the routine measurement of serum electrolyte concentrations.

In conclusion, talking to patients during this study has taught me how much they appreciate a doctor who has taken a real interest in them as human beings, and who has been prepared to inform, explain, and answer any questions they might have. A patient summed this up by describing her feelings about one member of staff: "Mr X will talk to you. He doesn't make you feel that you're just another piece of furniture, he makes you feel you're an individual. I'd like to think that all doctors could be like that."

I am indebted to all the patients who took part in this study. I thank Mr W K Eltringham, Mr H J Espiner, Professor D Johnston, and Professor J H Peacock, of Bristol Royal Infirmary, for allowing me to interview patients under their care; Professor Johnston, now at Leeds General Infirmary, for help and encouragement in writing this paper; Mr P W Davies for help with the statistical analysis; and Miss J S Taunton for her secretarial skills.

References

- ¹ Cartwright, A, *Human Relations and Hospital Care*. London, Routledge and Kegan Paul, 1964.
- ² Hugh-Jones, P, Tanser, A R, and Whitby, C, *British Medical Journal*, 1964, **2**, 660.
- ³ Ley, P, and Spelman, M, *Communicating with the Patient*. London, Staples Press, 1967.
- ⁴ Committee on Hospital Complaints Procedure, *Report*. London, HMSO, 1973. (Davies Report.)
- ⁵ Waters, A, and Macintyre, I M A, *Practitioner*, 1977, **218**, 269.
- ⁶ Raphael, W, *Patients and their Hospitals*. London, King Edward's Hospital Fund, 1977.
- ⁷ *Which?*, January 1974, p 4.
- ⁸ Illich, I, *Medical Nemesis*. London, Calder and Boyars, 1975.
- ⁹ Solzhenitsyn, A, *Cancer Ward*. Harmondsworth, Penguin Books, 1971.
- ¹⁰ Egbert, L D, *et al*, *New England Journal of Medicine*, 1964, **270**, 825.
- ¹¹ Meadow, R, and Hewitt, C, *British Journal of Medical Education*, 1972, **6**, 317.

(Accepted 8 March 1978)

A reorganised medical division

J H FRIEND

British Medical Journal, 1978, **1**, 1676-1678

Hospital development in north Staffordshire was piecemeal before 1948; even after this the medical division existed in little more than name until 1967, when the physicians planned a reorganisation to improve the service and to use resources more efficiently.

This report describes the reorganisation and its effects. It was carried out against a hospital background similar to that found in many large British towns and cities. The difficulties therefore are common, and our solutions might be applied elsewhere.

The problem

The North Staffordshire Royal Infirmary, with 97 general medical beds, and the City General Hospital, with 170 general medical beds, lie a quarter of a mile apart. Most specialist units are at the infirmary, as is the only accident unit in the district. The psychiatric unit and the coronary care unit are at the City General Hospital. This disposition of beds, being fortuitous and historical, was hard to change, and any improvements had to be made with the existing beds. Interchange of medical and surgical beds was impossible without disturbing the balance between surgical beds and theatres.

It had proved impossible to provide room for all emergency admissions in the two wards allocated to the duty physician each day. Consequently, wards not on call had to accept emergency admissions, even though they were inadequately staffed for this. After a busy day seriously ill patients would be found throughout the medical wards in both hospitals. This imposed an intolerable demand on the nursing staff and made it difficult for the medical staff to provide satisfactory care.

All the wards fulfilled a multipurpose function for the physicians in charge of them, being used primarily for patients admitted as emergency cases (and later for their convalescence) but also serving a minor role for investigating and treating "cold" cases. Patients

admitted for cold investigation or treatment had to be inserted when possible into wards concerned chiefly with an emergency commitment. The mix of patients, each needing different degrees of nursing, served none of them well; added to the confusion were random, acutely ill patients. It seemed that if emergency medicine could be organised, then all else would follow and the whole medical division would benefit.

Reorganisation

The conventional ward, which had beds allocated to individual physicians and which attempted to fulfil these different functions, seemed to bar the rational development of both nursing and medical care. As a preliminary to total reorganisation of the service in general medicine the physicians agreed to abandon the allocation of beds to individual physicians. They also agreed that patients' needs would be met best by separating three areas offering different levels of care: (a) a high dependency unit (HDU), (b) an intermediate area, and (c) a planned investigation unit.

