Major disaster planning

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Abstract

In 1983 a coach crash brought a hospital's major disaster plan into operation. The surgical aspects of the plan were assessed to see how well they matched up to three major aims: saving life, relieving pain and distress, and completing primary treatment of open wounds within eight hours of the accident. The last goal was not met for most of the 21 victims, mainly children with multiple deep dirty abrasions and extensive tissue loss. Having determined that none of the victims were in immediate danger the surgeons reassessed the priorities—in several cases disturbing dressings for a third or fourth time. The total time spent in theatre (in five theatres) was 37 hours, as opposed to the original estimated 10-15 hours.

The experience gained in this accident suggests that a disaster plan should indicate the number of patients a single hospital can admit and that a senior surgeon should act as a coordinator and get surgeons working as soon as patients arrive, keeping two theatres reserved for lifesaving surgery. In this way primary treatment of wounds may be completed within eight hours of injury and the risk of infection reduced.

Introduction

A major disaster plan is intended to provide optimum treatment of the victims of a major accident when there are too many patients to be dealt with by the routine emergency services. The surgeon responsible for coordinating the surgical services after a major accident may be doing this for the first and only time in his life.

The immediate primary goals of such a plan should be: (a) to save life; (b) to relieve pain and distress; and (c) to complete primary treatment of open wounds in all patients within six to eight hours of injury. While the speed required to succeed in the first two is generally recognised, the urgent need to get on with the third is, in my experience, not usually realised, despite its recognition in individual patients.

Unless primary surgical treatment—that is, wound toilet and where possible wound excision—is completed within eight hours of injury the patient is exposed to a greater risk of subsequent infection from within. If, as they must be, the wounds are left open they are also exposed to infection from without—for example, from ward cross infection or from wet dressings. Surgical treatment completed within six to eight hours does leave the surgeon with the admittedly controversial option of performing primary skin closure by suture or by grafting. Intact skin remains the body's best defence against infection from without. It may be the only means of covering exposed nerves, bones, and joints. Delayed primary closure is only partially safe and has disadvantages. An extra surgical procedure is inevitable and prolongs the inpatient stay. Joint mobilisation and rehabilitation may be delayed.

Early completion of the treatment of wounds therefore not only reduces the risk of infection in wounds left open, but also allows the surgeon to perform definitive primary treatment in selected patients.

In 1983 the major disaster plan at the Royal Devon and Exeter Hospital came into action after a coach crash. I analysed the effectiveness of the plan's surgical aspects in relation to these three primary aims, particularly that of early completion of primary treatment.

The accident: what actually happened

A coach travelling on the M5 motorway ran into the back of a lorry and then slid along the carriageway on its offside for about 80 metres. A teacher died in the accident, which occurred at about 6 30 am. Emergency services were on the scene within 10 minutes and by 7 00 am patients and hospital staff were arriving at the Royal Devon and Exeter Hospital, Wonford, the last patient arriving at 8 00 am.

The coach driver and 13 children did not need treatment. Six children needed outpatient treatment. Twenty one children and three adults were admitted. The injuries in the patients admitted were remarkably uniform, consisting of deep extensive abrasions, contaminated with road dirt and glass, on the trunk, limbs, scalp, and hands, often down to and including bone and joints.

By 8 30 am it was apparent that no patient needed life saving surgery and none appeared in great distress. Inevitably perhaps everyone relaxed a little. Because all 21 patients needing general anaesthesia had eaten or drunk something shortly before the accident occurred, the consultant anaesthetist took the reasonable anaesthetic view that surgery should not start before 2 30 pm.

Only about two thirds of the patients admitted had been seen by the orthopaedic consultant or senior registrar on call, the rest being seen by other surgeons. A discussion was held with the anaesthetist in charge, who gave a sympathetic ear to the explanation of the need to get on with the surgery. It was agreed to do a round of all 21 children to assess surgical priorities and fitness for anaesthesia.

