HOSPITAL TOPICS

Report on the Oxford Accident Service after 25 Years

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The comprehensive Accident Service in a teaching hospital dealing with all types of injury and under the general direction of an orthopaedic surgeon was pioneered in Oxford and opened in 1941. Twenty-five years in such an enterprise seems to afford an opportunity and a responsibility to take stock.

The Accident Service was planned in 1940 and established in July 1941. The purpose was to provide a unified service for treatment of fractures and all other injuries. At first some justifiable misgivings were felt among general surgeons who had been accustomed to treating accidents, but once the decision was taken there was generous co-operation, and before long it was clear to all that the Accident Service had been an important advance in the hospital scheme. The aim was to ensure direction and supervision for the "casualty" department, and an important implication of this aim was that that department should be incorporated in the Accident Service to ensure a uniformly high standard of treatment. The casualty department of British hospitals is often the point of major public impact, providing an important service, and at the same time being most vulnerable to criticism and censure.

It was decided that *all* the injured should be admitted to the Accident Service and that the special departments of the hospital should be responsible for the treatment of injuries in their own field. The majority of the injuries were known to be fractures and soft-tissue injuries, and it was appreciated that head injuries would make up a considerable proportion of those requiring admission. It was obviously desirable that these should be treated by those best qualified, and it was agreed by the late Professor Hugh Cairns that they should become the responsibility of the department of neurosurgery, though housed with the Accident Service. Burns and hand infections were included under the category of "accidents," the burns to be managed in close collaboration with the department of plastic surgery. Hand infections were included at the suggestion of the general surgeons. The conditions mentioned were the only ones to be treated in the Accident Service. The Accident Service house-officers carried out a sorting function when unexpected emergencies arrived arising from causes other than injury. Sixty surgical beds were set aside for injured patients, and a theatre was made available for inpatients—the "casualty" service was housed in one room and there was a small outpatient theatre. These, together with a small office for the surgeon in charge and his secretary, made up the Accident Service.

The staff consisted of the surgeon in charge (part-time), first assistant, two house-surgeons, and one secretary to deal with outpatient and inpatient records, etc. Those who were organizing the Accident Service hoped that it would provide a pattern for future development of services of this type functioning in a teaching or general hospital as distinct from an accident hospital started elsewhere at about the same time. It was thought that accident surgery did not constitute a specialty where other specialists were available, and that to achieve the

best treatments of all types of injury the injured should be dealt with in a general hospital.

The additional requirement of undergraduate teaching thrust on the hospital in 1940 by existing circumstances was also taken into consideration, and it was agreed that this type of accident service organization provided the best basis for teaching (and research) in this important field.

In an attempt to produce a factual survey of the working of a unit of this type it is necessary to make some record of the work done and to indicate the lines along which it has developed; also to record the difficulties encountered and the modifications that have been made over the years.

The attendances at the Accident Service are shown in Fig. 1.

FIG. 1.—Attendances at the Accident Service.

Outpatients

A review of the attendance at the "casualty" department of the Radcliffe Infirmary in 1940 indicated that most patients came as a result of injury but that a group attended, usually of their own volition, for other reasons. Two things thus became evident: (1) that those responsible for the treatment of minor injuries must also serve a sorting function and refer to the appropriate department those with other complaints; and (2) that general practitioners and the public should be educated to appreciate the function of the Accident Service, and not clog its wheels with patients who did not require hospital treatment or who should properly go to other outpatient clinics.

From a review of the figures it was evident that the casualty department had been used as a clinic and that patients had attended repeatedly. The average number of attendances per person for the year 1940 was 3.4. Unnecessary attendances were due to reluctance on the part of the casualty officers to refer the patients back to their own doctors and to lack of supervision of inexperienced doctors, particularly with reference to hand infections and minor fractures. These difficulties have

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been overcome by careful liaison with the general practitioners and the early return to them of patients with minor injuries; also by referral to the appropriate outpatient clinic of patients sent by them to the Accident Service department with other complaints; and by the establishment of a special clinic for hand infections run by the surgeon in charge of the service. All outpatient fractures were automatically referred to the daily fracture clinic so that a watch could be kept on the efficiency of the work and the supervision of the house-surgeons. Two other important factors in easing the working of the outpatient section of the service were: (1) that non-accident emergency cases were taken direct to the admitting department and were not the responsibility of the Accident Service, and (2) that the admission of all injuries to the one unit meant the elimination of delay while agreement was reached on which was the major injury.

The original one-roomed casualty department had been expanded by alteration of an old isolation/admission ward (Fig. 2). The plan works well, but the total floor space is only a little more than half that recommended by the Ministry of Health for the daily attendance.

