except for their effectiveness, in the health care systems of Czechoslovakia and England and Wales between the Second World War and the late 1980s. In a comparison of Czechoslovakia with England and Wales, the objectives of this study were to examine data sources and to report time trends and regional distributions in hospital bed supply, hospital doctor supply and hospital utilisation. Methods: For the specialties of general medicine and general surgery in both countries from 1960 to 1986, data were collated on bed supply, hospital doctor supply, discharge rates and length of stay. Issues concerning the comparability of the data were addressed, for example those of the definitions of specialty, length of stay and casemix. Results: In the period 1960 to 1986, in the specialties of general medicine and general surgery, there was a relative excess in the supply of hospital doctors and beds in Czechoslovakia compared with England and Wales. Hospital performance in terms of discharge rates, discharges per bed and length of stay remained relatively static in Czechoslovakia during this period compared to marked increases in discharge rates and reduced length of stay in England and Wales. Both countries recorded reductions in the regional variation of bed and doctor supply and hospital utilisation. Conclusions: International studies of hospital utilisation need to be interpreted carefully in the light of definitions of hospital stay, casemix, the use of day cases and the availability of other services. Subject to these caveats, discharge rates were high and duration of stay long in Czechoslovakia compared with England and Wales; however, both countries achieved important improvements in regional equity.

Key words: Czechoslovakia, England and Wales, hospital inputs, hospital performance, regional variation, trends

There are a number of historical parallels with respect to health care in Czechoslovakia and England and Wales. Prior to the Second World War, medicine was paid for everywhere on a fee-for-item of service basis and a substantial proportion of each country’s population, primarily those not working, was not covered by any insurance scheme. Post-war, each country developed a national health service (NHS) financed primarily through taxation and in which, broadly speaking, health care was delivered free of charge. The public sector was dominant in both countries although the private sector in the UK, though small, was certainly larger than in Czechoslovakia. For example, in 1978–1979, beds in private hospitals and pay beds in NHS hospitals together accounted for less than 2% of the acute bed stock.1 Primary, out-patient, in-patient and public health care were integrated in both countries, although this only took place, in part, in the UK in 1974. Both countries were relatively wealthy; for example in 1980, the gross national product (GNP) per capita was recorded as US$ 5,820 in Czechoslovakia and US$ 7,920 in the UK.2 In 1976, when Czechoslovakia was spending 6% of GNP on health care, 5.5% of GNP in the UK was being spent on the NHS.3 In common with the NHS of the period, the Czechoslovak health service was administered territorially through regional and district Institutes of National Health, though these were controlled and financed by local authorities. In both countries, the armed services had independent health facilities and, in Czechoslovakia, the railways also had a separate service.3,4 Prior to 1990, a health district in Czechoslovakia comprised several health communities and served a population of up to 200,000. At district level there was a either a type I or a type II hospital providing mainly acute hospital care.6 A type I hospital provided in-patient care for the basic specialties of general medicine, general surgery, paediatrics, obstetrics and gynaecology and had approximately 250 beds. A type II hospital served a wider range of in-patient specialties and had approximately 680 beds. Type I and type II hospitals frequently had polyclinics (out-patient departments) at-
tached, serving a more extensive range of specialties than for in-patients. The Czechoslovak equivalent of an English regional health authority (RHA) was a health region which comprised several health districts and served a population varying from approximately 700,000 to over 2 million inhabitants. At regional level and occasionally lower, there was a type III hospital and polyclinic. Type III hospitals were often teaching hospitals and served not only basic specialties but also provided more highly specialised services, for example urology and oncology. Type III hospitals had approximately 1,200 beds. In addition to health service beds in general hospitals, there were other non-acute beds such as spa and mental hospital beds. In primary care, the smallest territorial unit for health care was a health community of approximately 4,000 persons. Each community was served by a generalist community physician, supported by community paediatricians and obstetricians who covered more than one community. Unless an individual worked in a factory, there was no choice of primary care doctor, but in large factories there was access to the workplace doctor.

A final similarity between the health systems is that both underwent fundamental change around 1990. In Czechoslovakia, but more particularly in the Czech Republic part of that country, a rational, comprehensive change to a health insurance-based system was proposed. The regional and district health authorities under the political control of local authorities were abolished. A publicly operated General Health Insurance Office was set up and newly independent health care providers, for example hospitals and community physicians, contract with this body. A number of independent health insurance companies were also set up in order to stimulate competition in the health insurance market. These changes were in line with the recommendations of a World Bank team which rejected public ownership on the grounds of poor productivity and efficiency. In England and Wales, the functions of purchasing and providing health services were separated and, within the publicly financed system, an internal market was devised. The driving forces for this were the government's perception of a lack of patient choice, wide geographical differences in performance and the absence of market forces.

