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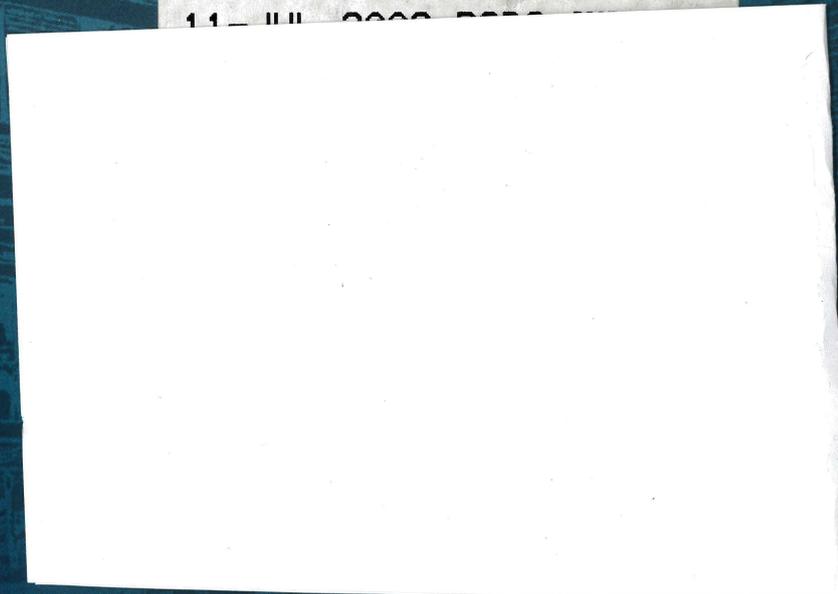


The University of Sheffield

TFR REPORT

PRELIMINARY ANALYSIS OF HOSPITAL COST AND ACTIVITY DATA
AS A FEASIBILITY FOR THE DEVELOPMENT
OF HOSPITAL INFORMATION FOR U.K.

11-111-0000-0000



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SCHOOL OF HEALTH AND
RELATED RESEARCH

TFR REPORT

*A PRELIMINARY ANALYSIS OF HOSPITAL COST AND ACTIVITY DATA - UK / POLAND
AS A FEASIBILITY FOR THE DEVELOPMENT OF A DATABASE
OF HOSPITAL INFORMATION FOR HOSPITAL MANAGERS.*

MALCOLM WHITFIELD, MARCIN KAUTSCH, DANIEL HIND

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CTION

INT
This paper compares the costs and clinical activity of a Polish teaching hospital with a random sample of seven similar hospitals in the UK. It starts by comparing the average costs and activity of the UK hospitals with the Polish Hospital then goes on to compare the eight hospitals on an individual basis, by speciality.

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The data used for the comparison has been derived from an exercise in which a UK 'Trust Financial Return' was completed by the Polish hospital. Trust Financial Returns (TFRs) as shown in appendix 1, are completed annually by all UK National Health Service (NHS) Trusts¹. They are designed to collect aggregated data on net expenditure and total activity for hospital and community health services by medical / surgical speciality and by health programme.

The return includes net expenditure, total patient bed days and the total number of patients treated by medical or surgical speciality for in-patient services. From these figures we can calculate the average cost per case, the average cost per bed day and the average length of stay at a hospital or speciality level.

The analysis of the aggregate data at a specialist level has shown some areas of significant variation between the Polish and UK hospitals. The assumptions made by the authors, based upon their experience of the two systems, about the meaning of different profiles are currently at the level of hypothesis. They have yet to be verified with additional data at a sub speciality level.

Similarly, although great care has been taken in the completion of the Polish TFR, we still need to verify that each speciality grouping contains the same range of clinical procedures. For example, HIV services would probably be returned under Genito-urinary medicine in the UK. It is shown under infectious disease in Poland. Variations of this kind, however, do not dramatically affect the overall profile at a hospital level or medical and surgical grouping level. Having taken account of these limitations, however, the comparative analysis throws up a series of interesting questions, which warrant further investigation.

The ultimate aim of the project is to develop a database of hospital information across Europe which will allow hospital managers to set benchmarks against which to judge the performance of their hospital. All of the data used is, and will continue to be anonymised.

Subscribers to Hospital Healthcare.com will be encouraged to submit financial and activity data and in return receive a comparison of their data with other anonymised hospitals across Europe in return.

In the early stages of the project we are seeking to develop a data collection format which can be used to collect comparable data across Europe. We have now received data using this format from both Poland and Spain. On the basis of this experience we are continually refining the data collection instrument in order to facilitate its generic use across all countries.

We are painfully aware that aggregate data of this nature cannot be easily adapted for benchmarking purposes. For this we will need a common measure of case mix or the severity of the illness of patients treated. Such a measure is certainly a longer term aim of the project. In the mean time, however, comparative exercises of this sort allow us to identify the areas of greatest variations in-order for us to develop a program of further investigation.

The next feasibility study, to be undertaken over the next few months will be concerned with the differences between hospitals at a clinical practice level.

¹ NHS Trust and Publicly owned organisations which provide health care in UK. Trust status allows them significant operating freedoms with direct accountability to the Secretary of State for many functions.

As the following report shows, the variation in the ratio of cost to numbers treated and the consequent cost per case varies a great deal between the UK and Poland across many specialities. In Cardiology for example it varies a great deal within the UK.

We are currently looking for hospital managers from five hospitals across Europe to discuss in-patient cardiology in more detail. What are the in-patient costs and how are they broken down? What ICD codes would describe the conditions most commonly treated as in-patients? How are people referred to Cardiology services?

What diagnostic tests are routinely done? What is the average length of stay for the five most common conditions? What clinical outcome data is available. The ultimate aim of the case study will be to investigate the extent to which the best ideas for organising care can be brought together to form a simple bench mark of good practice which subscribers can compare themselves with or learn from.

If successful similar studies will be carried out across other speciality areas.

The expenditure data collected using the TFR in forms 2a and 2b is 'net cost' of each speciality and programme with net expenditure defined as follows:

- Total operating expenses
- Less other operating income
- Less expenditure on subcontracted patient care activities
- Less private patient expenditure (where material)

Subcontracted patient care, where one hospital purchases patient care episodes (as opposed to ancillary services such as catering) from another, is excluded.

Private patient expenditure and activity can be excluded where amounts are material and costs are separately recorded.

Costs are allocated to the main speciality of the senior medical officer or 'consultant' as they are called in the UK, responsible for a patient's care. This may mean that few costs will be recorded for specialities, such as Anaesthetics, as these are often apportioned to other specialities, such as Orthopaedics.

When an episode of treatment has been completed and the patient is transferred to another consultant, the costs of each episode are recorded separately.

For 'shared-care' episodes, the costs and activity are recorded against the locally agreed primary speciality.

The term 'joint consultant clinic' is not used in this return; activity and expenditure related to activity in such a clinic is recorded against the speciality of the clinician to whom the patient is initially referred.

The method(s) of cost apportionment correspond to those used for pricing UK hospital services and will, therefore, accord with published NHS costing and pricing guidance. We are currently exploring the extent to which costing in Poland is different to that adopted in the UK, in order to build in adjustments to fine-tune the accuracy of the comparisons.

The number of consultant episodes corresponds to those recorded as activity by the hospital; they do not include episodes undertaken by others on behalf of the hospital and recharged to it. Only finished episodes should be included.

The following analysis has been developed to demonstrate the type of comparative information which could be generated, if it were possible to extend the TFR system to other hospitals in Europe.

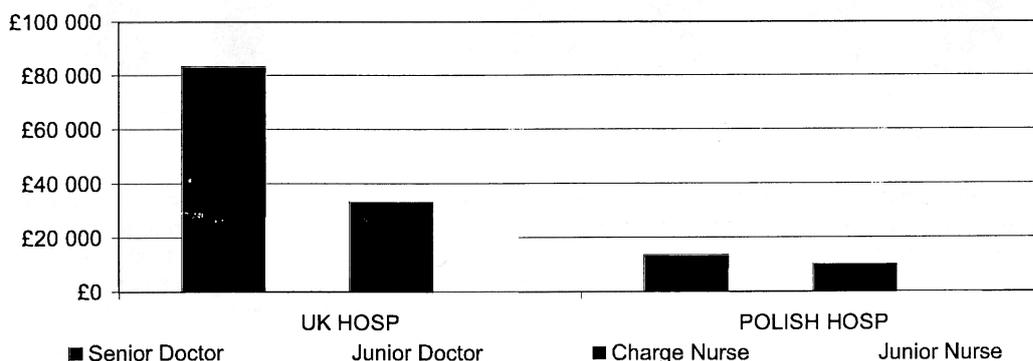
Data has been collected, from a Polish University Teaching Hospital, on expenditure by speciality across all aspects of clinical service provision. The graphs shown in this document relate to medical and surgical specialities only (data is available on supra-regional speciality services but further work is required to define common criteria in this area).

The Polish data has been compared to a random sample of seven University Teaching Hospitals (Outside London) from across the UK, with TFR data taken from the Certified Institute of Public Finance Accountants CiPFA database¹.

Both the UK and the Polish costs have been adjusted using a Purchasing Power Parity (PPP)² calculation and converted into US dollars. This is similar to an exchange rate mechanism but it is weighted to take account of difference in cost of living. The 1999 GDP PPP has been used. This equates one UK pound to 0.673 adjusted US dollars and one Polish Zloty to 1.87 adjusted US dollars. This method of conversion takes account of differences in production costs i.e. wage rates, supplies, building costs etc.

Wages, in particular, vary enormously between the UK and Poland and are only partially offset by differences in the cost of living. Fig 0 show the current differences in the average income of Doctors and Nurses again using the GDP PPP conversion rate to accommodate differences in living costs.

DIFFERENCES IN SALARY COSTS BETWEEN THE UK AND POLAND



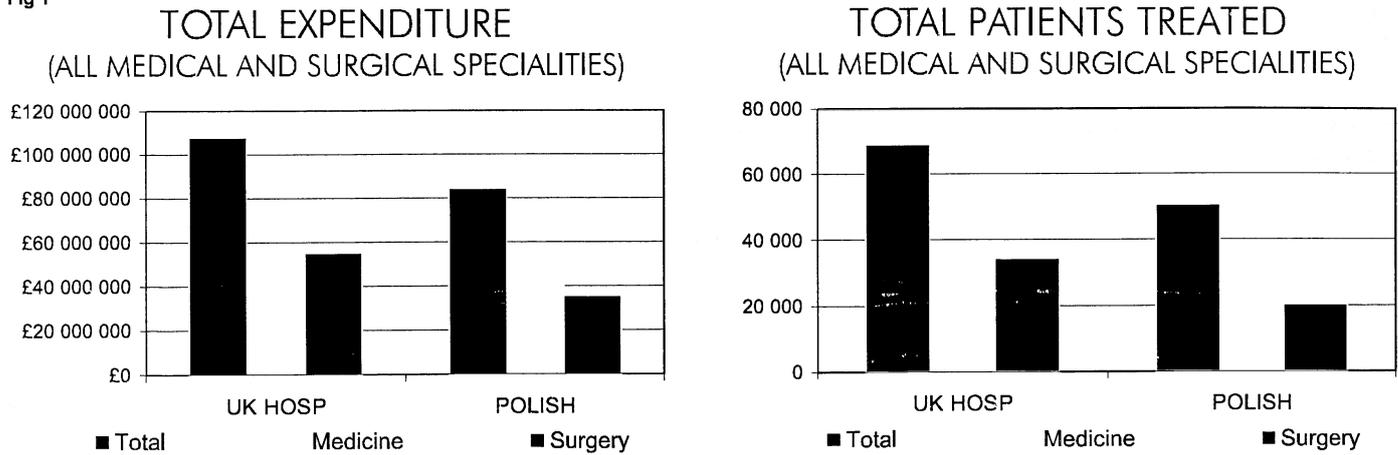
Where costs between UK and Polish Hospitals are similar overall it masks significant differences in the underlying structure of costs in terms of the ratio of staffing to non-staffing costs.