PLANNED INVESTIGATION UNIT

The planned investigation unit, which has 10 beds, is not the major concern of this report. It was formed by reallocating one medical ward and is staffed by a sister and an auxiliary nurse. The unit has worked well in the three years it has been open, and 411 patients were investigated in 1977. Its work is still increasing.

HIGH DEPENDENCY UNIT

A centre for the emergency service was created by the release of three of the six medical wards in a block at the City General Hospital. A pair of wards of the ground floor were adapted to make the unit. Each ward was redesigned to hold 14 beds and two beds in single rooms. A four-bed ward was made for intensive care. An x-ray department, added to the ward block, was planned to offer a comprehensive radiological service apart from arteriography and was equipped with a skull unit, moving top table, and a screening unit. All beds except those in the single rooms had monitor points with a six-channel console at the nurses' stations in each ward. Oxygen was piped to each bed and suction points were made to serve all beds.

Two bedsitting rooms were made for junior medical staff and

North Staffordshire Hospital Centre, Stoke on Trent
J H FRIEND, MD, FRCP, consultant physician

another for relatives and visitors of ill patients. A medical office and a store and repair room for electronic and other equipment were provided. A reception area was added to the entrance of the main building. It was intended to be an area where patients could be rapidly assessed before being admitted to the HDU or, if this was unnecessary, elsewhere.

Two house officers provide immediate medical cover for the unit. One is on duty for 24 hours, and the other helps with unusually heavy demands until late evening. A senior house officer, registrar, and consultant are also on duty for this unit on a 24-hour rota.

The numbers of nursing staff were agreed early in the planning stage: 10 sisters, 26 State registered or enrolled nurses, and 10 auxiliary nurses for the day and half as many for night duty—a total of 70. It was accepted that the unit would have its work done by a permanent, trained staff and that unqualified nurses would work there only for training.

The operational policy was decided before the HDU opened. The important general features were: (a) the HDU admits any patient at any time who needs its resources; (b) it admits all patients presenting as medical emergencies overnight; (c) it admits all patients with drug overdoses and poisoning; (d) patients remain in the HDU as long as they need to do so; (e) all other medical wards and special units admit patients when high dependency care is not needed; (f) the duty physician is in charge of the unit and sees all admissions at 0900, at the end of his duty period, and he can move any patient from the HDU to create beds there; (g) all physicians may use any other medical beds in general medical wards.

Results of reorganisation

Both wards of the HDU were opened by January 1975.

FIRST SURVEY

The first examination of the work of the unit was a retrospective survey of the admission records of the 5444 patients (2568 men, 2876 women) admitted from October 1975 to September 1976. The coronary care unit admitted another 785 men during these 12 months. The daily admission rate to the unit was 15 patients. Admissions per month varied between 397 in August and 557 in March (average 454 cases per month).

Altogether 1209 (22.2%) of the patients admitted were discharged direct from the HDU; 403 (7.4%) died there. Another 1146 patients were transferred from the unit by ambulance to the Infirmary, and the remaining 2686 patients were transferred to wards within the City General Hospital.

SECOND SURVEY

A more detailed survey was undertaken in the nine weeks from 24 January to 27 March 1977. A questionnaire was prepared by the computer department, completed by the nurses and clerks of the HDU, transferred to magnetic tape, and entered in the computer. Routine information obtained included: date of birth; sex; date and time of admission and of transfer, discharge, or death; the use of diagnostic services such as electrocardiography, radiography, and endoscopy; and various procedures such as transfusion, infusion of fluids, gastric aspiration, and lumbar puncture.

The nursing staff recorded the patients' nursing dependency according to whether they were seriously ill, needing all the care and

facilities offered by the HDU; moderately ill, yet within the capabilities of any adequately staffed medical ward; or needing minimal care. This crude assessment was obviously open to appreciable observer error.

Diagnoses were also broadly classified—cardiovascular, chest, alimentary, neurological, renal, and other unclassified diseases. Patients who suffered from self-administered overdoses and those admitted on social grounds were recorded separately.