In terms of regional policy, England and Wales had earlier attempted to remove regional inequalities through initiatives such as the Research Allocation Working Party (RAWP), by which revenue funding for hospitals was distributed, though within limits, according to indicators of health needs and not the number of beds. The Slovakian hospital building programme, which began in the 1950s, was intended to rectify the geographical imbalance in beds with the Czech lands. However, in 1991 the World Bank reported that in principle the allocation of resources was meant to be based on objective criteria, including demographic ones, though in practice the distribution of funds tended to follow the supply of beds, a situation which also applied to England and Wales in the early years of the NHS.

One profound difference between the countries, however, is their mortality experience since the war and in particular since approximately 1970. Between 1970–1974 and 1985–1987, mortality potentially amenable to appropriate, timely medical care fell by 50% in England and Wales but by only 28% in Czechoslovakia. These aggregate data mortality studies of amenable mortality suggest the superior effectiveness of Western health services compared with their eastern European counterparts, particularly for conditions sensitive to secondary prevention. The current study examines the inputs and technical performance trends, accompanying the differential amenable mortality trends in Czechoslovakia compared with England and Wales.

Therefore, the objectives of this study were to examine the similarities and differences in relevant data sources in the two countries and to compare national time trends between 1960 and 1986 and regional distributions of hospital bed supply, hospital doctor supply and hospital utilisation, measured as rates in the specialties of general medicine and general surgery.

METHODS

For the years 1960, 1970, 1980 and 1986, data on hospital bed supply, doctors and hospital utilisation were collected for each country and region. Data downloaded from the 15 health regions of England and Wales. Prior to 1974, these were the Regional Hospital Boards which, with minor boundary changes, became the RHAs when the health service was reorganised in 1974. Data recorded separately for Boards of Governors' hospitals were attributed to the appropriate health regions. In Czechoslovakia, data were collated into the 12 health regions which remained unchanged during the period of analysis. The indicators collected have been presented as rates based on resident populations. In two of the four Thames regions (covering London), cross-boundary flow in the selected specialties was in excess of 12% but this fell to 1.5% when the four Thames regions were combined. In Czechoslovakia, equivalent adjustments were made: Prague was amalgamated with Stredočeský (Central Bohemia) to form Greater Prague and Bratislava was amalgamated with Západoslovenský (Western Slovakia) to form Greater Bratislava.

In England and Wales, data on the availability of hospital beds, the utilisation of beds and out-patient services were drawn regionally and nationally from the Annual Hospital Return (SH3 data). The Annual Hospital Return was the standard of completeness against which other data collection systems, for example the Hospital In-patient Enquiry, were compared. Almost invariably, the completeness of these other data systems was slightly inferior to the Annual Hospital Return. Data on the number of hospital doctors were obtained from Hospital Medical Staffing Returns provided by the Department of Health (DOH). In Czechoslovakia, population data and data on hospital bed availability, utilisation and hospital doctors were drawn from the annual statistical publica-
Comparative hospital performance

No definitive information was available on the completeness of these systems. The recording of hospital data within the Annual Hospital Return system in England and Wales was relatively stable during the period 1960-1986. During this period, length of stay referred to a completed hospital stay. However, it should be noted that the equivalent Czechoslovak data always referred to specialty episodes. Examination of all data sources did not reveal any way of accurately converting, particularly by region and in different time periods, completed hospital stays into specialty episodes or vice versa. It was therefore accepted that there would be a systematic bias between the countries, in consequence of which Czechoslovakia would have apparently shorter lengths of stay and higher discharge rates because of differences in the definition of length of stay. In 1979, for Czechoslovakia as a whole, 6.3% of exits from general medicine and 5.2% in general surgery were to other departments. In broad terms, this is the likely order of reporting bias on discharges in favour of Czechoslovakia compared to England and Wales, though it was not possible to quantify this by region or over time.

The specialties chosen were general medicine and general surgery since they were represented in all district hospitals in both countries. However, with progress in the scientific basis of medicine and professional aspirations, there is a tendency towards the creation of new subspecialties from within main specialties. This process may affect each country's hospitals differently and in turn each country's casemix. Therefore, there were no serious distortions in data always referred to specialty episodes. Examination of both MGM and MGS. Between the countries, therefore, there were no serious distortions in casemix.

