

# MEDICAL PRACTICE

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## *Hospital Topics*

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### **The Manchester Royal Infirmary Programmed Investigation Unit**

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The Programmed Investigation Unit (P.I.U.) of the Manchester Royal Infirmary is an inpatient department providing facilities for all tests used in medicine. There are two special features of the unit: the timing of the admission of patients to suit their convenience; and placing of the tests in a compatible rapid sequence, which is incorporated in a timetable agreed with the investigative departments. This is an alternative to the usual pattern of waiting-list management, in which the availability of beds is the sole determinant of the admission date. In this traditional pattern investigations are usually requested after admission, and sometimes their full compass or the main purpose may not be fully grasped by the house staff until the next formal ward round. The investigations are then subjected to delays because of poor communications within the hospital and of the difficulties in the departments themselves. For the "cold" medical case admitted for investigation and diagnosis, the actual time spent by the patient in active investigations is surprisingly short in relation to the total duration of hospital admission.

The proper use of hospital facilities and the convenience of patients demand that some attempt should be made to time admissions more carefully. This article describes a solution of the problem, which is characterized by a novel and advanced use of nursing skills and based on three assumptions which have been proved in practice. Firstly, the first generation of investigations can be predicted after the initial outpatient consultation and screening procedures. Secondly, in most cases, the first

generation of investigations includes all the major procedures required in a particular case—that is, those subject to the constraints of waiting lists in service departments. "Second generation" tests, which derive from the results of the first, are usually simple from the organization point of view—for example, venepunctures. The third assumption is that hospital doctors will modify their pattern of work in outpatient clinics to describe more accurately the purpose of admission and to predict the relevant investigations.

In 1969 we had the opportunity of using a ward in the Manchester Royal Infirmary for what has become known as the Programmed Investigation Unit (P.I.U.). The original title, "Five-day Ward," was soon discarded because it was misleading and drew attention to a relatively unimportant feature rather than to the benefits resulting from planning. For various administrative reasons the number of available beds has fluctuated between 20 and 26 but is expected to reach a final figure of 39 (12% of the total medical beds). There have been no changes in the basic philosophy; the only major development has been the erection of cubicles in the old "Nightingale" ward so that patients of both sexes may be admitted. Beds are not allocated to individual physicians; applications for admission are dealt with as they are received and the patients are admitted as soon as possible, or later if they wish.

#### **Operational Policy**

The following are the main features of operational policy:

(1) The patient population served is defined as that requiring the whole range of investigative medicine. At the time of admission all patients can dress themselves and eat in the adjacent refectory, and can be nursed in a minimal care area. Nevertheless patients can be intensively supervised if they are temporarily confined to bed after hazardous investigations, such as air encephalography or angiography, and after anaesthesia.

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#### **Manchester Royal Infirmary**

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(2) While the admitting physician retains full clinical responsibility for the patient, organization of the sequence of tests and selection of the admission date are left to the unit staff.

(3) The construction of each patient's programme and the search for a bed are done simultaneously (neither being valid without the other) by the ward sister aided by the physician in administrative charge of the unit. Each individual programme is fixed so that it is streamlined and coincides with the availability of a bed.

(4) When investigations are performed in rapid succession, the validity of the results may depend on the absence of interference between tests, or between a test and the preparation for the next—for example, a glucose tolerance test interferes with the fast leading to a barium meal. The production of satisfactory programmes depends on the sources of error being fully recognized. Several considerations influence the order in which tests are done and the minimum intervals between them. They may be classified as follows: *Intrinsic*—(a) Considerations of kindness or safety, and influenced by the patient's age and the complaint; (b) an estimate of the stress resulting from a test, which is often a matter of subjective judgement. This always affects (a) but may also affect biological criteria measured in subsequent tests—for example, air encephalography and adrenal function tests; a non-specific interaction; (c) the influence of the test itself, or of drugs administered during it, on other tests—for example, dexamethasone suppression and glucose tolerance, isotope incompatibilities, gastric biopsy and tests for intestinal bleeding; a specific interaction. *Extrinsic*—The compatibility between a course of action and the routine of ward administration, meals, etc. The date for admission depends on: (a) The patient's wish—for example, as soon as possible, or not before a specified date; (b) the work load imposed on the nursing staff by the total level of activity on the unit; (c) the availability of diagnostic facilities in service departments; (d) the availability of accommodation in the unit.