Number of admissions—In the 63 days the HDU admitted 937 patients (459 men and 478 women). Over a year this would amount to about 5428 cases. An average of 14.87 patients (range 4–26) were admitted daily. More were admitted on Mondays and fewer on Thursdays and Saturdays (17.2, 12.5, and 12.0 admissions respectively). This variation was of little practical importance, though significant statistically ($\chi^2 = 15.187$; $P < 0.02$). The figure shows that the admission rate rose sharply from 8 am to noon, was maintained during the afternoon, and fell slowly until midnight. In the eight hours from midnight to 8 am only 168 patients were admitted in the nine weeks surveyed, an average of 2.6 cases each night. Day-to-day variations in numbers of admissions showed no pattern. The autocorrelation coefficient between admission on successive days was 0.02—not significantly different from zero. Admissions after an unusually heavy day were evenly divided between another heavy day and a lighter day. Predicting the volume of emergency medicine was impossible. But extreme numbers of admission were few: on nine days there were 10 or fewer admissions and on six days 20 or more. Thirty-five per cent of patients were admitted through the accident unit, the others being accepted direct from their general practitioners. Altogether 280 (30%) patients were aged 70 years or more and 482 (51.4%) were aged 60 years or more. Of the 455 younger patients 169 had suffered drug overdoses or poisoning.

Diagnosis—Table I shows the frequency of the diagnostic groups and the sex of the patients. As expected, women were predominant only among those with drug overdoses. With cardiovascular disease men would have been in the majority if those admitted to the coronary care unit had been included in these figures.

Nursing dependency—This was assessed as high in 253 (27%) cases, moderate in 498 (53%), and low in 187 (20%). Of those with a high dependency on admission, 139 (55%) had improved to the moderate group or died within 24 hours. Seventy-two hours after admission only 19 (7.5%) of the original 253 high-dependency cases remained

TABLE I—Diagnosis, sex, and outcome

				Diagnosis							Total	
				Overdose	Cardiovascular disease	Chest disease	Alimentary disease	Neurological disease	Renal disease	Social disease		Other
				Sex								
Men	..	..	..	71	111	95	54	76	8	12	32	459
Women	..	..	..	114	132	68	33	66	5	13	47	478
				Outcome								
Transferred	..	..	..	29	180	140	72	115	11	18	54	619
Discharged	..	..	..	153	37	15	13	9	1	5	15	248
Died	..	..	..	3	26	7	2	19	1	2	10	70
Total				185	243	162	87	143	13	25	79	937

so. Of the 186 patients who needed minimal nursing care 116 were admitted suffering from self-poisoning. All such patients were sent to the HDU. Of the other 70 cases, 34 were admitted overnight, as operational policy dictated; so 36 patients were admitted wholly incorrectly to the HDU. The proportion of high-dependency cases admitted each day varied from 21.3% on Saturdays to 32.7% on Thursdays. On Mondays the total intake was greatest, and 23.9% of the patients admitted then needed intensive nursing. There was, however, no statistical proof of significant correlation between size and quality of intake ($\chi^2=9.25$; $P<0.5$).

Disposal—Seventy patients in the HDU died, 45 from cardiovascular or neurological disease (table I). Only 10% of deaths were caused by respiratory disease. Only 153 of the 248 patients discharged direct from the HDU had taken an overdose of drugs.

Length of stay—Direct discharges were made rapidly, 84.7% within 48 hours and over half of these within 24 hours of admission (table II). The length of stay varied with the diagnosis but the small numbers precluded analysis. No group had special need for longer use of the HDU.

TABLE II—Length of stay

Outcome	Total	(%) Remaining in HDU for less than:			Approximate mean length of stay (days)
		1 day	2 days	3 days	
Transferred ..	619	27.8	67.4	85.5	2.3
Discharged ..	248	46.8	84.7	94.8	1.8
Died ..	70	51.4	75.7	91.4	1.9

TABLE III—Investigations performed on patients in HDU

Procedure	No of patients	Procedure	No of patients
Monitored ..	204	Endoscopy ..	38
Barium studies ..	16	Transfusion or infusion ..	152
Other x-ray investigation ..	631	Lumbar puncture ..	18
ECG ..	607	Stomach washout ..	170
EEG and/or scan ..	20		

Use of facilities and services—About two-thirds (69%) of patients had at least one radiological examination and 65% underwent electrocardiography (table III). The relative infrequency of other investigations was remarkable. Altogether 204 (22%) patients were monitored. The use of monitoring varied with both diagnosis and the degree of nursing dependency: 60.1% of those with cardiovascular disease and 15.1% of those with drug overdoses were monitored, and together they accounted for 85% of all patients monitored. Altogether 31.6% of patients with high nursing dependency were monitored, 21.7% of those with a medium dependency, and 8.7% of those with low dependency.