¹ The Health Service Financial Database and Comparative Tool 2000, Chartered Institute of Public Finance Accountants, ISSN 1461 040X

² OECD Health Data 2000 (on CD ROM), Organisation for Economic Co-operation and Development: Paris:OECD

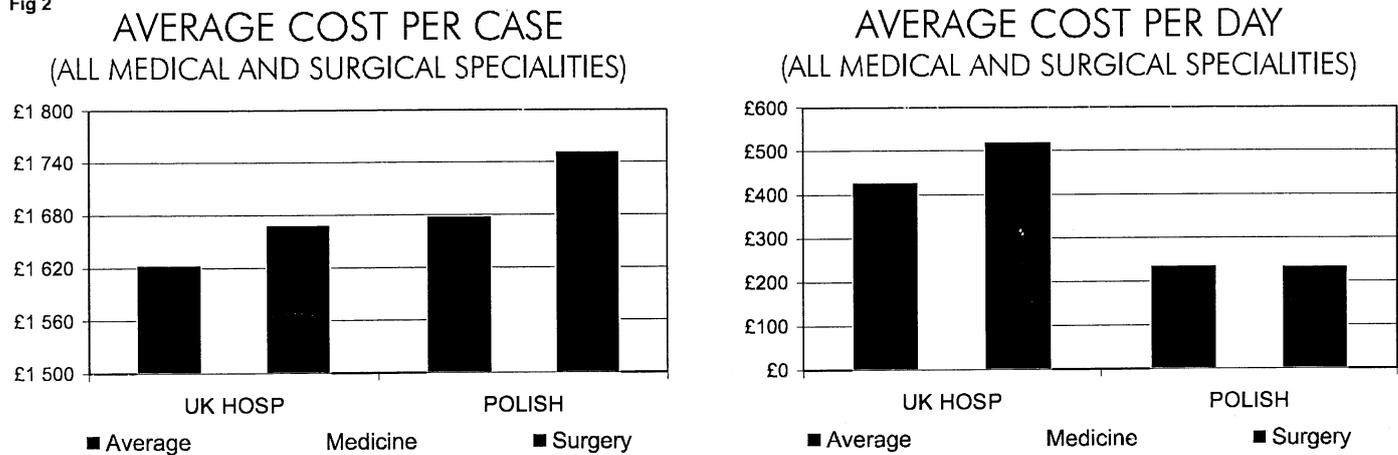
The graphs in fig 1 shows the data from the Polish university teaching hospital for all medical and surgical specialities compared with the average cost and activity rates from the eight similar hospitals in the UK.

Fig 1



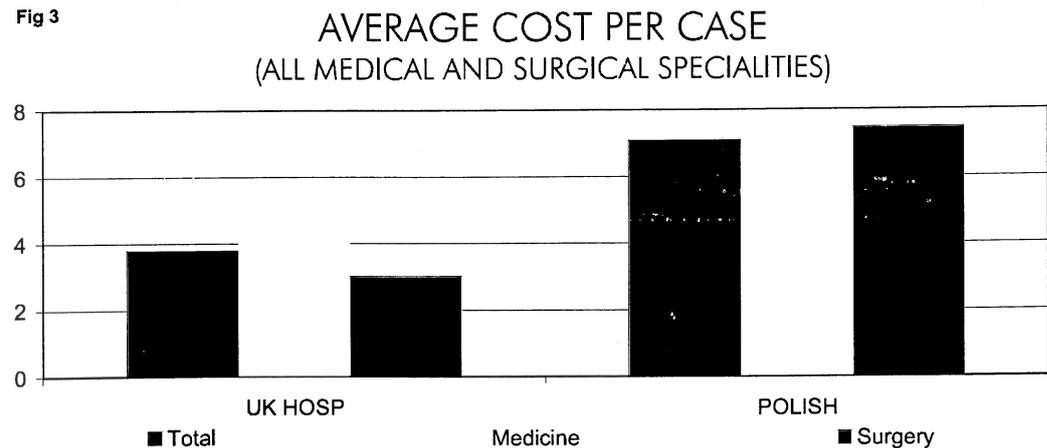
The graph shows two significant features. Firstly, the Polish hospital appears to treat significantly fewer patients in relation to the level of investment, particularly across the surgical specialities. Secondly, the ratio of investment is dramatically skewed towards surgical services in the Polish hospital, whereas investment in the UK is split relatively evenly between the two speciality groupings.

Fig 2



The graphs in fig 2 show that the average cost per case is dramatically higher in the Polish hospital, again, with a particular emphasis on surgical services. The difference between cost per case and cost per day is also much greater in the Polish hospital. This would suggest either over capacity or much greater length of stays, which means that the cost of the overall service is being divided by a much lower number of patients.

Fig 3



The graphs in fig 3 bear out the hypothesis that length of stay is, on average, much greater in Poland than in the UK. Surprisingly, however, the Polish hospital has fewer beds than the UK average, even though the level of PPP adjusted investment is much higher (see fig 1). Also, the number of beds in medical and surgical specialities are reasonably evenly distributed, but the vast majority of resource is skewed towards surgery, even though activity is lower. It is probable that this demonstrates a low level of occupancy and a high level of investment in high tech medical equipment with low utilisation rates.

If it is assumed that case mix is equivalent (although it is shown later that if anything the UK case mix will be on average a great deal more complex), it would appear that there is a dramatic difference in operating efficiency between the UK and Polish hospitals, particularly across the surgical specialities. This is characterised by higher operating costs, lower numbers of patient's treated, longer lengths of stay and lower occupancy levels.

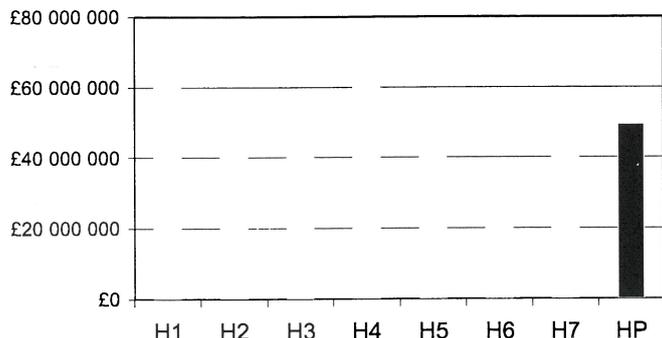
These initial impressions from the data are in line with expectations from detailed knowledge of the two health services and, therefore, give great confidence in the internal validity of the data.

ALITIES

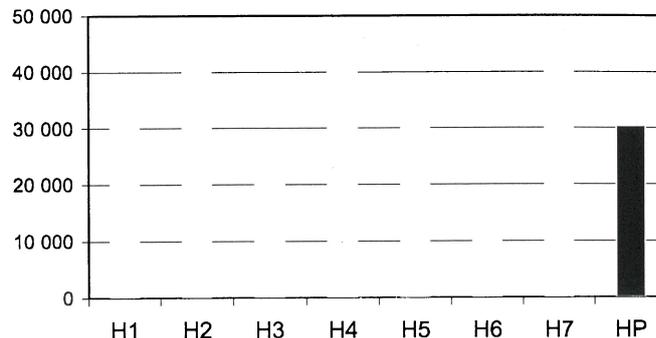
The following section looks at the medical specialities across seven UK University hospitals and compares them, individually, with the Polish hospital.

Fig 4

TOTAL EXPENDITURE
 (ALL MEDICAL SPECIALITIES)



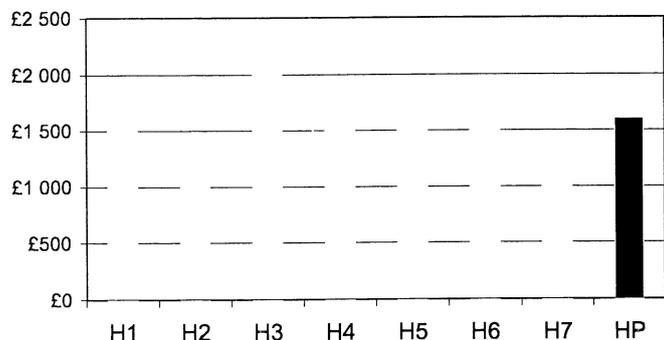
TOTAL PATIENTS TREATED
 (ALL MEDICAL SPECIALITIES)



Although the scales of the graphs in fig 4 are different it is clear that all of the UK hospitals treat more patients, in relation to the level of investment, than the Polish hospital (although UK hospital 5 is very close).

Fig 5

AVERAGE COST PER CASE
 (ALL MEDICAL SPECIALITIES)



AVERAGE COST PER DAY
 (ALL MEDICAL SPECIALITIES)

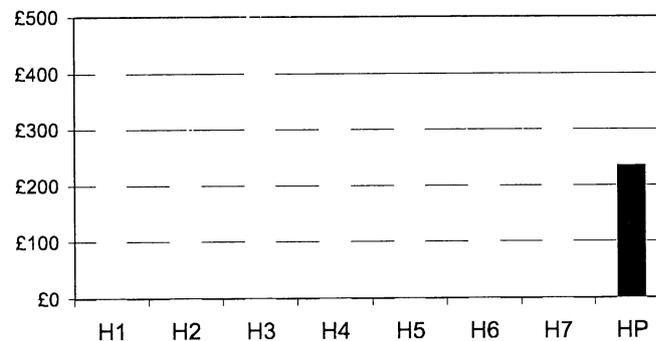
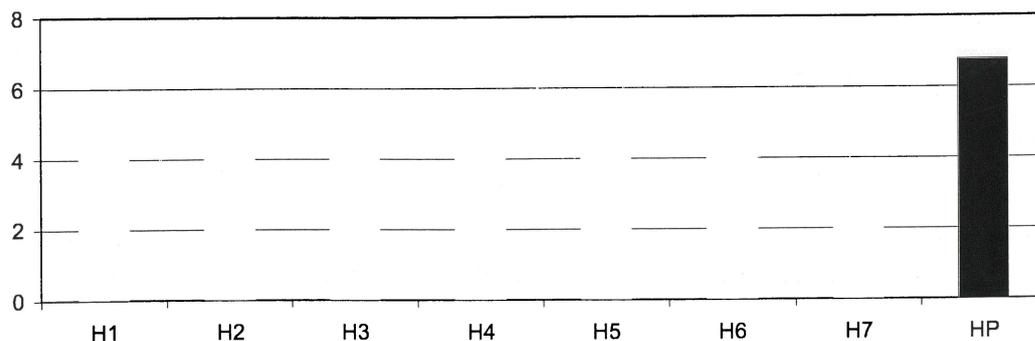


Fig 5 shows that although the total number of beds are relatively comparable to the UK (fig 6) the cost per case is disproportionately high. This appears to be linked to the disproportionate average length of stay.

The fact that the average cost per bed day is more in line with the UK hospitals would, again, suggest over capacity, low occupancy or both.

Fig 6

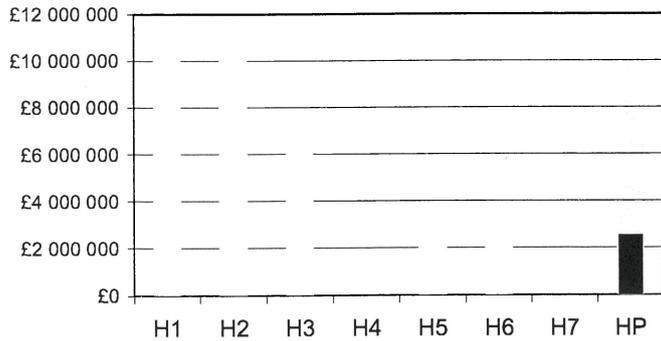
AVERAGE LENGTH OF STAY (DAYS)
 (ALL MEDICAL SPECIALITIES)



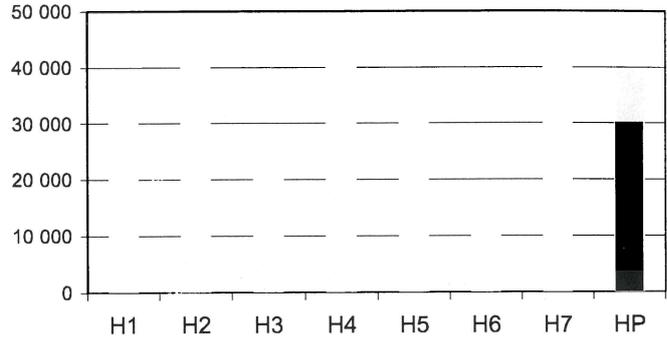
The following analysis looks in some detail at individual medical specialities to investigate if the larger picture is repeated or if there is variation across specialities.

Fig 7

**TOTAL EXPENDITURE
(CARDIOLOGY)**



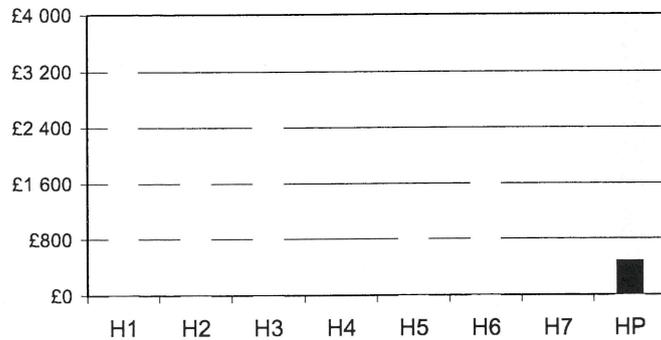
**TOTAL PATIENTS TREATED
(CARDIOLOGY)**



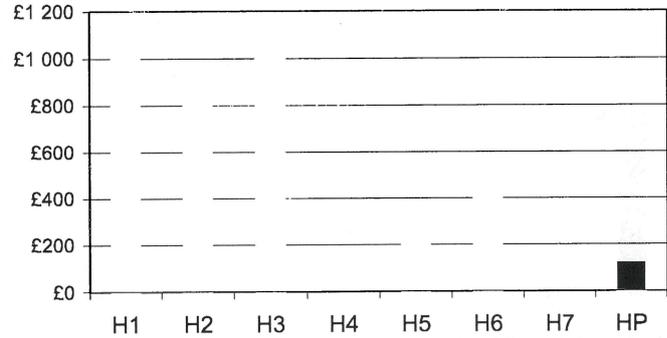
Cardiology services (fig 7), in contrast to the overall picture, show a high number of patients treated, relative to the level of investment. Similarly, fig 8 shows a very low cost per case and cost per bed day, while (fig 8) shows a relatively high length of stay.