This round lasted from 9 00 to 10 20 am and was highly satisfactory from the surgeon's point of view. In only one patient was there a request for delay. Six of the 21 patients were accorded immediate priority. Total theatre time needed was estimated at 10 to 15 hours.

There were about 100 separate dressings on the 21 patients, most of whom were comfortable. They were not at all keen on the idea of having their dressings disturbed during this round—in some cases for the third or fourth time.

The most serious missed top priority arising from an incomplete examination occurred in a child with a compound depressed skull fracture; this was beside an area of exposed dura that had resulted from abrasion of both tables of the skull, with glass and road dirt pushed between the dura and the inner table of the intact skull. She also had other injuries of middle priority. This child was the last to leave theatre, 18½ hours after the accident, and had to have a double scalp rotation flap to achieve cover of the dura.

Work in the first two theatres began at 10 30 and 11 00 am with the consultant and senior registrar on call operating until the day's end; as a result they were unaware until mid-afternoon that the estimated 10 to 15 hours' operating time was inadequate. Belatedly, a third theatre began work at 5 00 pm, a fourth at 6 15 pm, and a fifth at 7 00 pm. The last three theatres finished work between 9 00 and 9 40 pm and the first two at midnight and 12 45 am.

The total time spent in the theatre was 37 hours, and most of the patients, including some of those given top priority, came to theatre after 2 30 pm—more than eight hours after the accident.

All the surgeons agreed that wounds should be inspected under general anaesthesia 48 to 72 hours later. This time an attempt was made to assess and not guess at the theatre time required for each patient, and for each list, exactly as in elective surgery.

Five theatre lists were drawn up with the expected theatre time

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for each patient recorded on the list. Three quarters of an hour non-operating time was allowed for each patient. I assessed the operating time required for each patient, without making allowance for variation in speed of operating by individual surgeons. The estimated total theatre time for all five lists at this second procedure was 22½ hours. The actual running time of the five lists departed no more from the time assessed for them than elective lists normally do.

I applied retrospectively the calculation used for the second procedure to the first operation, in which the 21 patients had required 37 hours' theatre time and not the estimated 10 to 15 hours. By allowing three quarters of an hour non-operating time for each patient (total 16 hours), we were left with 21 hours of operating time—that is, one hour for each patient. While the actual operating time for individuals varied, an assessment based on three quarters of an hour of non-operating time plus one hour operating time per patient would have provided a far more accurate, immediate, and easy assessment of the overall need for theatre time in this major accident.

The accident: what should have happened

Accident prevention is better than cure. Any major disaster plan should allow for review in the light of the management of previous major accidents and a short explanation of their cause. Most accidents are avoidable—that is, not accidents.

Should all the survivors of the coach accident have been brought to the same hospital? The uninjured and minor injuries undoubtedly placed an additional administrative load on the hospital in dealing with extra queries from relatives and arranging transfers home.

The 21 admitted were certainly within the resources available at the hospital, though the major disaster plan did not in fact indicate the limits on the numbers or types of patients the hospital could take. In retrospect the three childrer with large areas of scalp loss, and the four with the most severe knuckle loss could to their potential, if not real, advantage have been transferred from Exeter to a neighbouring plastic surgery unit. Alternatively a neurosurgeon and a plastic surgeon could have been asked to come to Exeter. Few major accident centres have full comprehensive specialist services and the major disaster plan should recognise such limitations and obtain outline consent for referral.

Who should direct the surgery of victims of a major disaster? Ideally he should be a senior surgeon with perhaps military experience and a thorough knowledge of his hospital and regional resources. He should be able to free himself of all commitments at short notice for any day on which a major disaster occurs and be able to resist the temptation to operate so as to be free to receive reports on the condition of victims before and after operation. He will have much else to do besides.

How should he proceed once the major disaster plan is activated? By the time he arrives at the hospital, some patients and colleagues will have arrived already. He will probably receive an initially inaccurate report of the number of patients and of the severity of their injuries.