Discussion

The reorganisation of the medical division has proved a success. The increased ease of work for medical staff was appreciated immediately and resulted in greatly improved patient care. Nursing staff found the benefits of the scheme equally rapidly, despite there being little more than half the original number of nurses on the HDU.

The most unexpected result of the detailed survey was the true size of the problem of seriously ill patients. Many mistakes made in the planning of the HDU and its equipment and staffing stemmed from our ignorance of this point. When all emergency admissions were collected together, it became clear that relatively few patients needed high-dependency care and that those who did needed it for only a short time. Many of the problems of emergency medicine seem to be created by the dispersal of emergency admissions to many wards, and many of the difficulties may be removed by concentrating this work in a specialist unit.

I thank my colleagues Dr G M Aber and Dr W van't Hoff for their advice and help; and Mr H J A Norman and Mr D Thompson of the computer department, and the nursing staff of the HDU for their help and co-operation.

(Accepted 3 March 1978)

Is the habit of sucking tobacco, by placing a small wedge of "thick twist" tobacco between gum and cheek, hazardous?

Known carcinogens including carcinogenic polycyclic aromatic hydrocarbons¹ and N'-nitrosonornicotine² have been identified in raw tobacco. Cancers of the mouth associated with the chewing of tobacco mixed with betel, or lime, or both, are well known in Asian countries.³ The site of origin of the cancer often coincides with that at which the quid is habitually kept. It is not clear to what extent the hazard relates to tobacco per se or to what extent it is due to impurities in oriental tobaccos or to carcinogens in the other materials with which tobacco is usually mixed (for instance, betel). It would be unwise to assume that this way of sucking tobacco would carry no risk of developing cancer of the mouth. On the other hand, compared with cigarette smoking, the habit would certainly carry much less risk of cancer of the lung and none of disabling chronic bronchitis or emphysema.

¹ Campbell, J M, and Lindsey, A J, *British Journal of Cancer*, 1956, **10**, 649.

² Hoffmann, D, *et al*, *Science*, 1974, **186**, 265.

³ Samuel, K C, *et al*, *Journal of the Indian Medical Association*, 1969, **53**, 179.

Does leprosy fulfil Koch's postulates?

Mycobacterium leprae is generally held to be the causative agent of the disease called leprosy, though strictly speaking, this organism has not yet fulfilled all four of Koch's postulates:

(1) *M leprae* is present in the tissues of all patients suffering from active leprosy so diagnosed by a competent clinician, but the concentration of the organisms in the tissues varies within the widest limits. In lepromatous leprosy, the dermis, the mucosa of the upper respiratory tract, the peripheral nerves, and deep organs (such as bone

marrow, lymphatic nodes, liver, etc) may contain abundant organisms, whereas in indeterminate and tuberculoid leprosy they may be extremely scanty and found only in degenerate form in dermal nerve elements.

(2) *M leprae* has been "isolated from the tissues of leprosy sufferers," but has not yet been cultivated outside the human body "for several generations" in pure culture. None of the claims to successful culture has been confirmed or generally accepted as satisfying the stringent criteria laid down.¹ This, the second of Koch's postulates, has therefore not been fulfilled.

(3) *M leprae*, however, has been successfully cultured in the mouse footpad (immunologically normal, or rendered incompetent by thymectomy and whole-body irradiation)² and in the armadillo.³ Organisms obtained after serial passage in either mouse footpads or armadillos will produce a lepromatous-like disease in about 40% of inoculated armadillos. In this sense, therefore, the second and third of Koch's postulates may be said to have been essentially fulfilled.

(4) *M leprae* has been isolated from the inoculated armadillos that show the typical lesions of lepromatous-like disease.

¹ Pattyn, S R, *Bulletin of the World Health Organisation*, 1973, **49**, 403.

² Shepard, C C, *Journal of Experimental Medicine*, 1960, **112**, 445.

³ Kirchheimer, W F, and Storrs, E E, *International Journal of Leprosy*, 1971, **39**, 693.

Is amnesia a recognised side effect of nortriptyline?

The prolonged use of large doses of tricyclic antidepressants may produce reversible interference with short-term memory.¹ In the context given, both depression and the use of barbiturates may contribute to this effect.

¹ *British Medical Journal*, 1974, **2**, 49.