Attendances have been reduced to 1.1 per patient (Fig. 3). We now do very little non-accident work—about 95% attend because of injury, and most of the others are visitors to Oxford. Continuous vigilance is necessary, as the tendency, particularly among new doctors in the district, is to use the service as the old casualty department. It is difficult to change the name. In spite of recommendations from the Ministry of Health, approved by the Board of Governors, "casualty" is used more often than accident emergency service.

Inpatients

The principle underlying the care of inpatients has been that all the necessary special skills should be brought to the patient.

THE UNITED OXFORD HOSPITALS

THE RADCLIFFE INFIRMARY
PLAN OF ACCIDENT SERVICE — OUT-PATIENTS DEPARTMENT

Fig. 2.—Radcliffe Infirmary. Plan of Accident Service—Outpatient Department: 1, Wet viewing. 2, Dark room. 3, X-ray. 4, Store. 5, Fracture room. 6, Examination cubicles. 7, Waiting-rooms. 8, Lavatories. 9, Linen. 10, Recovery. 11, Septic theatre. 12, Clean theatre. 13, Anaesthetic. 14, Sterilizing. 15, Plaster room. 16, Sluice room. 17, Doctor's office. 18, Sister's office. 19, Records office. 20, Curtained treatment area. 21, Dirty utility. 22, Entrance hall.

Fig. 3.—Total attendances and average attendances per patient.

Members of four or five different clinical teams might be attending the patient at the same time, the surgeon in charge, or his deputy, acting as co-ordinator. The administrative problems have largely arisen from the steady increase in the flow of patients, which has outstripped the supply of beds and services. This increase has been due not only to the rise in the number of injuries but to their greater severity and to the problems created by improved standards of treatment (Fig. 4). This last point applies particularly to severe head and multiple injuries,

Fig. 4.—Mortality rate of closed head injuries in a consecutive series of 4,000 cases. Oxford 1948-57.

where life is saved at the cost of a great deal of skilled hard work, particularly by the nursing staff, and a long stay in hospital for secondary surgery to fractures and other injuries. (Nearly 25% of the cases admitted have head injuries, and in one-third of these there are other fractures.) There is no problem relative to the management of straightforward fractures and injuries to extremities, which make up about 70% of the total number of admissions. The highest incidence of chest injuries for any year was 4% of the total, and 96% of these were first-degree injuries (Table I), the total mortality being 16%.

TABLE I.—Oxford Accident Service. Chest Injuries and Mortality Rate, 1961

Group	No. of Cases	Mortality per Group
I	96	0%
II	32	2%
III*	17	16%

* National mortality (U.K.) was 64%.

The average annual admission of burned patients is about 3 to 4%. For each burned patient admitted more than four are treated as outpatients.

Injuries to abdominal and pelvic organs make up less than 1% of annual admissions.

It will be seen from Fig. 1 that it has been possible to effect a reduction in the average length of stay. This came to the point where nearly three times the number of patients were put through the same number of beds in 1959, as compared with 1941. The average length of stay has been reduced to nine days, and has become too much influenced by the shortage of beds.

Staff

From the beginning it was decided that the residents appointed to the Accident Service should be responsible for the care of both inpatients and outpatients. It was felt that this would increase the value of their training and would offer a much wider field of interest for all the trainees. The policy in relation to junior staff has been to offer responsibility in proportion to experience and ability, and to emphasize that help

and advice are always readily available and must be used. In 1941 there were two house-officers and one chief assistant. This establishment has gradually increased to the present one of five senior house-officers, three registrars, and two senior registrars. There has been a variety of methods of sharing outpatient and inpatient work—the present method, which seems to be the most satisfactory, is that the house-surgeons spend two months in the outpatient department and four months dealing with inpatients, two being spent on head injuries and two on general injuries. The registrars are directly responsible for the supervision of outpatient work, and the senior registrars for the supervision, under the direction of the consultants, of the work of the service as a whole. There is, as well as the service for new patients, a daily fracture clinic, to which all inpatients and outpatients with fractures and similar injuries are sent for follow-up, and a weekly hand clinic.

Over the years a pattern has been evolved with regard to trainees. About half the house-officers go into general practice—the other half take the post as part of surgical training, often because such a post is required by the Royal Colleges before the candidate can take the final examination for the Fellowship.

Almost all the registrars have been Fellows of one of the Royal Colleges, and have continued in some form of surgical training. A considerable number have come from overseas to take this training as part of their preparation for the practice of orthopaedic or general surgery where that includes the treatment of injuries. Apart from temporary problems of illness, etc., there has never been any difficulty in obtaining residents. The senior house-officer posts are filled by direct application, and there is a list of advanced bookings. Registrars have in recent years included consultants from Canada, Israel, Singapore, and the R.A.F. for a year's special training in this field.