Fig 8

**AVERAGE COST PER CASE
(CARDIOLOGY)**



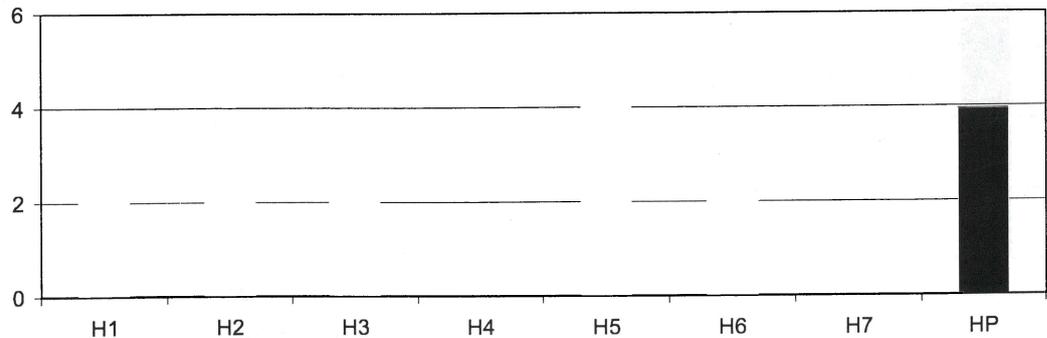
**AVERAGE COST PER DAY
(CARDIOLOGY)**



This suggests a difference in case mix. It is known that most cardiology in the UK is carried out at primary care level, with only the most complex or acute cases receiving care in an acute hospital setting. It is possible that the relative lack of primary care infra-structure in Poland has led to the situation where many of these patients are hospitalised.

Fig 9

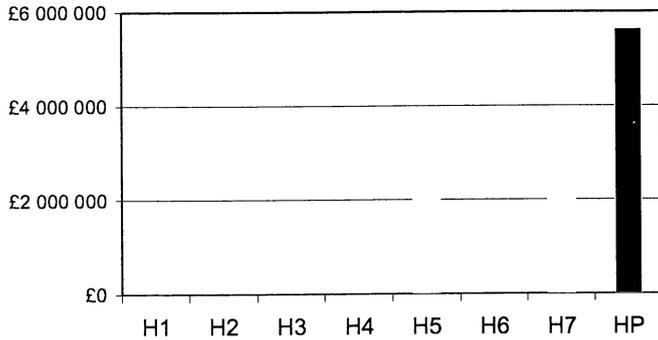
**AVERAGE LENGTH OF STAY (DAYS)
(ALL MEDICAL SPECIALITIES)**



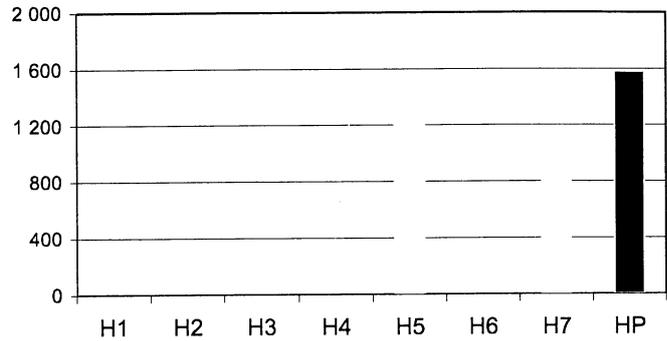
The profile of infectious disease services in Poland (fig 10) bears no relationship to that seen in the UK.

Fig 10

**TOTAL EXPENDITURE
 (INFECTIOUS DISEASE)**



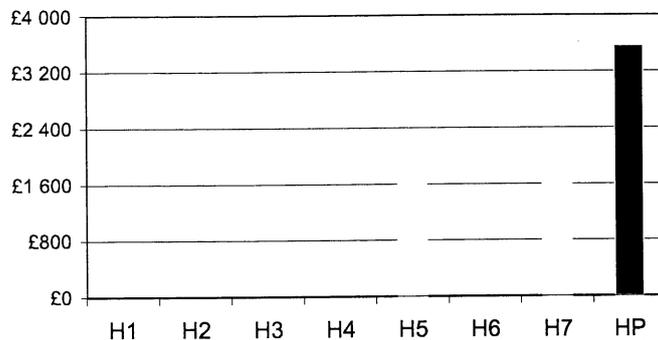
**TOTAL PATIENTS TREATED
 (INFECTIOUS DISEASE)**



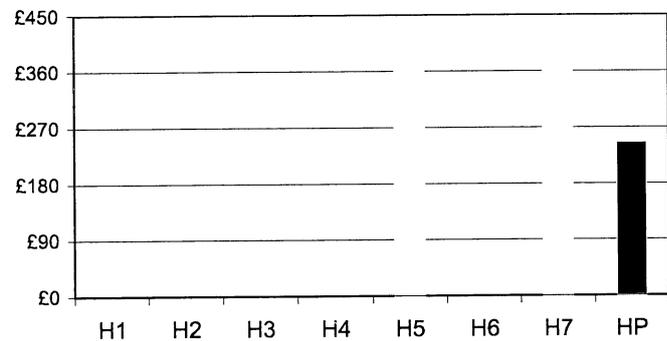
Total expenditure, cost per case, length of stay and number of beds are all comparatively high, whilst the number of patients treated is disproportionately low.

Fig 11

**AVERAGE COST PER CASE
 (INFECTIOUS DISEASE)**



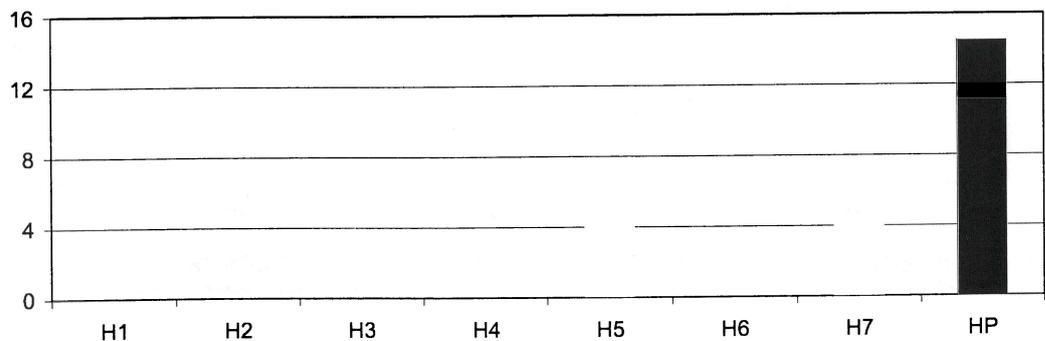
**AVERAGE COST PER DAY
 (INFECTIOUS DISEASE)**



It is not clear, at this stage, if this reflects the nature of infectious disease, i.e. hepatitis, HIV etc., or the modality of the treatment. It is known that hospital acquired infection rates of hepatitis B is significantly greater in this region of Poland than the national average. Poland, in turn, has the highest incidence in Europe. This issue would warrant further research and investigation.

Fig 12

**AVERAGE LENGTH OF STAY (DAYS)
 (INFECTIOUS DISEASE)**

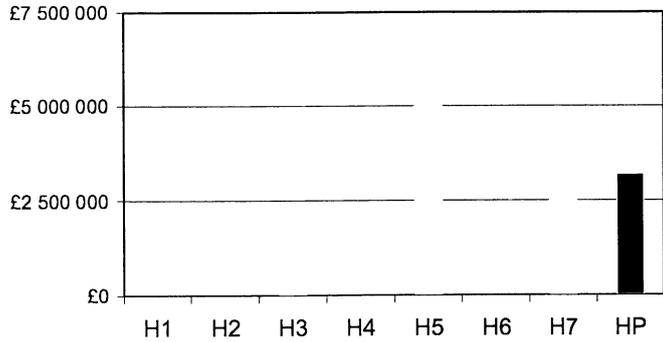


The number of out-patients with infectious disease is also very high compared to the UK.

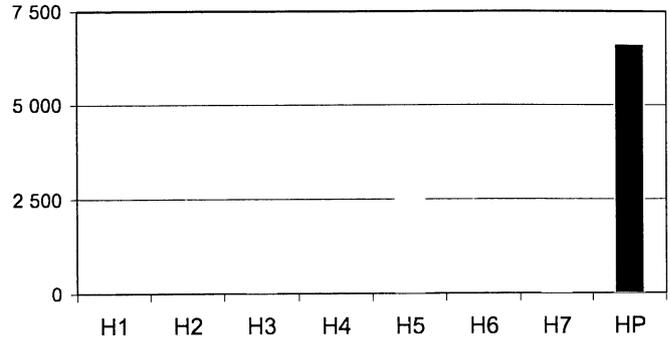
On the face of it neurology services appear, like cardiology, to be remarkably efficient services.

Fig 13

**TOTAL EXPENDITURE
(NEUROLOGY)**



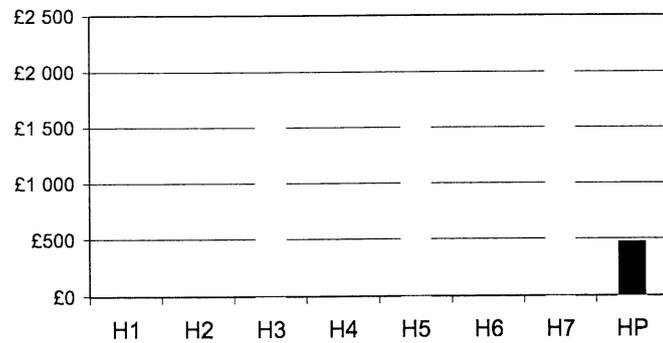
**TOTAL PATIENTS TREATED
(NEUROLOGY)**



The number of patients treated is huge in comparison to total cost. Similarly, cost per case (fig 14 length of stay (fig 15) are very low.

Fig 14

**AVERAGE COST PER CASE
(NEUROLOGY)**



**AVERAGE COST PER DAY
(NEUROLOGY)**

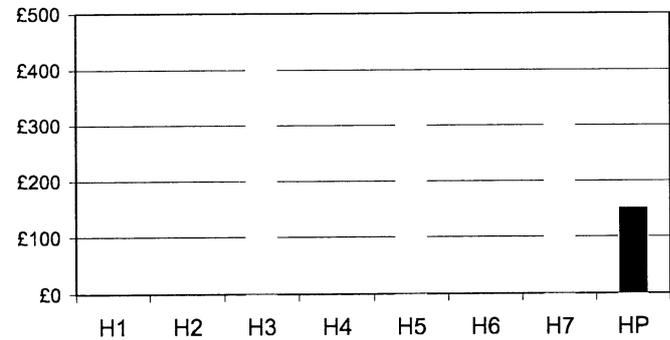
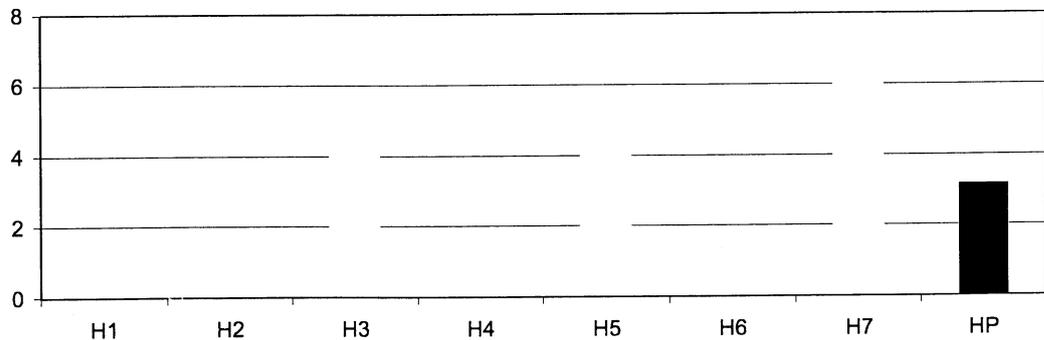


Fig 15

**AVERAGE LENGTH OF STAY (DAY)
(NEUROLOGY)**

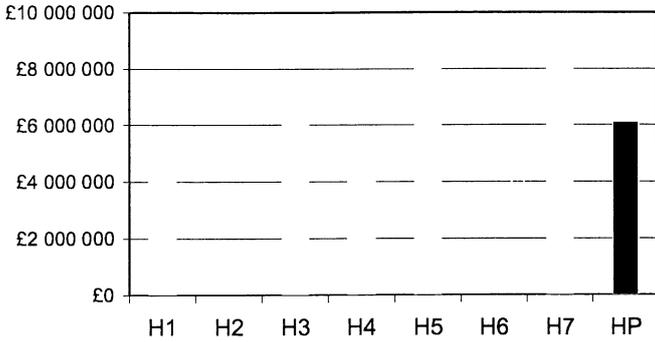


This, again, could reflect case mix. It could, on the other hand, reflect an area of good practice. This would be an area in which a simple case comparison study could be of great benefit.

