

adequate follow-up stresses the problems in accommodation, the poor access to day-care and the incomplete understanding from neighbours that they encounter.<sup>3</sup> The challenge to practitioners in this field is to improve community-based facilities such that patients can accept these as offering a better quality of care.

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#### REFERENCES

- <sup>1</sup>SHUGAR, G., SMITH, I. et al (1986) Moving experiences: a model for inpatient transfer based on interviews with patients and their families. *Hospital and Community Psychiatry*, 37, 1035-1040.  
<sup>2</sup>ABRAHAMSON, D. & BRENNER, D. (1982) Do long-stay psychiatric patients want to leave hospital? *Health Trends*, 14, 95-97.  
<sup>3</sup>PETERSON, R. (1982) What are the needs of chronic mental patients? *Schizophrenia Bulletin*, 8, 610-616.

### *Estimating hospital bed numbers*

DEAR SIRS

May I refer to Professor Priest's letter, 'Hospital Beds, Psychiatric Patients' (*Bulletin*, November 1986, 10, 322-323) and to the comments by Dr McGovern (*Bulletin*, April 1987, 11, 131).

I think it may well be that I occasioned some of the figures of beds quoted because I sent to Professor Hirsch a paper that I prepared on this matter. It may be that, if that is so, my paper deserves wider circulation to help people understand the difficulties of estimating bed numbers. Of course if you argue that in-patient beds are quite unnecessary in psychiatry then we need not proceed any further but I think there is a consensus that some in-patient facilities are required.

The number of hospital beds required by a service depends upon three factors:

- (1) the number of patients considered to require in-patient treatment per unit time
- (2) the average length of stay
- (3) how long a queue for admission is acceptable!

The number of patients requiring in-patient care, per unit time, rationally depends upon in-patient care being:

- (a) more appropriate
- (b) more effective
- (c) more efficient

than other forms of care.

For a given service over a reasonable period of time the number of patients requiring in-patient care is finite and acceptably predictable. Once the number of patients requiring admission and average length of stay are known then the number of beds can be calculated on a rational basis. (The figure required for the calculation is *not* the number of patients actually admitted but the number considered to require admission, whether admitted or not).

At present in-patient accommodation is determined by empirical decisions, often historically based on the part of

those on the spot, guided by numbers that are promulgated by authorities such as the DHSS. When clinicians, administrators, authority members and politicians discuss these matters they often adopt a commonsensical, but alas, fallacious approach. Crudely put it can be stated thus, "if bed occupancy of any unit is less than 100% then that unit is inefficient and bed numbers should be reduced until bed occupancy approaches 100%."

You could adopt such an approach for British Rail. Even at rush hour less than 50% of the platforms at Waterloo Station are occupied by trains. Let us improve efficiency and cut the number of platforms until the occupancy rate approaches 100%. Sometimes this happens because of strikes or signal failures and the result is a queue of trains waiting to get into the station of infinite length. This is only overcome by cancelling trains—sometimes every train. Common sense withers under the impact of the queuing theory. Using queuing theory of a very simple type<sup>1</sup> we can develop the argument.

Let P be the utilisation factor which can be expressed by:

$$P = \frac{B}{A} = \frac{\text{average stay of a single patient}}{\text{average gap between the admissions of two consecutive patients}}$$

$$A = \frac{\text{bed numbers} \times \text{days in the year}}{\text{admissions required in each year}}$$

It follows that the probability of finding a free bed is  $1 - P$ .

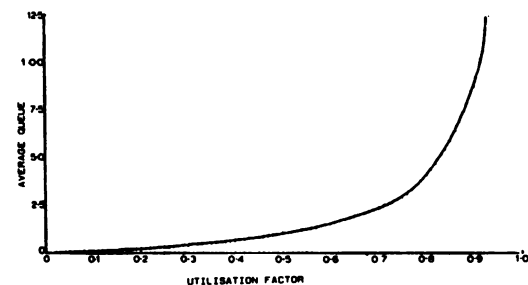


FIG. 1. Average queue size and utilisation factor

The average queue size is  $P/(1 - P)$  and the probability of queue size exceeding a prescribed length is  $P^n + 1$ . These are shown in Figure 1 and the relationship between P values and queue size in Table I.

Perhaps we could give some hypothetical examples: Let

P = utilisation factor

B = length of stay

A = average gap between the admission of consecutive patients

D = number of days in the year

G = number of admissions needed (required) each year

X = number of beds needed in unit

X' = number of actual beds in unit

Y = actual number of admissions each year.

TABLE I  
Relationship between P values and queue size

Utilisation factor (P)	Probability of a free bed (1 - P)	Average queue size [P/(1 - P)]	Average waiting time [B P/(1 - P)]	Probability of queue size exceeding	
				4 (P.5)	9 (P.10)
0.1	0.9	0.11	0.11B	0.000	0.000
0.2	0.8	0.25	0.25B	0.000	0.000
0.3	0.7	0.43	0.43B	0.000	0.000
0.4	0.6	0.67	0.67B	0.010	0.000
0.5	0.5	1.00	1.00B	0.031	0.001
0.6	0.4	1.50	1.50B	0.077	0.006
0.7	0.3	2.33	2.33B	0.168	0.028
0.8	0.2	4.00	4.00B	0.327	0.107
0.9	0.1	9.00	9.00B	0.590	0.348
1.0	0.0	Infinity	Infinity	1.000	1.000

Where B is average length of stay

*Example 1*

For a hypothetical unit let

B = 21

G = 400

D = 365

X' = 28

Y = 350

$$\text{Then } P = \frac{B \times G}{X' \times D} = 0.82$$

This gives an average queue length of 4 and an average waiting time of 84 days. Therefore some patients will in practice never be admitted.