(5) The unit's policy is to perform a test according to any protocol desired by the admitting physician, provided the exact procedure has been clearly defined. When there is no special agreement covering the test a standard method is used, the protocol having been established with the help of diagnostic departments and with the approval of clinical specialists in each field; much effort is given to improving the instructions and bringing them up-to-date.

(6) Requests for major investigations and those concerning the whole field of radiology entail a degree of clinical responsibility inadequately met by a statement on the routine admission request. The x-ray cards must be completed at the time of the original application to the unit and the physician's signature is taken as evidence of his acceptance of responsibility. This irksome rule is also justified on the ground that he is fully aware of the indications and circumstances leading to the request and only he can provide the information demanded by the radiologist. Transcription errors are also avoided.

(7) The number of nurses is geared to the concept of minimal nursing care but recognizes the important need for a high proportion of qualified staff. The exclusion of patients who are confined to bed by illness is in line with the modern concept of progressive patient care and also allows the staff to concentrate their energy and thoughts on the techniques of investigations, thus promoting a high standard of accuracy.

(8) The unit explains to each patient the general nature and sequence of the investigations, the pattern of co-operation needed, and the possible date for discharge. He is also warned of any effects the test may have on his comfort and wellbeing. We have found that this explanation is always desirable, improves all aspects of work, and is well done by specially trained nurses.

(9) The rapid performance of the investigative ritual might survive all criticism on the ground of economy alone. Nevertheless, it would have little merit if it failed to accelerate diagnosis and treatment, and so we try constantly to speed up the flow of reports and to present them to the medical staff. Highly significant data, thought to imply decisions on further investigations

(second generation tests) and therapy, may be telephoned to the physician.

(10) The unit has not discharged its duty until the patient's dossier contains a report on all the requested investigations and the completed document has been returned to the admitting physician.

## Management

### REQUESTS FOR ADMISSION

The initial documents for any patient's admission are the request-for-admission form and the completed x-ray cards. Vague statements, such as "blood tests," are not accepted and the forms are returned to the issuing doctor for more details. The unit acts only when there is no doubt about the nature of the requests. Since the purpose of the unit has become fully understood fewer difficulties have arisen over this demand for explicitness.

### SCHEDULING OF INVESTIGATIONS

Planning the sequence of investigations demands consideration of the constraints outlined in operational policy no. 4. We need the full co-operation of the booking clerks in the diagnostic departments when matching the various parts of the programme. Alternatively, several test appointments may be allocated to the unit which, if not used, can be returned to the common pool in time for distribution to other departments. The method used is influenced by the preference of departments and by the frequency of demand for particular investigations. The clinician must also be fitted in when he has a role in the investigations rather than in clinical management. He may be required to perform a lumbar puncture or a sigmoidoscopy but his commitment to the unit need not be timed in advance, with the precision there must be for an appointment for a barium meal. The solution lies in a general agreement with the clinical teams that some procedures will be performed on specified mornings and afternoons; the exact timing can then be arranged when the patient has been admitted. Requests that patients should be available for regular teaching sessions are considered in planning the course of events.