Data on performance at national level are presented as Barber–Johnson diagrams. These allow four utilisation variables to be viewed in two dimensions because of certain tautological relationships. Percentage emptiness in England and Wales but included in that specialty (intern) in Czechoslovakia. General medicine and general surgery were therefore modified to create a standard definition over time and between countries. In effect, the aggregation of specialties in all years was determined by Czechoslovak recording practice in 1960. These adjusted specialties were termed modified general medicine (MGM) and modified general surgery (MGS), provided a consistent definition of the selected specialties by country and time period and reduced the possibility of between-country casemix differences. However, the possibility of casemix differences arising from differences in incidence and hospital admission practices remained. No relevant incidence data at national or regional level were available for comparison. However, data on hospital discharges by age, sex and diagnosis were available for the Czech (Socialist) and England and Wales in 1985. Discharge rates for each diagnosis were higher and discharges for only one diagnosis, cholecystitis and cholelithiasis (ICD-9 574–575.1) had a substantially higher relative position in the Czech Republic than in England and Wales. Between the countries, therefore, there were no serious distortions in casemix.

RESULTS

Table 1 shows that, compared to England, Wales, Czechoslovakia had nearly always twice as many beds in both MGM and MGS. Between 1960 and 1986, beds were

<table>
<thead>
<tr>
<th></th>
<th>Modified general medicine</th>
<th>Modified general surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>England and Wales</td>
<td>Czechoslovakia</td>
</tr>
<tr>
<td></td>
<td>Region</td>
<td>SD</td>
</tr>
<tr>
<td>Bed supply rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>67.9</td>
<td>26.4</td>
</tr>
<tr>
<td>1986</td>
<td>65.1</td>
<td>11.2</td>
</tr>
<tr>
<td>% change 1960–1986</td>
<td>-4.1</td>
<td>-55.8</td>
</tr>
<tr>
<td>Hospital doctor supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>6.4</td>
<td>1.4</td>
</tr>
<tr>
<td>1986</td>
<td>11.9</td>
<td>1.3</td>
</tr>
<tr>
<td>% change 1970–1986</td>
<td>85.0</td>
<td>-48.3</td>
</tr>
<tr>
<td>Discharge rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>1,125.3</td>
<td>313.2</td>
</tr>
<tr>
<td>1986</td>
<td>2,217.0</td>
<td>325.1</td>
</tr>
<tr>
<td>% change 1960–1986</td>
<td>97.0</td>
<td>-47.1</td>
</tr>
</tbody>
</table>

Region mean: regional mean; Coef of var: coefficient of variation; SD: standard deviation.
- Values are means of 12 regions in England and Wales and of ten regions in Czechoslovakia (i.e. not the weighted mean).
- Coefficient of variation = SD±100 mean.

Table 1 Summary of trends and regional variation in the rates of bed supply, hospital doctor supply and discharge rates per 100,000 persons.
reduced in England and Wales, particularly in MGS, but small increases were observed in Czechoslovakia. With respect to regional variations, the larger size of the regions in England and Wales compared to Czechoslovakia suggests (and table 1 confirms) that the standard deviation (and therefore the coefficient of variation) will be systematically smaller in the former. Hence, a within-country interpretation of the time trends and inter-regional variation in the coefficient of variation (which incorporates the standard deviation) results is to be preferred. In both countries, in spite of widely different bed supply rates and changes in these with time, coefficients of variation between the regions fell markedly with time. Czechoslovakia was also better endowed with hospital doctors (all grades) in the two modified specialties than England and Wales. Both countries increased the supply of doctors between 1970 and 1986, yet reduced the coefficients of regional variation during this period.

In both specialties, discharge rates in Czechoslovakia exceeded those in England and Wales markedly, though the difference may have been exaggerated by the systematic difference in recording hospital utilisation in the two countries. Between 1960 and 1986, a marked increase in the discharge rate was found in both specialties in England and Wales, particularly in MGM. Smaller increases were observed in Czechoslovakia, the discharge rate in MGS remaining almost static. In both countries, however, there was a reduction in the coefficient of variation in discharge rates with time.

Figures 1 and 2 compare hospital activity during the period 1960–1986 in MGM and MGS respectively in England and Wales and Czechoslovakia using Barber–Johnson diagrams. In MGM, the utilisation indicators were relatively static in Czechoslovakia. In contrast, marked reductions in length of stay and increased annual throughput per bed (from 16.2 in 1960 to 33.4 in 1986) were observed in England and Wales. This increase in performance activity was accompanied by a small rise in percent emptiness and fall in turnover interval (figure 1).