The senior registrar posts are recognized training posts in traumatic and orthopaedic surgery, and are linked with the Nuffield Orthopaedic Centre. Candidates spend successive years at the two hospitals, which are three miles apart. They are given responsibility for care of the patients and administration of the unit, advice and supervision always being available. Since the war there have been 19 senior registrars, all of whom are now consultants in orthopaedic and accident surgery.

Consultant Staff

The purpose of the organization was to use all the clinic departments in proportion to the demands that would be made on them in the treatment of injuries in their own field. From one "part-time" orthopaedic surgeon and the occasional use of all other consultants, the specific attachment of consultant staff to the Accident Service has grown to 12 weekly sessions from three orthopaedic surgeons (one of whom is always on duty), four sessions from a neurosurgical consultant, and one session from a plastic and facio-maxillary consultant. No other medical or surgical specialist has specific time allotted on a sessional basis for accident service duties. This is the outcome of regular assessment of clinical duties. No other department is called upon to the extent of a weekly session. This does not take into account the medical ancillary services. Heavy demands are made on the radiologists, anaesthetists, haematologists, and biochemists, amounting to many hours of consultants' time each week. There is an accident service duty roster in neurosurgery, in facio-maxillary and plastic surgery, and, for those in the respiration unit, for severe chest injuries.

Records

An effective records system was thought to be an essential feature of the day-to-day management of a service of this type—quite apart from the contribution to teaching and research which might be derived from the mass of clinical material avail-

able. The one full-time secretary has been increased to five, and the weight of clerical duties in the wards has been met by the appointment of clerks in the two main wards. Clerical assistance is also provided until 10 p.m. each day, including weekends, in the reception-room. With the exception of the notes made by the senior house-officers on reception, all inpatient and outpatient records are dictated and typed, and dictating machines have been used at the daily fracture clinics for 13 years. The first duty of the senior registrar each morning is to go the round of all patients in the unit, arranging continuing treatment, discharges, etc. A portable machine is used on these rounds for notes, discharge letters, etc. The use of recording machines has proved an economy, and has materially improved the standard and legibility of notes. A diagnostic index of both inpatients and outpatients is kept and the translation of relevant data to punch cards has made the clinical records available for analysis. Part of the duties of the registrars is to indicate on the notes the diagnosis, complications, procedures, etc., which will be translated to the punch card along with information about the injury, referral, transport, etc. This has made it possible to provide valuable statistics relative to the work of a unit of this type, and these have been made available to all the major committees reporting on accidents and accident service organization.¹

Teaching and Research

There has been no research budget available to the Accident Service. Ad hoc grants have been made by the hospital from time to time.

Medical students, in groups of about six, have been attached to the Accident Service for the three months during which they were also doing special subjects, and, in addition to ward teaching, have had tutorials covering the whole field of accident surgery. This is mainly practical instruction in what is to be done for injuries and why. The constitutional problem of the reaction of the body to injury should be taught in the pre-clinical period and followed up in postgraduate study. In this way the inquiring approach to the problem can be stimulated and pursued. The Accident Service has been for these purposes a part of the department of surgery. Postgraduate teaching was in the early years principally for war purposes, but the increasing importance of accident surgery since the war has produced an increasing number of requests for appointments, and applications from visitors interested in organization and methods.

In common with other branches of surgery, research efforts have been hampered (at all times) by lack of facilities and funds. The emphasis has been on clinical research, partly because it is cheap and partly because any service of this kind with effective records rapidly builds up a volume of clinical material by means of which it is possible to increase our knowledge of the natural history of injuries and the results of different methods of treatment. Since the war papers have been published on all varieties of fractures, burns, infections of the hand, head injuries, and chest injuries. That it has been possible to do these things was largely due to the continuous interest and assistance of the Nuffield Provincial Hospitals Trust, which contributed to the cost of establishing the Accident Service and has given £10,000 for research purposes during the past ten years.

Examples of projects which were carried out with this and the help of ad hoc grants to individuals working in the Accident Service were: (1) burns unit established by the Medical Research Council in 1941 under Dr. J. M. Barnes; (2) the development and popularization of the crash helmets started by Sir Hugh Cairns and continued by his department after the war²; (3) investigation of the bacteriology of open wounds under plaster³; (4) investigations by Mr. A. J. Buhr and Dr. A. M.

Cooke⁴ into the fracture patterns; and Dr. L. Dewes and Dr. Michael Wright's⁵ work on pH in the fracture haematoma, the M.R.C. unit now working on coagulation patterns in "traumatic" shock. Apart from these special projects members of the junior staff have been encouraged and assisted in the assembling and assessing of clinical material, and this has led to the publication of 80 papers.