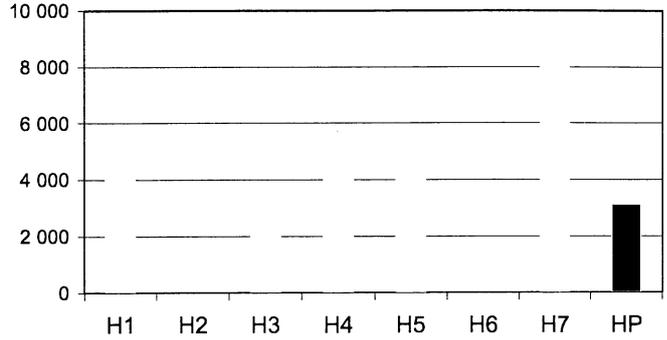
HA

Fig 16

**TOTAL EXPENDITURE
(HAEMATOLOGY)**



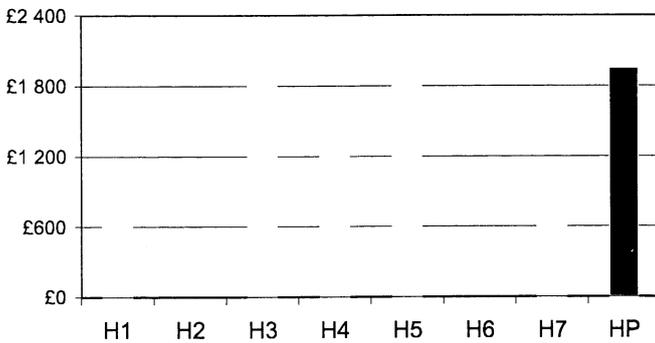
**TOTAL PATIENTS TREATED
(HAEMATOLOGY)**



Haematology services seem broadly comparable to the UK. There are some variations, but they appear, at first glance, to be in line with the variation across the UK.

Fig 17

**AVERAGE COST PER CASE
(HAEMATOLOGY)**



**AVERAGE COST PER DAY
(HAEMATOLOGY)**

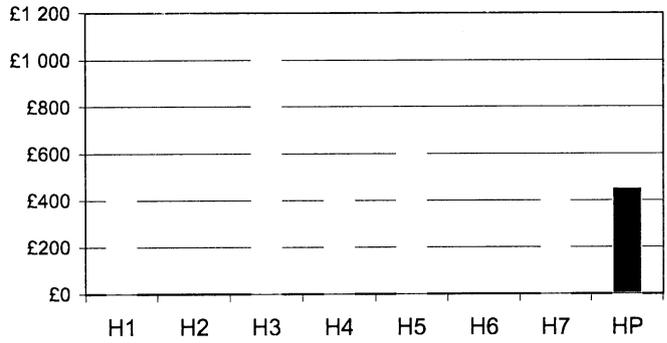
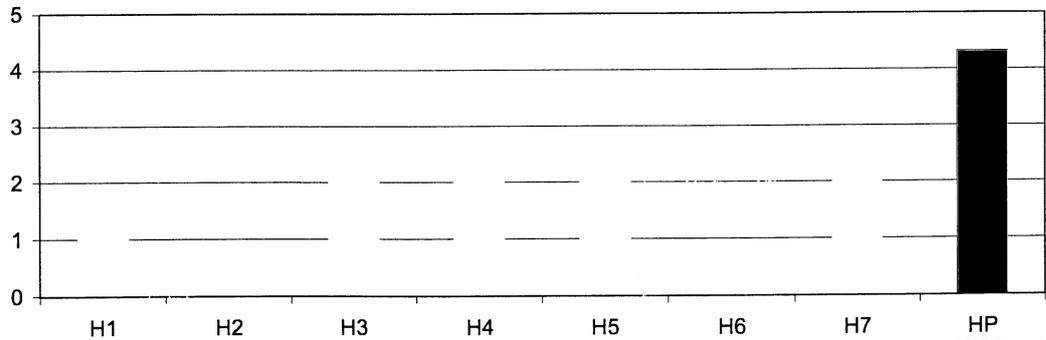


Fig 18

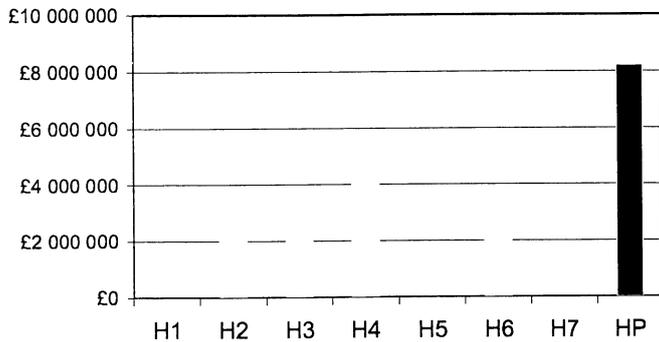
**AVERAGE LENGTH OF STAY (DAYS)
(HAEMATOLOGY)**



With respect to Polish nephrology services, as with infectious diseases, the level of investment in relation to the number of patients treated is huge (fig 19), leading to a totally disproportionate cost per case (fig 20).

Fig 19

**TOTAL EXPENDITURE
(NEPHROLOGY)**



**TOTAL PATIENTS TREATED
(NEPHROLOGY)**

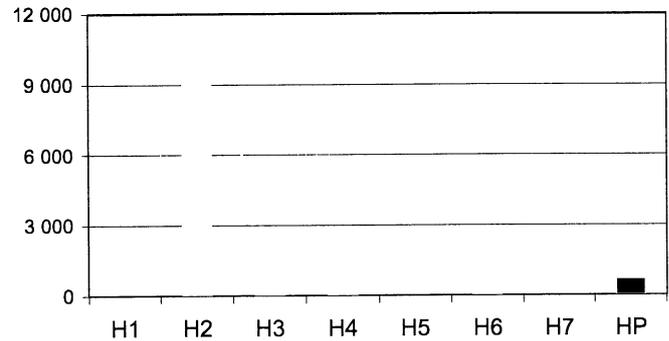
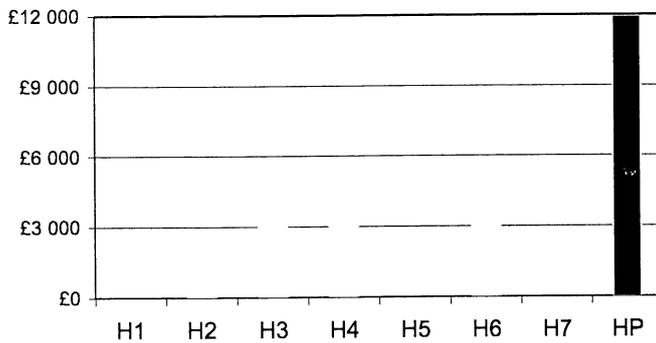
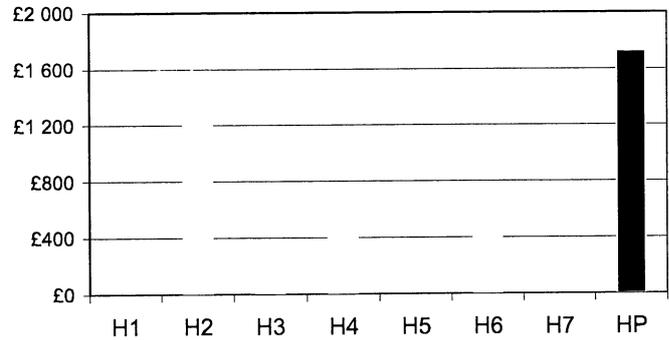


Fig 20

**AVERAGE COST PER CASE
(NEPHROLOGY)**



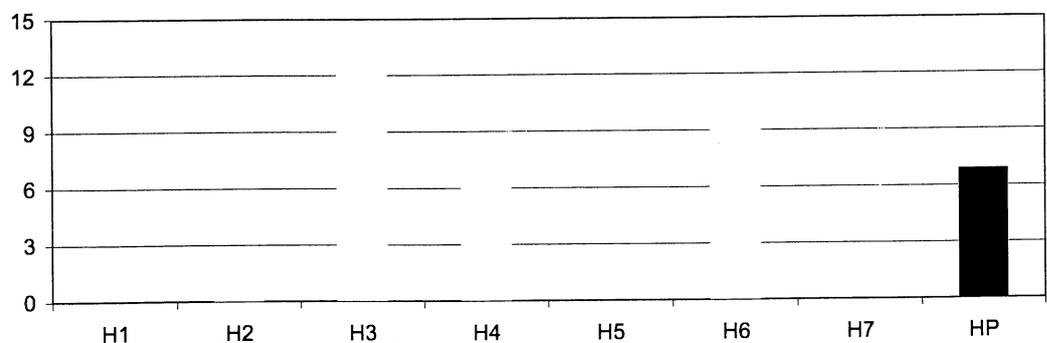
**AVERAGE COST PER DAY
(NEPHROLOGY)**



Length of stay (fig 21), however, seems relatively comparable, giving the impression that the problem is in the production cost. This may reflect high levels of technological investment with low utilisation, disproportionate staffing costs or some major difference in clinical protocols.

Fig 21

**AVERAGE LENGTH OF STAY (DAYS)
(NEPHROLOGY)**



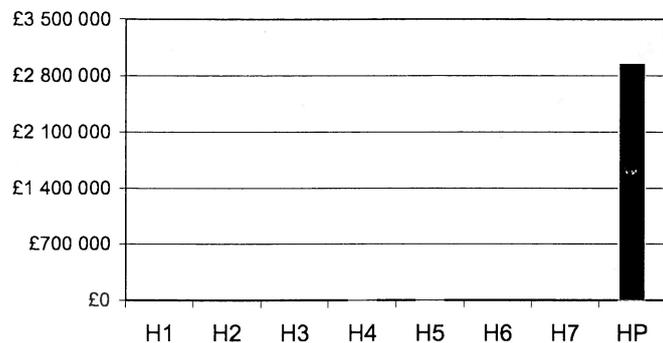
Knowledge of the Polish system suggests the first cause as the most likely cause. Again, this would be an ideal area for a case comparison study.



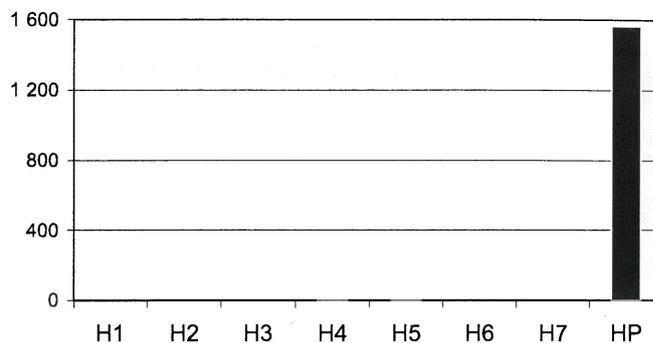
This is perhaps the most significant variation in treatment modalities between the UK and Poland. Genito-Urinary Medicine is almost exclusively treated on an out-patient or day case basis in the UK, whereas, in Poland, it falls under the secondary care system.

Fig 22

**TOTAL EXPENDITURE
 (GENITO-URINARY MEDICINE)**



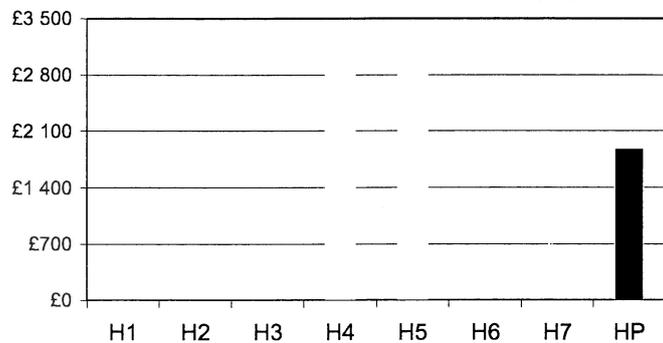
**TOTAL PATIENTS TREATED
 (GENITO-URINARY MEDICINE)**



HIV infection would fall under this speciality in the UK, hence the low numbers of patients treated and the high cost per case. HIV in Poland is shown under Infectious Diseases.