All routine theatre lists must be temporarily suspended. Experienced surgical colleagues offering their services should be invited to select two patients each, to organise their theatre team and theatre, and to start forthwith, but the theatre superintendent should be asked to hold two theatres in reserve for emergency lifesaving surgery until all patients have been assessed. Because non-lifesaving surgery is started immediately this inevitably means that it may run concurrently with life-saving surgery. But when, as in Exeter, five theatres could have been operational within two hours of the accident occurring and 10 theatres within four hours this concurrence is no problem.

In this accident valuable time was lost in trying to estimate the overall size of the problem and an order of priority before getting on with the surgery. Mistakes were made in both and had we simply proceeded as suggested on the basis of "first come first served," we could have completed the treatment of all patients within eight hours of injury.

Summary and conclusions

Firstly, a major disaster plan should provide for the completion of primary treatment of all victims within eight hours of injury, and should therefore specify the maximum number of patients who can be admitted, allowing one and a half to two hours of theatre time for each admission.

Secondly, the flow of patients to and through the accident service should follow through to the operating theatre, by working on the principle of "first come, first served," but two theatres should be held in reserve for emergency surgery.

Thirdly, full and immediate use should be made of colleagues called out under the major disaster plan or they will disappear.

Fourthly, no attempt should be made by the surgeon directing a major disaster plan to see all the patients personally, or to assign priorities in a large number of patients because: (a) until the last patient has arrived and been assessed priorities cannot be assigned; (b) it is difficult to find all the patients who will be in or between the accident department, x ray department, and wards; (c) if the surgeon in charge examines all patients thoroughly, dressings are disturbed for a third or even a fourth time, which is distressing for the patient and time consuming for him; and (d) if the surgeon in charge makes a hurried incomplete examination he will also make mistakes.

Fifthly, the surgeon directing the surgical management of a major accident should stay out of theatre. He should free himself of all routine commitments that day until the last patient has left theatre. During the ensuing week, the further surgical needs of his patients, the interviewing of relatives, and the arrangement of transfers to hospitals nearer the patients' homes will leave little time for routine work.

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How much is known about the biochemical basis of addiction?

Our understanding of the biochemical basis of addiction, though still limited, has increased considerably during the past decade with the discovery of the endogenous opiate neurotransmitter system. Specific opiate receptors have been identified, and endogenous opiates—the enkephalins and endorphins of modern medical jargon—have been isolated. Tolerance develops to these endogenous opiates in vitro and in vivo and cross tolerance occurs between endogenous opiates and morphine. An abstinence syndrome may be precipitated by the opiate antagonist naloxone in rats dependent on endogenous opiates, and β-endorphin administered to human addicts relieves the symptoms of the abstinence syndrome. Nevertheless, changes have not been detected in the number of properties of opiate receptors in addicts or in the levels of endogenous opiates in animals treated with morphine.¹ So far as addiction to other drugs is concerned, we know even less. Specific benzodiazepine receptors have been identified in the brain and an endogenous ligand is being sought. Other sedative hypnotic drugs, such as barbiturates, activate drug metabolising enzyme systems in the liver so that larger doses are required to produce the original effects. Amphetamines and cocaine mimic the effects of the body's own catecholamines. These fragments of knowledge, however, do not address the central problem of the reinforcing (rewarding) properties of drugs of addiction—of what happens at a cellular level to account for their repeated administration. Recent experiments, albeit on rats, have suggested that the rewarding properties of opiates may share a common neural substrate, involving a dopaminergic mechanism, with other sources of reward such as food and water.²—A H GHODSE, consultant psychiatrist, London.

¹ Simon EJ. Recent developments in the biology of opiates: possible relevance to addiction. In: Lowinson JH, Ruiz P, eds. *Substance abuse: clinical problems and perspectives*. Baltimore: Williams and Wilkins, 1981.

² Bozarth MA, Wise RA. Localization of reward-relevant opiate receptors. In: Harris LS, ed. *Problems of drug dependence*. NIDA research monograph No 41. Rockville: US Department of Health and Human Services, 1982.