No satisfactory research programme can be pursued without an annual income for this purpose. There is no doubt about the need for advancement of knowledge on many fronts in this field, as well as the dissemination of existing knowledge which is not applied.

Organization

The pattern of accident service organization described suits a teaching or general hospital serving a population large enough—at least a quarter-million—to require all the special departments. It can also provide certain central facilities for peripheral accident services. In general hospitals where certain special departments do not exist more may be demanded of the surgeon in charge of the Accident Service. This will mean, in fact, his dealing with the immediate treatment of head and chest injuries and perhaps facio-maxillary injuries. This limiting process would continue through decreasing size of community and hospital until the size of unit was reached which supported only one surgeon—this is the place of the "traumatic" surgeon.

The logistics relative to beds, floor space, and equipment have all been thoroughly worked out and recorded.¹ This should be read as a guide and not an instruction.

There are many points of detail in which departments should differ, but in outpatient departments the general pattern of flow of patients is important, as is the provision of adequate floor space and special facilities for cleaning, isolation, and resuscitation. This will also permit some privacy for adults and children. Provision of x-ray facilities in receiving departments is essential.

The only problem in medical management relates to the division of responsibility and applies to the injured who require the attention at the same time of more than one special department. As medical specialties become increasingly interdependent this situation is met more often. That the surgeon equipped to treat the majority of the injured is the one to direct the service has proved to be sound practice.

It is important to concentrate on the two margins of the clinical problem. Ninety-one out of every hundred patients who attend have only outpatient treatment (Fig. 3). Efficient treatment of these abrasions, cuts, burns, fractures, etc., presents the biggest social and economic problem. Unnecessary attendances, days off work, disruption of the household, etc., all must be avoided. Much of this work can be done by trainees and career doctors in grades less exalted than consultant, but close supervision and readily available advice are essential.

The other obvious problem is the potentially fatal injuries (Table II). The first step in dealing with these is co-ordination of ambulance services and direct communication between them and the Accident Service—an important point in the management of serious injuries. Direct R/T link has been established now between the Radcliffe Accident Service and ambulances in the area. This has involved establishing a new common wavelength for five ambulance services. Standardization of ambulance equipment has made it possible to reduce movement

of patients and time lost by the ambulance crews waiting for stretchers and blankets. The second step is the effective collaboration of all concerned, including ancillary services. The consultant, radiologist, anaesthetist, haematologist, etc., should play their part in keeping the patient alive. It must also be remembered that active treatment of the injuries from the start is an essential part of the life-saving operation. In spite of much loose use of the word "rehabilitation," it is probably the most important single step in this process. Therefore the person responsible for the treatment must be the co-ordinator of activities from the time of arrival. This requires good will and co-operation and an organization based on the concept that skills will be sought and applied irrespective of established lines of professional practice.

TABLE II.—Injuries (67) Associated with Deaths, 1965

Fractures around the hip (average age 80)	21
Severe head injuries (age 2-78) (9 had other fractures)	27
Severe chest injuries (2 had head injuries, 1 stab wounds)	5
Multiple injuries	9
Burns (age 70)	1
Single fractures (2 coronary thrombosis, 2 pulmonary embolism)	4

Pulmonary embolism mentioned as a cause of death in 6 and fat embolism in 1

The Accident Service, with its cutting across medical specialties, is from start to finish an exercise in planning, organization, and co-operation. Direction is of little value in obtaining the last-mentioned, but most worth-while people are attracted by the approach that everyone with something to contribute is welcome. It also has an important part to play in the education of the medical students, and in the postgraduate education of general practitioners and surgeons. One of the problems requiring repetition is that, in general terms, much of the treatment of injuries does not make use of modern methods because of inadequate staff, equipment, and accommodation, and the lack of dissemination of knowledge.

Summary

This is an analysis of 25 years of experience with a comprehensive accident service in a teaching hospital. The ideas behind the organization of the service are described with the method of their application. Accumulation of records on punch cards has made available a large mass of evidence for analysis covering both clinical and logistic problems. It has been possible by the concentration of patients in one service to improve the management of the patients as well as their treatment. The two principal problems from the medical point of view are the management (1) of the large number of minor injuries, and (2) the small number of killing injuries, most of which involve several systems. In social and economic terms the first is much the bigger. The type of organization described has proved to be satisfactory but requires positive direction and modification to suit changing patterns, and the co-operation and good will of the rest of the staff.

The accident service is likely to occupy a steadily increasing proportion of the hospitals of the future.

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