Fig 23

**AVERAGE COST PER CASE
 (GENITO-URINARY MEDICINE)**



**AVERAGE COST PER DAY
 (GENITO-URINARY MEDICINE)**

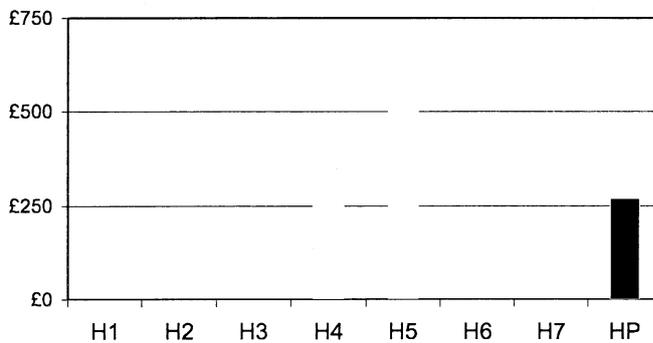
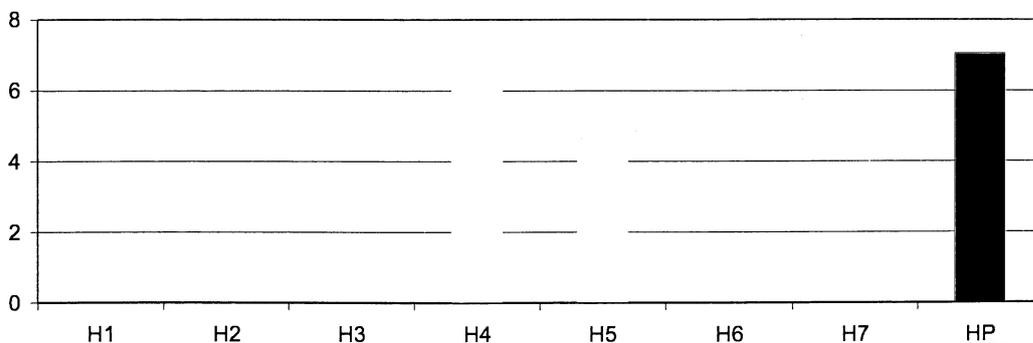


Fig 24

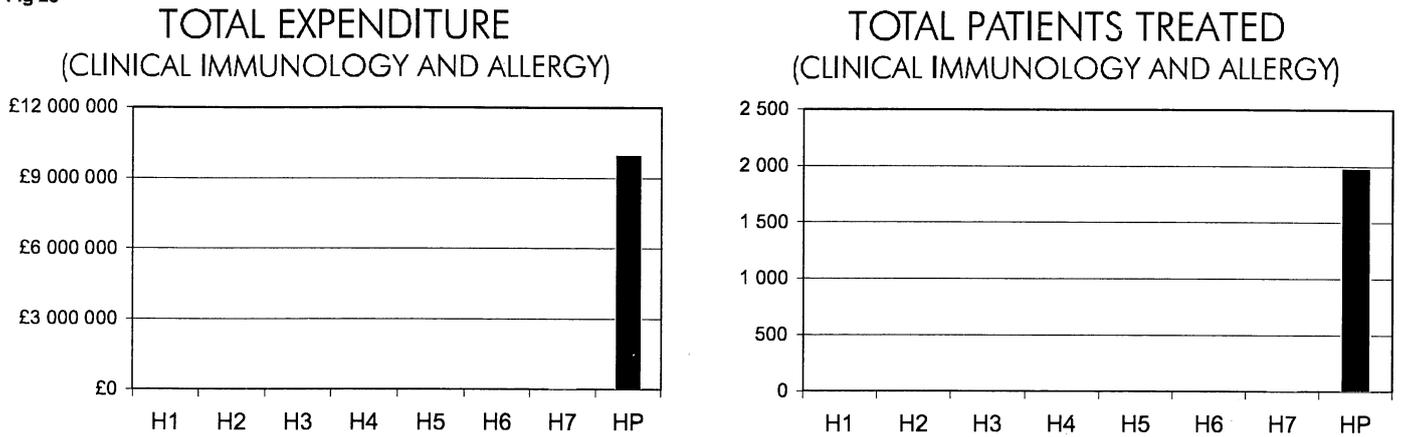
**AVERAGE LENGTH OF STAY (DAYS)
 (GENITO-URINARY MEDICINE)**



Although the length of stay is comparable with the UK, the cost per case is low. This would reflect the high treatment cost of HIV infection in the UK sample.

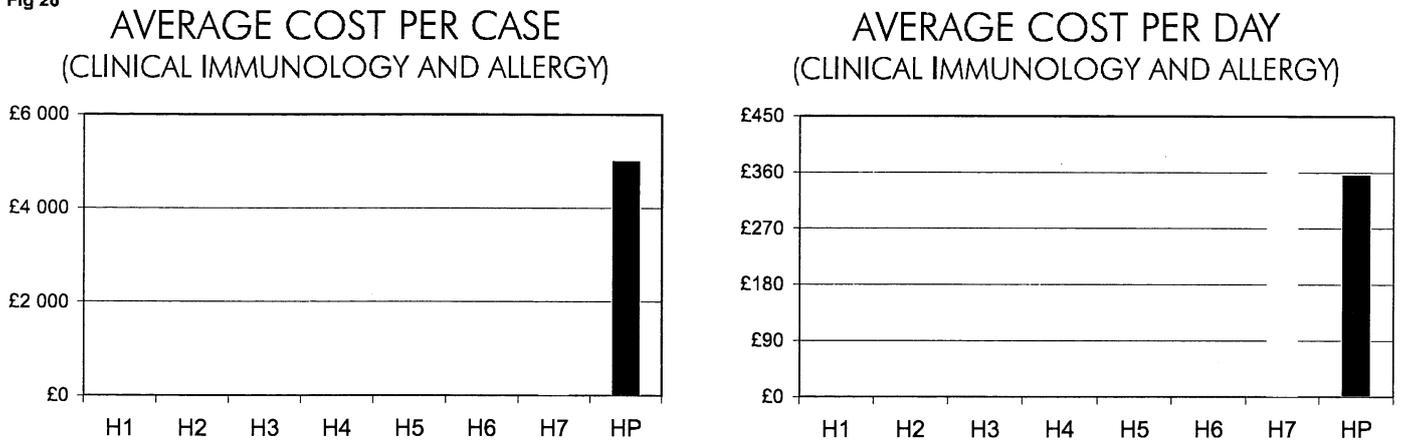
CLIN

Fig 25



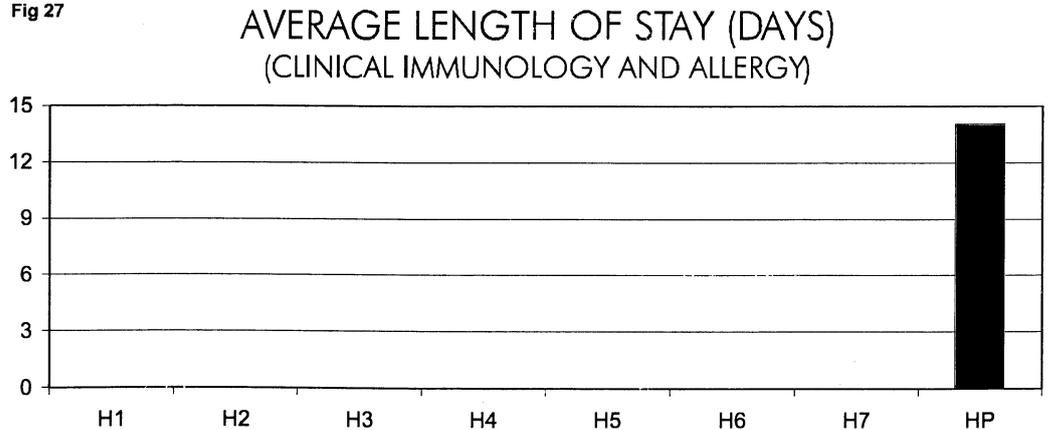
In Poland, clinical immunology is another example of a high investment, high activity service with a significantly different profile to similar hospital in the UK. It is known that specialities classified in this field, in this particular hospital include services such as pulmonology (which, it is assumed, deals with asthma), some heart diseases and diseases of the immune system.

Fig 26



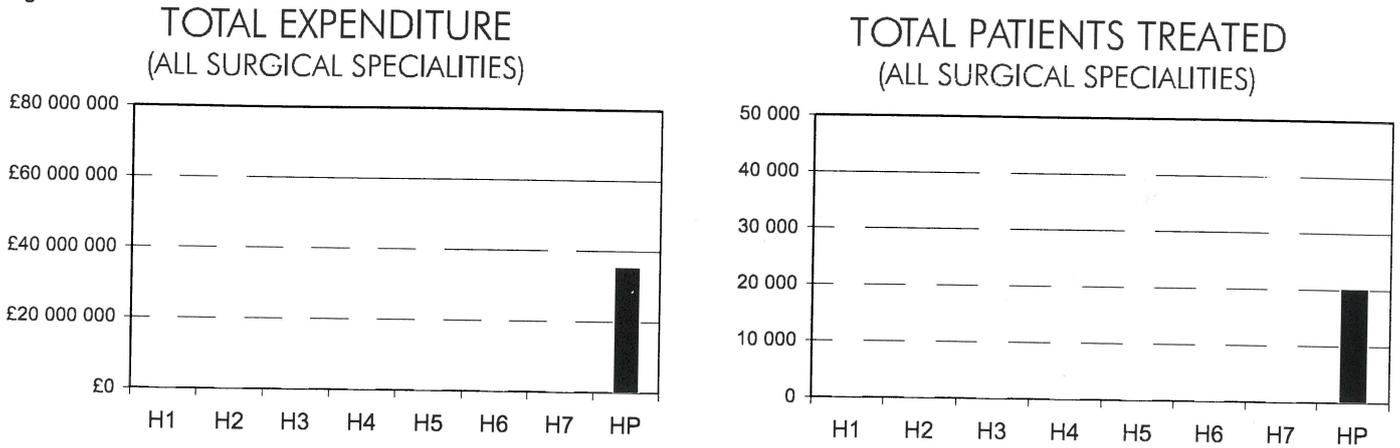
The average cost per day is very high by comparison with UK hospitals, which may be explained by differences in case types. The difference between cost per case and cost per bed is enormous (fig 26). This, along with the ten-fold difference in length of stay when compared with UK hospitals, suggests a significant excess capacity in terms of available beds.

Fig 27



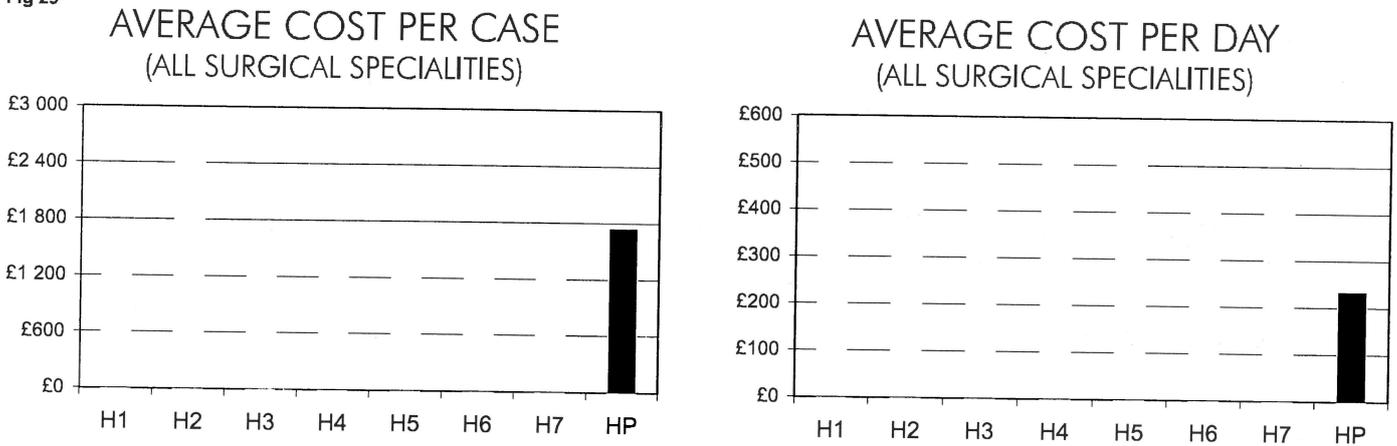
ANA

Fig 28



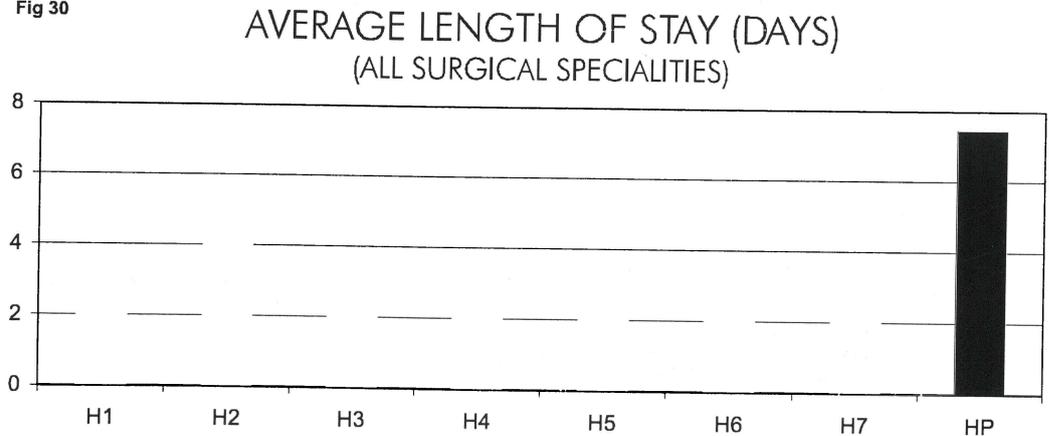
Although there is a significant difference in the ratio of the numbers of patients treated to level of investment between the UK and Polish hospitals across the medical specialities, this is even more striking in surgical services.