A similar picture emerged in both countries for MGS. In Czechoslovakia, the 1986 values for turnover interval were in excess of those for 1960. During this period, annual throughput per bed only increased from 24.5 to 25.1 (figure 2).

DISCUSSION

One of the major challenges in international comparisons is to compare like with like. We have noted a systematic bias in favour of Czechoslovakia concerning the definition of a discharge such that specialty episodes in Czechoslovakia are recorded as approximately 6.3 and 5.2% in excess of completed hospital stays in general medicine and general surgery respectively. The recording of hospital utilisation in both countries refers to events rather than persons. Results from both systems, therefore, are subject to the influence of readmission rates. However, there is little comparative evidence for the countries concerning repeat admissions, though hospitals in England and Wales may have been more subject to their influence following the introduction of general management and the performance indicator exercise in the early to mid-1980s.
Comparative hospital performance

Other factors need to be taken into account in interpreting the results. For example, in England and Wales there has been an increasing proportion of patients treated as day cases rather than as in-patients, particularly in surgery. Day cases were not recorded until 1980 when they accounted for 9.4% of all discharged cases in general medicine and 16.6% in general surgery. By 1986, these percentages had risen to 16.6 and 20.7% in general medicine and general surgery respectively. In the 1980s, day case treatment in Czechoslovakia was rarely practised and, consequently, statistics were not gathered on this item.4 When in-patients alone are being compared between the countries, there is therefore likely to be another systematic bias in favour of Czechoslovakia. Patients treated as day cases in England and Wales would be admitted as in-patients in Czechoslovakia. Since such cases are likely to be those with shorter lengths of stay, this will have the apparent effect of improving hospital in-patient performance in Czechoslovakia relative to that of England and Wales. Moreover, in Czechoslovakia there was a more plentiful supply of convalescent and spa beds which again would, in theory, support shorter lengths of stay in district hospitals. All known biases, therefore, are in favour of Czechoslovakia and, in comparison with England and Wales, will give an apparent enhanced view of hospital performance in the former. Given these caveats concerning interpretation, what may be deduced from the comparison? Firstly, there was an abundant supply in Czechoslovakia, compared to England and Wales, of beds for the MGM and MGS specialties studied. Bed capacity in these specialties was also maintained at a high level during the period studied. The relative excess of beds was accompanied by greater numbers of hospital doctors. The difference in the doctor supply rate between the two countries may also be underestimated since NHS hospital doctors treated both outpatients and in-patients whereas their Czechoslovak equivalents mainly treated in-patients. Subject to the differences in definition, discharge rates in Czechoslovakia still appeared to be high and duration of stay long compared to England and Wales. Within countries, relatively little change occurred in performance in Czechoslovakia compared to increased discharge rates and shorter lengths of stay in the NHS. Some commentators have referred to unnecessary upward referral from primary care to polyclinics and the hospital sector.31 Although the direct evidence is slight, this inference fits the mode of payment to primary care physicians through salaries since there was no (financial) incentive to continue and complete the treatment of patients in the primary care setting.32 Other factors, no doubt, contributed to this imputed excess of referral, namely poor diagnostic and treatment facilities and mode of training, although there was, as with hospital doctors, an abundant supply of primary care doctors.

Nevertheless, over the study period within each country, reductions in the coefficients of variation show that there was a decrease in the regional variation in the supply of hospital doctors and beds and, more importantly, in discharge rates. These improvements in regional equity were achieved in differing circumstances in both countries, namely through capital building projects in Czechoslovakia and, additionally, in England and Wales by the use of formale for the direction of hospital revenue funding.

One of the motivations driving the NHS changes proposed in 1989 was the variation in performance in different parts of the country.9,11 In this paper, we have noted variation with respect to discharge rates in general medicine and general surgery, although there were substantial reductions in the coefficients of variation for these indicators during the period 1960–1986. The fundamental change to a national insurance-based health care system in Czechoslovakia from 1990 was partly a response to perceived prior poor relative performance and efficiency, as documented in this paper and in part to poor effectiveness.10 The early indications are that, since 1990 in the Czech Republic, the bed supply rates and length of stay have decreased and discharge rates increased more than would have been anticipated from the trends in the pre-1990 system. Clearly, continuing close monitoring of the changes in performance and efficiency of the hospital system will be required as the insurance-based system evolves.

We are very grateful to M. Bernatova, from the Institute of Health Information and Statistics in Prague, for data collection and collation.

REFERENCES


Received 25 November 1997, accepted 14 September 1998