When the programme is completed the details are entered on a programme card and displayed, using a code number which represents either a specific test or a group of tests with common organizational features, such as blood tests. Both the patient and the physician are given the admission date, usually one to three weeks in advance. In future we hope to include a reply-paid postcard to enable the patient to decline or defer admission, to prevent the wastage of diagnostic facilities and beds. Scheduling is done daily as requests for admission to the unit accumulate and is rapidly completed, since patterns of requests are soon discerned. We have resisted the temptation to produce packaged programmes for particular conditions though, in many cases, these would prevent omissions which need correction later. The lack of incentive for learning, which is inherent in such a system, seems a serious objection to developing it. Nevertheless, we have introduced by agreement with the clinicians some initiative when safety is a major consideration. For instance, the admission of a patient for percutaneous hepatic or renal biopsy leads to the automatic performance of haematological screening procedures.

The display board in the office which contains the patients' records greatly helps the nursing staff who refer to it frequently. It provides information on the length of individual programmes and indicates the tests to be done daily on each patient. It is also used by visiting medical staff who can briefly consider the investigations to be performed before seeing their patients. The partially completed programme for the next three weeks is also available. Some types of treatment—including starting anticoagulant or insulin therapy, regular blood transfusions, and

cytotoxic therapy—are well suited to this pattern of working even though virtually no investigations have to be done. The latter are frequently handled as day cases. Patients are rarely scheduled to be admitted for two weeks, though they may be if the tests have to last longer than usual.

#### THE WORKING WEEK

Most patients arrive on Monday and fill all the available beds. They undergo simple tests and most of them are then reviewed by the medical staff, who may amend the programme. Additional tests can usually then be done if they are simple and can be accommodated. For example, while blood tests and simple x-ray examinations are frequently arranged, further major radiological or other procedures are rarely possible, but the unit arranges for them to be done later. For many tests of intermediate complexity which are performed elsewhere in the hospital the final decision on whether the programme should be extended rests with the investigative departments; consultation may be necessary unless the unit staff are sufficiently well informed to anticipate their response. Owing to her duties in scheduling, the ward sister is in continual communication with all diagnostic services. The major investigations that are the principal reason for the admission are usually correctly requested and appropriate. On some occasions the clinical picture has changed since the patient attended the outpatient clinic and the main procedures, usually radiological, have become irrelevant or hazardous; cancellations are, however, infrequent but the possibility exists, and underlines the importance of reviewing the problem on admission.

The second day is characterized by a considerable movement of patients throughout the hospital which must be foreseen because of the need for extra portering staff. Though many patients remain in the unit throughout the week, some are discharged on Wednesday and Thursday and are replaced by others scheduled for a stay of one or two days. Lumbar punctures, tests of gastric function, x-ray examinations, and other procedures that do not need a long period of recovery are conveniently performed in the second half of the week. These short-stay patients tend to enter hospital for a specific investigation rather than for the whole diagnostic process. The daily routine is for most patients to dress and congregate in "recreation areas," one of which also serves as a refectory. Others remain in bed while tests are performed or are called to a suite of "procedure rooms," which have been adapted for the convenient performance of venepuncture, paracentesis, lumbar puncture, sigmoidoscopy, etc., and for confidential interviews. Simple venepunctures are done by nursing staff, but other procedures may demand the attendance of the house staff. Patients returning from investigations performed elsewhere may need intensive supervision for varying periods of time (see above).

The unit assumes responsibility for organizing every predictable event during a patient's stay but it has no role in clinical management. The admitting physician has the same relationship to the patient as he would have in a general ward, but because of the speed of investigations, he must monitor events more often than he would normally. Many of the advantages of rapid investigations are lost if important decisions are delayed. Nevertheless, this requirement may be met in different ways and be modified according to local circumstances and preferences. One solution is for ward rounds to include a visit to the P.I.U. and for a member of each clinical team (senior house officer, registrar) to be nominated "linkman." His duties include a daily visit to the unit to familiarize himself with patients belonging to his clinical group, deal with unexpected situations, prescribe medication, and act as courier when returning information indicates important pathological findings. Previous medication is continued when relevant. Drugs are self-administered and we take any opportunity to uncover errors of dosage or general management.