Fig 29



The average cost per day and average length of stay across surgical specialities is much higher than for comparable UK hospitals, whilst the cost per bed and total number of available beds is only marginally inflated. This, again, suggests both excessive capacity and a much greater focus on hospital based treatment protocols.

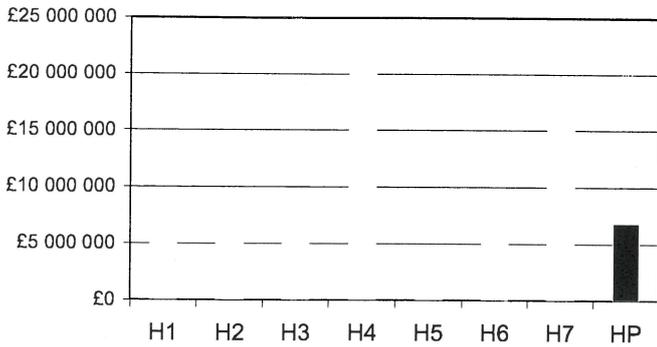
Fig 30



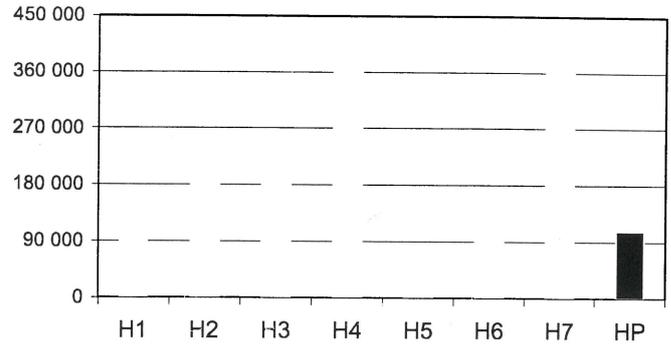
ANALYSIS

Fig 31

TOTAL EXPENDITURE OPD (ALL SURGICAL SPECIALITIES)



TOTAL OUTPATIENTS TREATED (ALL SURGICAL SPECIALITIES)



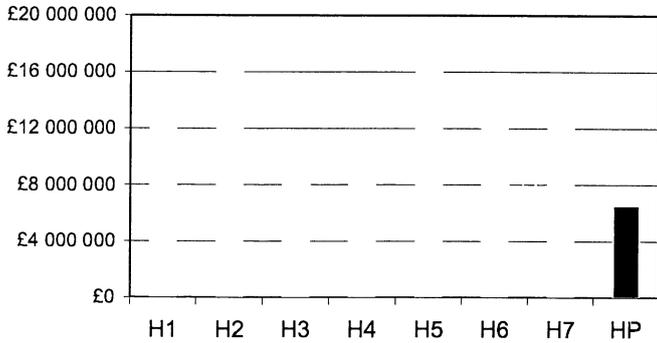
As with medical specialities, investment in outpatient based services is low.



General surgical services in Poland attract a higher proportion of investment than comparable services in the UK, again, with fewer patients treated. Average cost per case and average cost per bed are both disproportionately high. It is speculated that this is due to a lack of investment in day surgical techniques, low utilisation rates of expensive medical equipment and possibly an inefficient use of theatre time.

Fig 32

**TOTAL EXPENDITURE
(GENERAL SURGERY)**



**TOTAL PATIENTS TREATED
(GENERAL SURGERY)**

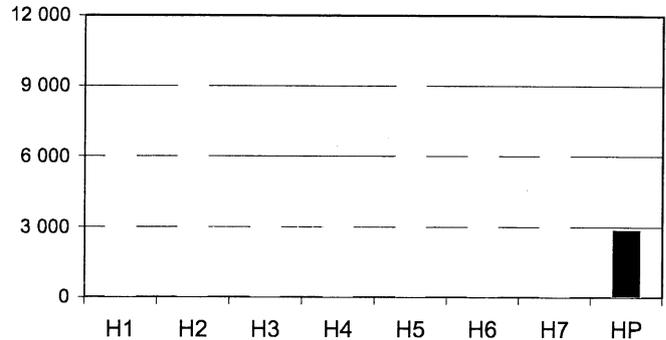
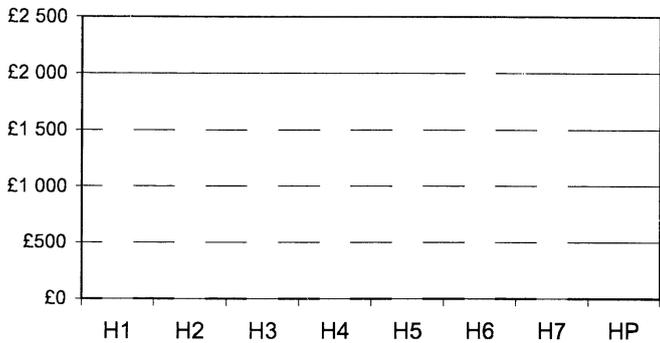


Fig 33

**AVERAGE COST PER CASE
(GENERAL SURGERY)**



**AVERAGE COST PER DAY
(GENERAL SURGERY)**

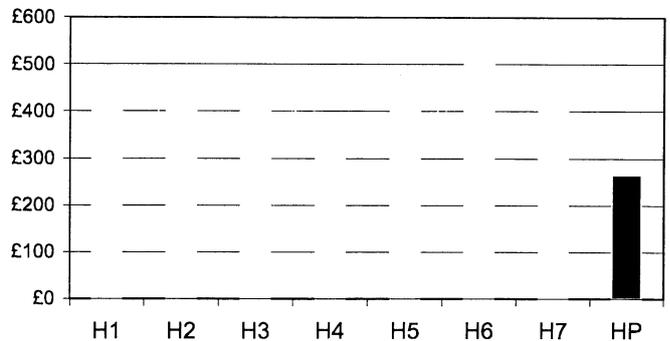
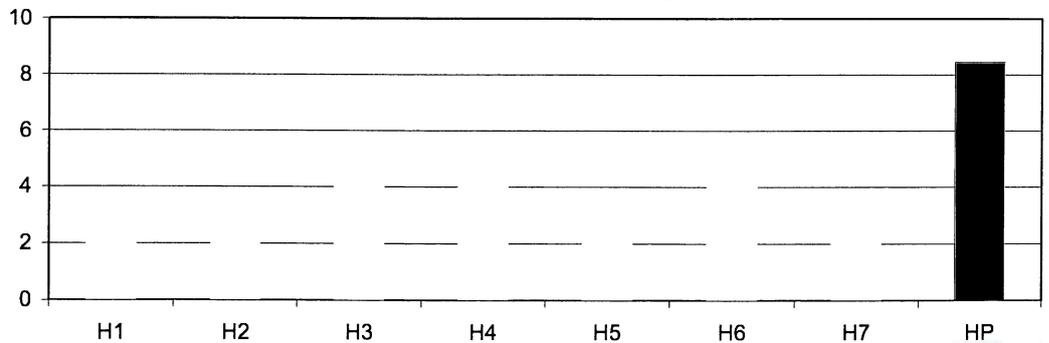


Fig 34

**AVERAGE LENGTH OF STAY (DAYS)
(GENERAL SURGERY)**

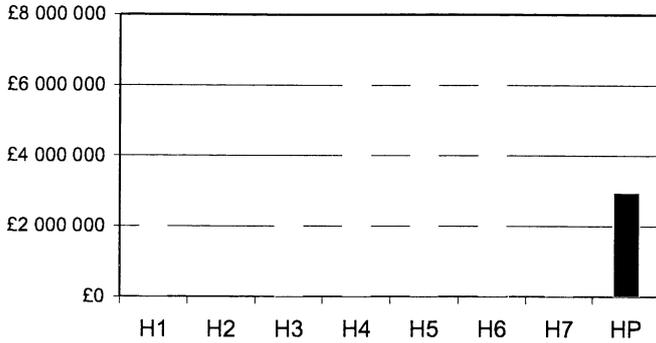


Length of stay is relatively high, suggesting a lack of community-based facilities to enable earlier discharge.

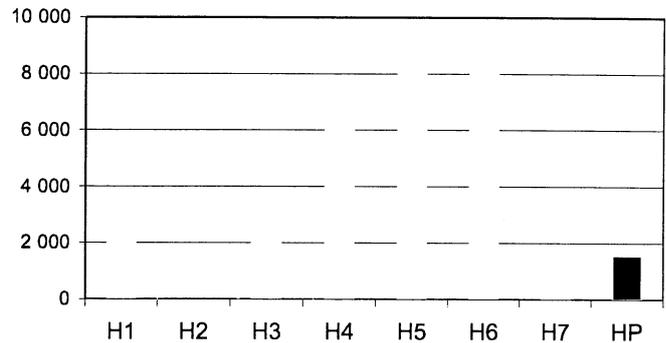
UR

Fig 35

**TOTAL EXPENDITURE
(UROLOGY)**



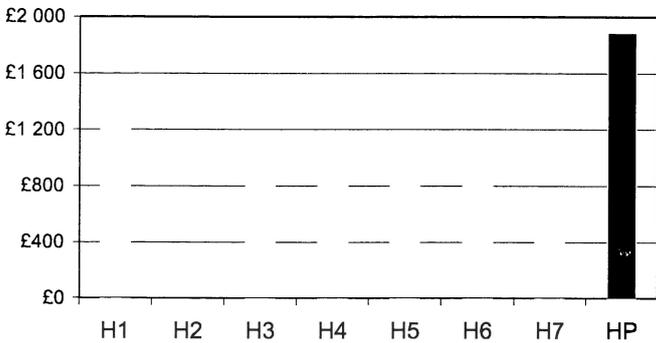
**TOTAL PATIENTS TREATED
(UROLOGY)**



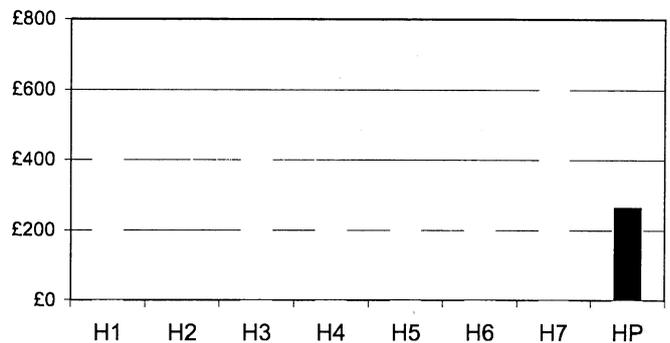
Urology services show an even greater difference between the level of investment, which is very high by UK standards, and the number of patients treated, which is disproportionately low.

Fig 36

**AVERAGE COST PER CASE
(UROLOGY)**



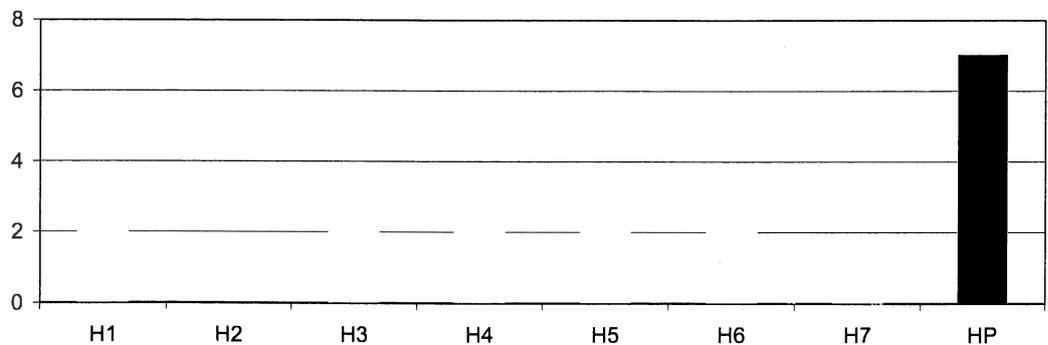
**AVERAGE COST PER DAY
(UROLOGY)**



The discrepancy between investment and the number of patients treated, predictably, translates into a disproportionate cost per case.