The number of beds X required for P=0.6, i.e. for an average queue of 1.5 patients.

$$\text{If } P = \frac{B \times G}{X \times D} \text{ then } X = \frac{B \times G}{D \times P} = \frac{21 \times 400}{0.6 \times 315} = 38 \text{ beds}$$

If P is 0.75 then for an average queue of 3 the number of beds needs to be 30. The average percentage of beds occupied in a year is, with 28 beds, 72%. In the case of this hypothetical unit, with a utilisation factor of 0.82, it will have an average bed occupancy of 72%. This clearly illustrates that average bed occupancy is not a valid measurement of bed requirements.

*Example 2*

Let us take a 30 bed unit with an admission request or need rate of 500 a year and an average stay of 18 days. This unit

will have a utilisation factor P of 0.82 and the average queue length will be 4 and the waiting time 72 days. If the beds are reduced to 27, then P is 0.91 and the average queue length is 9 and the waiting time is 146 days. If the beds are increased to 33 then P is 0.75, and the average queue is 2 and the waiting time 36 days.

For P values above 0.75, the length of the queue is very sensitive to small changes in demand or small changes in bed numbers. Very serious waiting lists can occur with little provocation. In practice once the utilisation factor P is greater than 0.5 there are serious problems in finding a bed for immediate admissions. It can be seen that this argument applies with particular force to, say, an intensive care unit. If you have a utilisation factor much above 0.3 in intensive care units there is a serious risk that you cannot get your patient in when you need to. There are a number of intensive care units which are full up and there are queues waiting to get in which rather destroys the point of the exercise and makes one wonder whether an alternative way of providing the necessary care cannot be found.

It should also be noted that the expediency of borrowing beds between firms does not in fact alter the overall situation as you then calculate the bed needs, not for the firm, but for the service as a whole whether that be the service of the hospital, the district, the region or the nation. We need to discuss with each catchment area:

- (1) their ability to care for the patient other than as an in-patient;
- (2) their ability to reduce the length of stay to a minimal acceptable figure.

Once it is known under these conditions how many patients

require admission, then we can determine precisely the bed need for a variety of queue lengths. Once the acceptable queue length is determined then it is possible to negotiate with the health authority concerned either:

- (i) to supply the necessary beds.
- (ii) to advise the consultant they cannot meet this basic need and leave the consultant free to decide to carry on a service deficient in acute admission beds or for the consultant, perhaps, to cease to provide some aspects of his service.

I think this may make matter clearer to our readers.

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#### REFERENCE

<sup>1</sup>SINGH, J. (1968) *Operations Research* (Pelican Library of Business Management). Harmondsworth: Penguin.

(see page 398)

### ***DRCPsych***

DEAR SIRS

This year the College is introducing its new Part I examination for MRCPsych candidates. The new exam will be different from the old preliminary test in its emphasis on clinical skills while testing the knowledge of basic subjects will be incorporated into the new Part II examination.

In this context I would like to propose to the College that it should offer the successful candidates in the Part I examination, a Diploma of the Royal College of Psychiatrists (DRCPsych).

This will be very attractive for two groups of doctors. Firstly, those doctors who intend to go eventually into general practice but have chosen to gain an extended psychiatric experience. These doctors may find an additional qualification in psychiatry a real opportunity to promote their chances of getting into a suitable practice. Secondly, doctors from overseas who sometimes are not able to complete full membership within the time period allowed under Limited Registration by the General Medical Council will find it very useful to have at least some qualification before they return to their countries. At present, when faced with a (perceived) humiliating situation of returning home after a stay of five years without any further qualification, many choose to rather stay behind and do a non-medical job in this country.

This proposal, if accepted, does not call for any compromise on standards of examination and neither is it a totally novel proposition; the Faculty of Anaesthesia of the Royal College of Surgeons offers the DA to successful candidates in the FFARCS Part I examination.

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### ***A form of consent for mentally handicapped patients***

DEAR SIRS

In the seventies I was supplied with the form below by a medical defence organisation for use in the cases of mentally handicapped patients who could not give consent.

#### OPERATION AND TREATMENT IN THE CASE OF A MENTALLY SUBNORMAL PATIENT

I, ..... medical practitioner in charge of the treatment of ..... an in-patient at this hospital, understand the nature and effect of the operation or treatment proposed for him/her.

..... is suffering from a degree of mental subnormality which prevents him/her understanding the nature and effect of the proposed operation or treatment.

As the medical practitioner in charge of treatment for his/her mental condition, it is my opinion that in his/her own interests it is necessary that the operative treatment should be undertaken in spite of his/her inability to give any valid consent.

Signed .....  
Medical practitioner in charge of treatment

Date .....

In the *Bulletin* July 1986 (10, 184–185) the Section of the Psychiatry of Mental Handicap presented interim guidelines on consent by mentally handicapped patients. I have confirmed with my medical defence advisers that the form of consent above is still acceptable. The terminology can be updated by substituting 'mental handicap' for 'mental subnormality'.

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### ***Psychiatric discharge summaries in mental handicap settings***

DEAR SIRS

I was interested to see guidelines for comprehensive information in summaries of mentally handicapped patients with psychiatric illness (*Bulletin*, July 1987, 11, 228–229). I would suggest, however, that some World Health Organization's definitions used are inappropriate since the 1983 Mental Health Act, and that in particular a different word should be found for 'impairment', possibly 'defect' or 'pathology'. With recent legislation making mental impairment apply only to those with aggressive or seriously irresponsible behaviour who are detained, the connotations of using the word in other settings for informal patients could distort its intended meaning.

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