#### THE DISCHARGE PROCEDURE

Often the diagnosis crystallizes sufficiently towards the end of the programme to allow preliminary or final conclusions to be drawn—for example, discharge to the care of the patient's own doctor, or referral to a surgeon, and the patient leaves the hospital according to the schedule. When the consultant has not specified the pattern of discharge and follow-up, or important results will probably be delayed, the records are kept at the unit until all reports are returned and the information is then forwarded to him. An outpatient appointment is made, to ensure a meeting between the doctor and patient and a clear end to the episode. When the requested second-generation tests are delayed or cannot be added to the programme we decide whether the patient should be rescheduled through the unit or treated as an outpatient. Some physicians may want a patient to be detained until a ward round; some latitude must be built into the programme to permit unpunctual discharge, and the ward sister soon makes allowances for the idiosyncrasies of each team. Late discharge, though unfortunate, is not necessarily a defeat for the system since one element cannot be scheduled: the time taken for new clinical facts to emerge and for doctors to appreciate the composite picture. Admission to a surgical ward for operation is an accepted route of discharge; transfer to a medical ward may be necessary because of deterioration in the clinical picture but, owing to the strict criteria for admission to the unit, this is rare.

#### Staff

The nursing complement consists of one sister, two staff nurses (S.R.N.), three State-enrolled nurses, one nursing auxiliary (part-time), one full-time clerk, and the usual orderlies and domestic staff. Night cover, which is essential if major investigations are performed, is provided by a State-enrolled nurse. Because of the five-day working schedule, the posts have been found suitable for married staff.

#### Performance

The unit functions for 46 weeks each year. Closure for holidays during August and Easter and Christmas is simple administratively and allows for maintenance work. During 1972, when 20 beds were in commission, 1,432 patients were admitted; of these 243 were scheduled for investigation under the care of surgeons. The remainder, 1,189 patients who were under the supervision of physicians, represented 22% of the total admission to medical beds, and half of the intake from medical waiting lists. The average length of stay was 2.4 days. Patients with simple programmes needing only a 24-hour admission are often received in the unit during the week after listing. The usual delay before admission, however, is two to three weeks, but when longer is due to external constraints such as the unavailability of earlier appointments in investigative departments, particularly in neuroradiology. Because individual programmes are prepared as soon as we get the request for admission, patients receive two to three weeks' notice of their date of admission. A provisional date for discharge is not given then since it remains at the discretion of the admitting physician, but the implications of five-day working are made clear.

The investigations are grouped under 72 headings, each representing either a single procedure or a series with common characteristics. Many of the list's features reflect the organizational peculiarities of the Manchester Royal Infirmary and may not be universally applicable. However, the following list shows the numbers of tests performed under various headings in March 1973. It excludes a large number of biochemical, haematological, and serological tests based on simple venepunctures, urine tests, and clinical observations—for example, blood pressure readings.

Cases for minor surgery are not accepted at the unit except those for biopsies. "Five-day" surgical wards have been

developed independently in the Gynaecological Hospital and the Eye Hospital of the United Manchester Hospitals.

Air encephalogram .. .. .	6	Sigmoidoscopy .. .. .	30
Carotid angiogram .. .. .	8	Jejunal biopsy .. .. .	10
Myelogram .. .. .	10	Renal biopsy .. .. .	10
Cholecystogram .. .. .	6	Pentagastrin test meal .. .. .	27
Inferior venacavogram .. .. .	4	Insulin test meal .. .. .	18
Barium enema .. .. .	32	Liver biopsy .. .. .	20
Barium meal .. .. .	28	Synacthen test .. .. .	25
Chest x-ray examination with Barium Swallow .. .. .	20	Glucose or insulin-tolerance test with growth hormone or cortisol assays and venous cannulation .. .. .	40
Cardiac catheterization .. .. .	25	Stabilization of diabetes .. .. .	4
Lumbar puncture .. .. .	20	24-hour urine collection .. .. .	41
E.E.G. .. .. .	12		