Fig 37

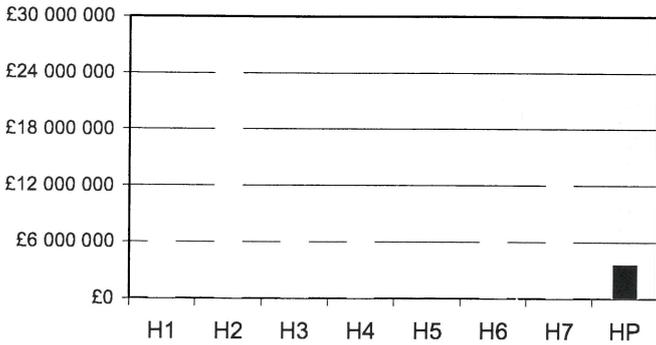
**AVERAGE LENGTH OF STAY (DAYS)
(UROLOGY)**



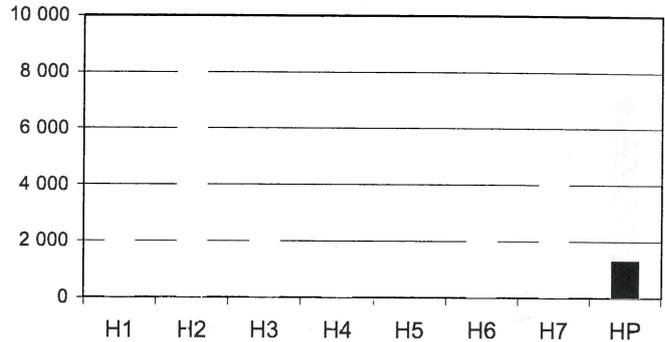
OR

Fig 38

TOTAL EXPENDITURE
(ORTHOPAEDIC)



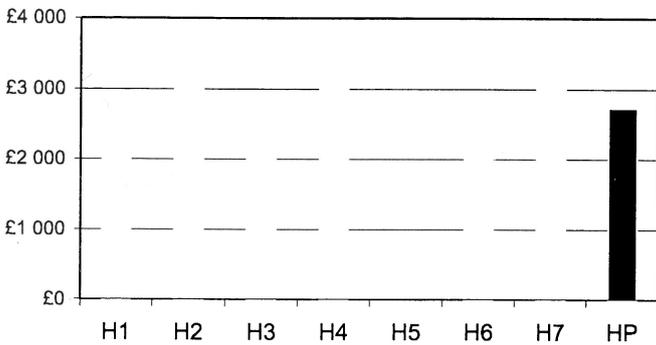
TOTAL PATIENTS TREATED
(ORTHOPAEDIC)



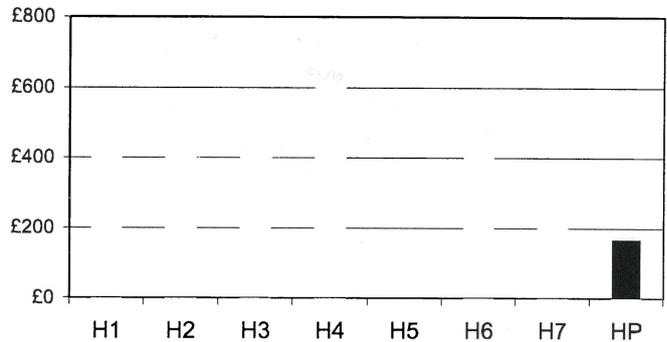
Orthopaedic services, again, reflect the familiar pattern of high investment, low activity and high cost per case.

Fig 39

AVERAGE COST PER CASE
(ORTHOPAEDIC)



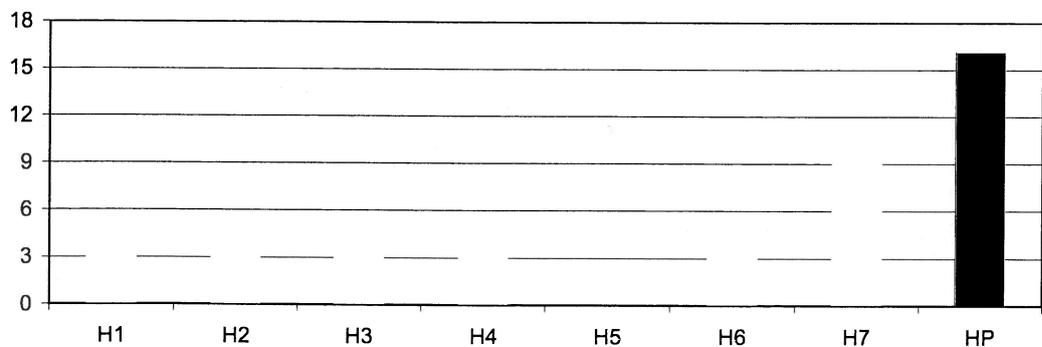
AVERAGE COST PER DAY
(ORTHOPAEDIC)



In this speciality, however, the number of beds is relatively low, although length of stay remains on the high side.

Fig 40

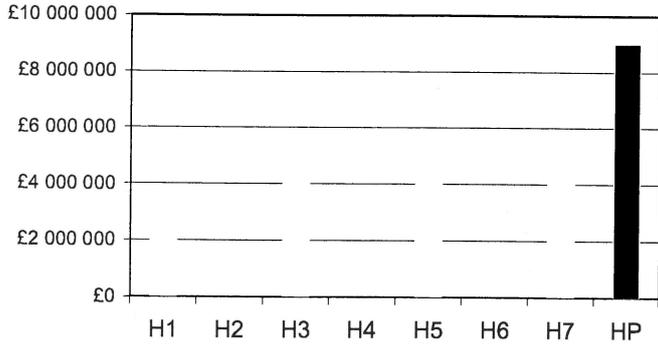
AVERAGE LENGTH OF STAY (DAYS)
(ORTHOPAEDIC)



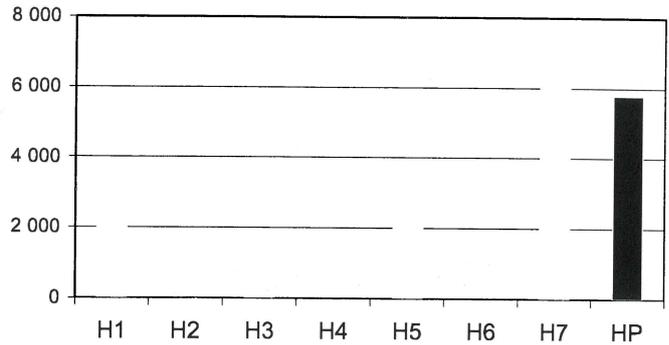
EAR

Fig 41

TOTAL EXPENDITURE
(EAR, NOSE AND THROAT)



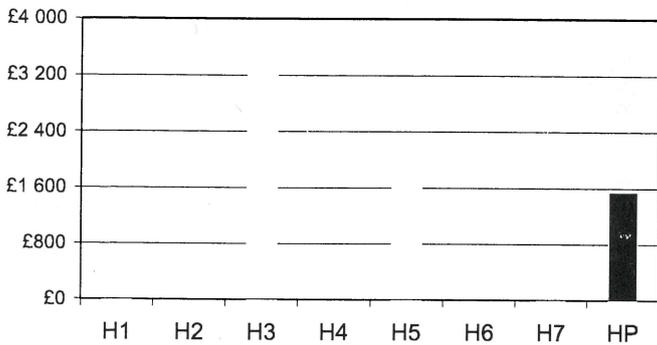
TOTAL PATIENTS TREATED
(EAR, NOSE AND THROAT)



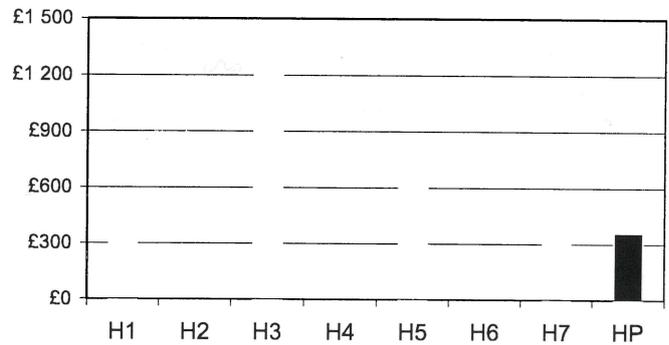
Ear nose and throat services, again, attract a relatively high level of investment compared to UK hospitals, but activity is more comparable.

Fig 42

AVERAGE COST PER CASE
(EAR, NOSE AND THROAT)



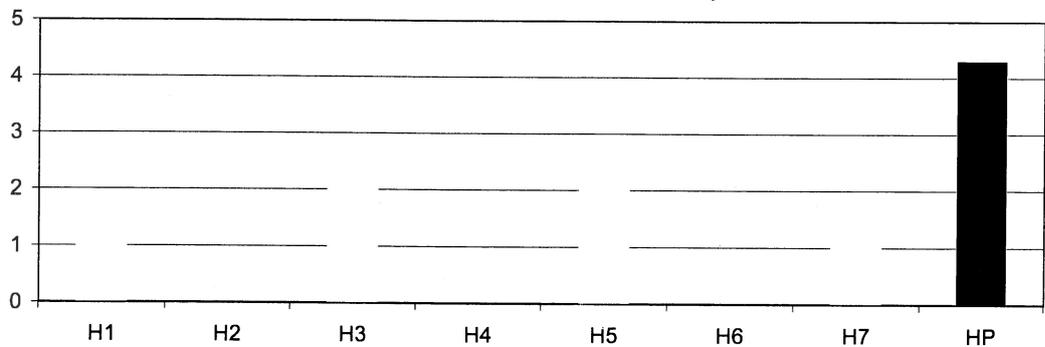
AVERAGE COST PER DAY
(EAR, NOSE AND THROAT)



Cost per case, cost per bed and the number of beds are disproportionately high but, in this case, length of stay is comparable.

Fig 43

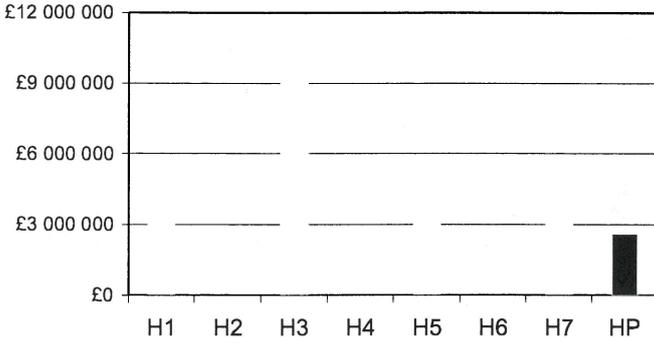
AVERAGE LENGTH OF STAY (DAYS)
(EAR, NOSE AND THROAT)



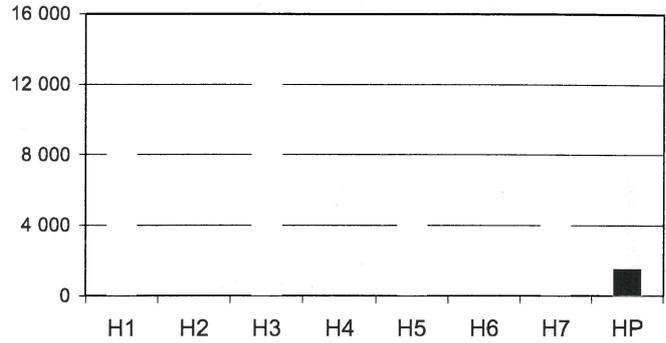
OP

Fig 44

**TOTAL EXPENDITURE
 (OPHTHALMOLOGY)**



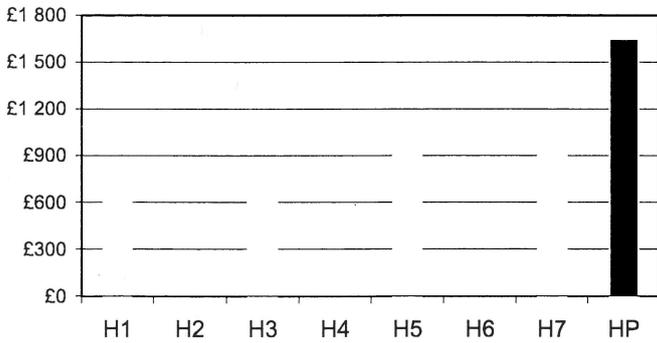
**TOTAL PATIENTS TREATED
 (OPHTHALMOLOGY)**



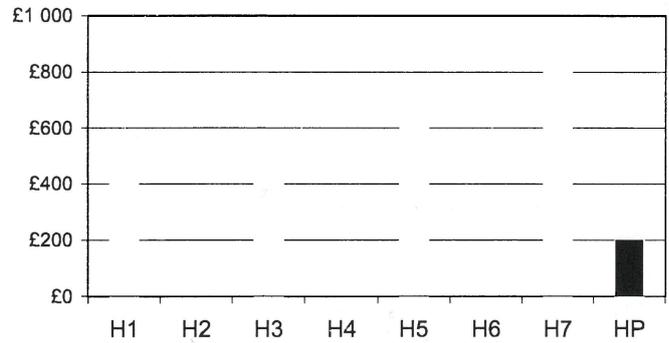
Ophthalmology, again, reflects a profile of very high investment with very low numbers of patients treated.