## Discussion

In this hospital the admission of some categories of patients with prearranged programmes of investigation has proved possible and helpful. The principle consists in asking physicians to predict the maximum patient requirements, and using this information. Increasing the total capacity of the inpatient medical services, and providing a pool of beds outside the mainstream of emergency work, have created a means for the regular and rapid performance of diagnostic work which is frequently otherwise disorganized by the changing demands for conventionally staffed and operated beds. For instance, a two-year waiting list for cardiac catheterization has been abolished. We believe that a unit of this nature does not affect the overall work load in diagnostic departments, though adaptation is needed to accept a new origin for requests, a different way of booking appointments, and if possible, a speeding up of reports. We can, in fact, control the amount of work sent to these special departments by varying the numbers and kinds of appointments given to patients. Absence of staff and other internal difficulties can be anticipated and diagnostic work can be directed towards specific waiting list problems.

A little work previously done on an outpatient basis may be deflected towards the unit but this affects mainly elderly people or those living some distance from the hospital who are attending for gastro-intestinal radiology or other tests in the fasting state. This improves the comfort of the patient since pre-x-ray preparation is more satisfactorily performed in hospital under the supervision of the radiologists; requests for repeat barium enemas have fallen considerably since the inception of the P.I.U. From the patient's point of view it is difficult to see any serious disadvantage and most patients have said that they were satisfied with the unit. Both the senior and junior medical staff have accepted the principle of planned admissions with an enthusiasm shown in the performance data. Each clinical team decides on the advantages and limitations of the unit's services in relation to its specialty and pattern of practice but after this, the selection of suitable cases becomes automatic and natural for each outpatient requiring admission. The system certainly causes an increase in the work of the medical staff but this naturally results from any scheme which improves bed usage. A close liaison with the junior hospital staff is very important for organizing

investigations that need their help, and for avoiding a clash of commitments.

General medical wards working alongside the unit inevitably feel the effects, since some of the patients who have light nursing requirements are removed to another area. The P.I.U. principle concentrates the performance of many procedures into one site, to the discouragement of their performance in general wards. This has provided one of the important and unpremeditated advantages of the system; a centre of technical expertise and excellence. Nevertheless, the range of experience offered to student nurses in conventional wards may be altered, and we strongly recommend that they should serve some time in the unit for training. In undergraduate teaching hospitals the range of opportunities offered to medical students may also be adversely affected unless the unit is regarded as an extension of the medical firms offering clerkships and, for the same reasons, the co-operation of house physicians must be assured.

The type of work undertaken is quite distinct from the activities of a "five-day" surgical ward, which require different facilities and orientation of nursing attitudes and skills. The management of scheduling is a suitable form of specialization for a senior nurse, though close association with a physician helps to create and maintain the correct ethos, the lines of communication, and the handling of personal relationships. We have been impressed by the number of scheduling problems requiring medical or nursing knowledge for their solution and would be unhappy to think of such duties devolving on a lay person.

Intensive co-operation between the interested physician and the nursing staff is particularly important in the early phase of development of a unit, when constraints are studied and the various interactions identified. At a later stage the code of practice is influenced by continuing co-operation between the staff and visiting physicians.

Interaction occurs between investigations or between a treatment and an investigation when the first either influences the features observed in the second, or interferes with the process of observation and measurement, such as effects diminishing with time. Specialists are usually familiar with such interactions in their own field but few would claim a broad knowledge of the subject. Under ordinary hospital conditions, when the sequence and speed of investigations are largely uncontrolled, some interactions may be unnoticed and may lead to misleading or inexplicable results. With the increasing advances in hospital medicine, and the pressures for rapid turnover, "interactions between investigations" should be studied more seriously.

We hope that this account of our adventure in medical organization will encourage others to experiment along similar lines while enjoying the same forbearance and encouragement as we did. To those who argue that such a unit is impersonal, we can only reply that it will bear that characteristic only insofar as that is the attitude of those who operate or use it.

We are indebted to Mrs. M. Parish for her loyal and most helpful service to the unit.