Fig 45

**AVERAGE COST PER CASE
 (OPHTHALMOLOGY)**



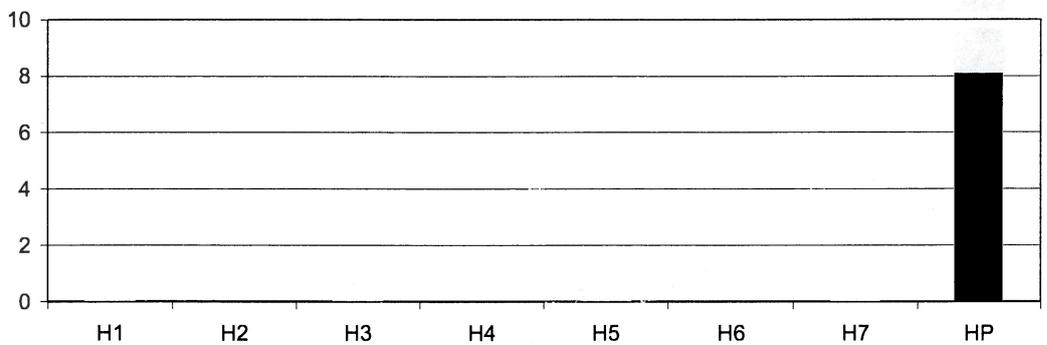
**AVERAGE COST PER DAY
 (OPHTHALMOLOGY)**



Again, the difference between the cost per case and the cost per bed is enormous, suggesting significant under occupancy.

Fig 46

**AVERAGE LENGTH OF STAY (DAYS)
 (OPHTHALMOLOGY)**

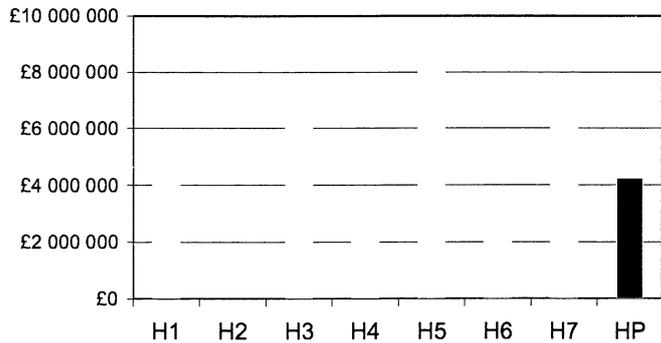


Once more, length of stay is very high in comparison to the UK services.

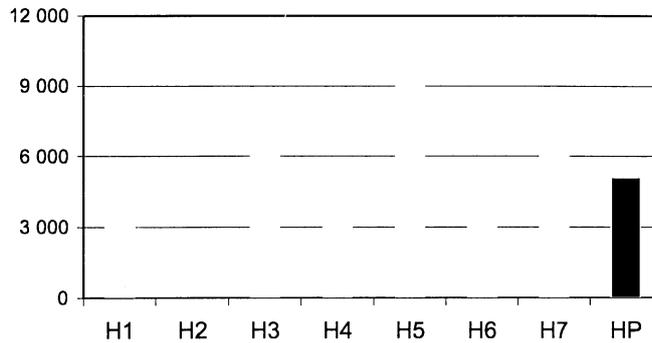
GY

Fig 47

**TOTAL EXPENDITURE
 (GYNAECOLOGY)**



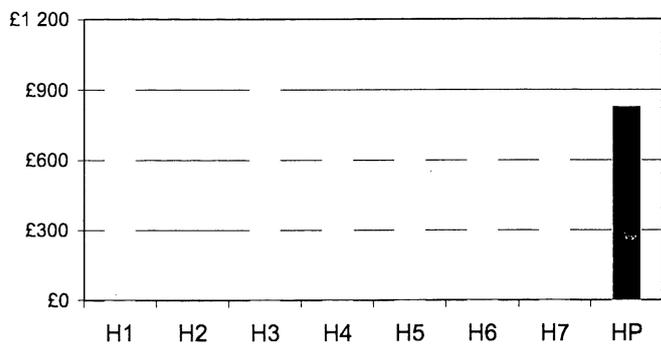
**TOTAL PATIENTS TREATED
 (GEYNAECOLOGY)**



Gynaecology presents a pattern familiar to other surgical specialities.

Fig 48

**AVERAGE COST PER CASE
 (GYNAECOLOGY)**



**AVERAGE COST PER DAY
 (GYNAECOLOGY)**

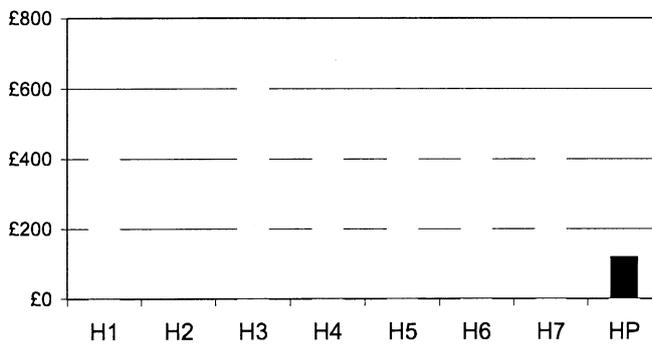
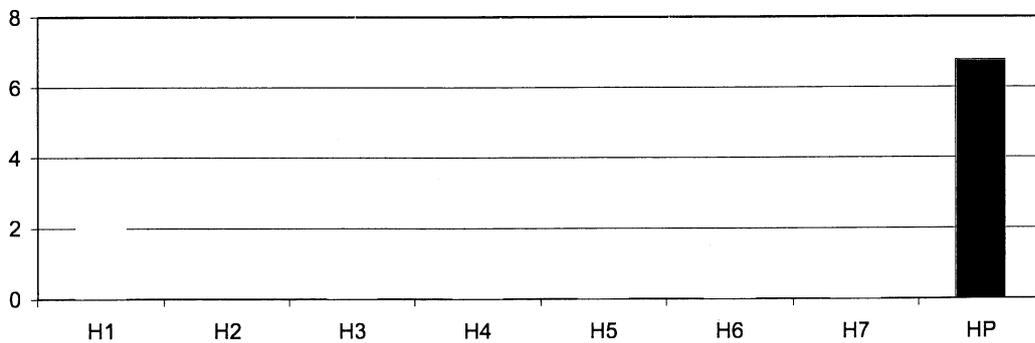


Fig 49

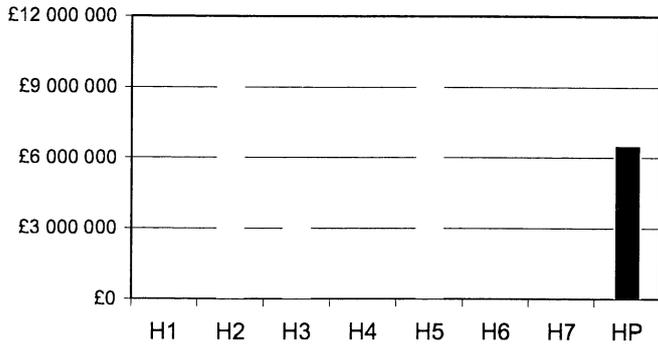
**AVERAGE LENGTH OF STAY (DAYS)
 (GYNAECOLOGY)**



Neuro-surgery also presents a pattern familiar to other surgical specialities.

Fig 50

**TOTAL EXPENDITURE
(NEURO-SURGERY)**



**TOTAL PATIENTS TREATED
(NEURO-SURGERY)**

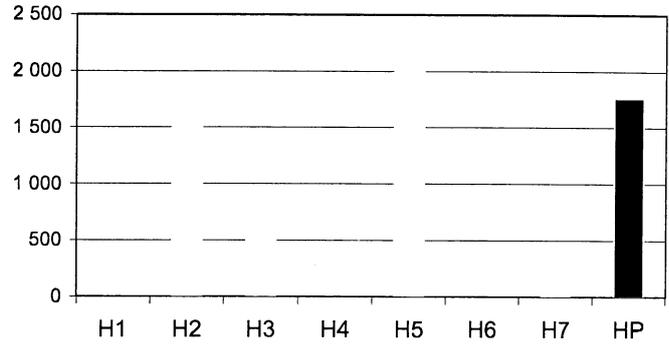
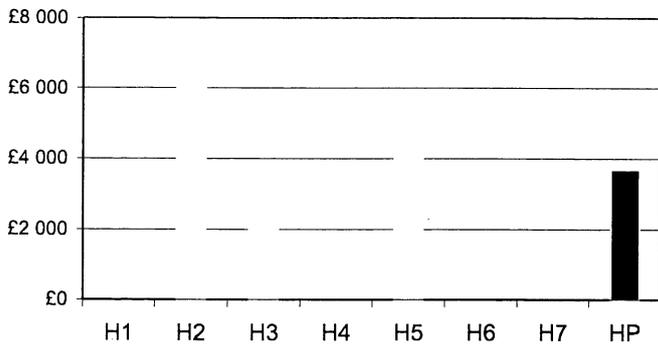


Fig 51

**AVERAGE COST PER CASE
(NEURO-SURGERY)**



**AVERAGE COST PER DAY
(NEURO-SURGERY)**

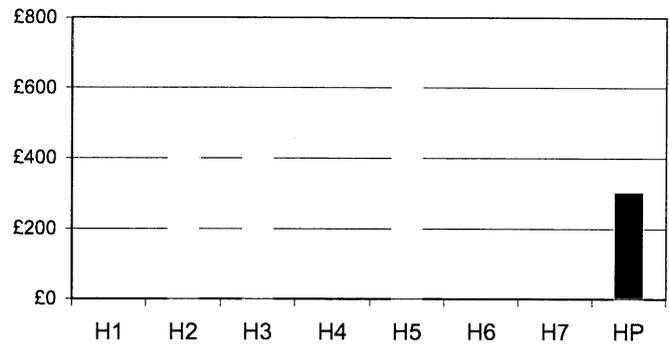
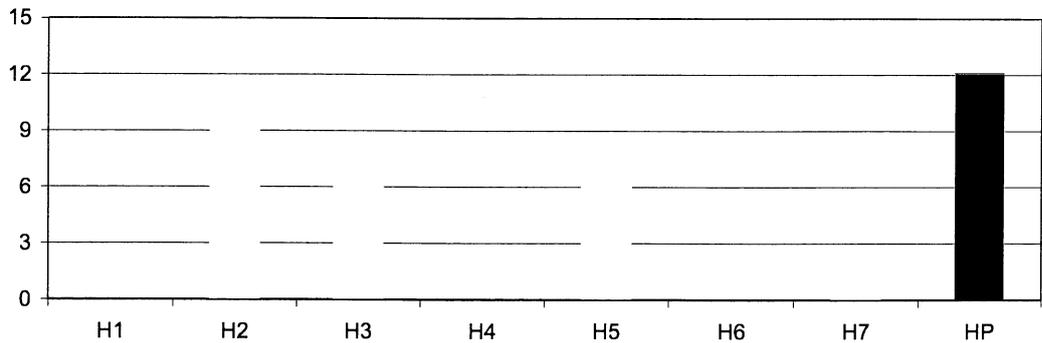


Fig 52

**AVERAGE LENGTH OF STAY (DAYS)
(NEURO-SURGERY)**



CONCLUSION

COA

Although the data from Poland, adjusted through the PPP calculation, appears comparable, we still need to carry out some validation processes to ensure that we are comparing like with like. The fact that the data is indicating differences of which we are already aware is extremely encouraging at this stage. The second phase of this analysis will be an examination of the remaining specialities in Poland and a meeting in Krakow to iron out any data validation problems. A TFR has now been developed in Spanish and will be forwarded to a comparable hospital in Spain.