

PRINCIPLES FOR FIRST AID
FOR THE INJURED

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SECOND EDITION

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PREFACE TO THE SECOND EDITION

Since the first edition of this book there have been striking changes in the joint manual of the voluntary First Aid societies and a working party has recommended a much higher standard of training for ambulance crews, for which the term 'Ambulance Aid' is being preferred in some quarters to 'First Aid'. The changes concerned are in the matters of detail and range; they do not depend upon changes in the principles upon which rest the properly varied practices of, for example, boy scouts, uniformed members of the voluntary First Aid societies, ambulance crews, miners, mountain rescue parties, nurses and doctors when they carry out the first useful treatment of someone who has suffered injury or sudden illness.

The changes in this edition reflect changes in knowledge, particularly of drowning and of exposure, and the introduction of the principle of pneumatic support for injured limbs. In the revised chapters dealing with shock and injury we have tried to emphasize that shock is a term that should not be applied indiscriminately and thoughtlessly to practically all victims of injury but restricted to those changes that injury causes in the pattern of circulation and that are mostly dependent upon diminishing blood volume. In spite of the confusing range of senses in which the word shock is used and the belief that its erasure from the medical vocabulary would in the long term make for clarity we have retained the word because it is conveniently brief and because it can be defined for our purpose.

In closing this Preface we wish to acknowledge our indebtedness to those many persons at all levels of emergency services and First Aid and allied movements that have given us the benefit of their opinions, advice and experience.

Birmingham

H.P.
P.S.L.

PREFACE TO THE FIRST EDITION

This is not just another book about First Aid but is intended as an exposition of modern ideas and practices in the care of the injured and of the principles upon which they are based. The idea of the book was conceived by the late Ruscoe Clarke, whose experience of forward surgery during World War II, followed by twelve years at the Birmingham Accident Hospital, gave him an excellent appreciation of the needs of injured persons. His breadth of vision and his sure grasp of essentials led him to the conclusion that while these needs were widely acknowledged at humanitarian level their interpretation in practice lacked precision. This precision depended upon accurate knowledge of the advances that he outstandingly among others had helped to make in applying scientific methods to the treatment of injuries of all kinds. From the commanding position that his experience allowed him he was able to survey the whole field of the care of the injured and to recognize that he and his kind must accept the responsibility of pointing out deficiencies with the constructive type of criticism that enabled them to be made good.

His intense and unflagging interest in people as individuals directed his thoughts and activities towards the preliminary care of those who had suffered injury. He devoted much time to the subject of First Aid and received increasing calls for advice and assistance as lecturer, writer and examiner. His main researches since 1947 have done much to elucidate the nature and treatment of shock and haemorrhage, and to emphasize the need to recognize promptly that treatment may have to be immediate if lives are to be saved and recovery facilitated. The over-riding necessity is to avoid the delay that can readily jeopardize survival and curtail the successful application of advances in resuscitation, surgery and anaesthesia to the repair of injuries. This new emphasis on urgency has entailed acknowledging that the delay inherent in some traditional First Aid can at times exert an unfavourable influence on the effects of injury, especially serious injury.

His purpose in preparing this book was to offer the fruits of rich experience to those responsible for teaching and organizing in the field of First Aid and kindred activities. He sought to provide them with a sound foundation for a system of early care that could be applied with benefit by those without special skill

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or training: it had above all to be a logical precursor to the appropriate medical treatment. In this he was following the example of the originator of First Aid—Esmarch. He intended the book for medical men in the First Aid movement and for senior, non-medical teachers and practitioners in this field. It was to provide them with a synoptic and reasoned view of the diagnosis and treatment of injuries and to show how modern ideas and practices should guide the practice and teaching of First Aid, particularly in eliminating methods that have been, and may yet be, invalidated by the advance of ideas.

At the time of his death in the summer of 1959 Mr. Clarke had not proceeded beyond a draft of the outline of the book, which was to have been a joint work by himself and the senior of the present authors. Far from weakening this project, the death of its originator provided a stimulus for its fulfilment and the original plan has been retained with few modifications.

The term First Aid has been used throughout and it will be seen that it has been allowed two senses. In the first it means the practice approved by the voluntary aid societies; in the second it reverts to its original meaning of preliminary treatment. While we have used the form with capital letters we have sought by indiscriminate use of the two senses to emphasize our belief that there should be but one meaning of these two words.

The field covered is much greater than that customarily allowed to First Aid. First, new sorts and severities of injuries are now increasingly occurring and they pose new problems in diagnosis and treatment. Secondly, definitive treatment of severe injuries is more effective and more often successful than before—provided there is a living person to treat. Thirdly, in some conditions definitive treatment may be long delayed and preliminary treatment may necessarily be something more than makeshift patching up and prompt despatch to hospital.

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CHAPTER 1

INTRODUCTION

The exponents of First Aid are essentially enthusiastic people who have also a wish to be of service and assistance to their fellows in time of trouble. Enthusiasm is fostered, recruiting assisted and proficiency developed by lectures, demonstrations and, above all, by competitions and awards. These admirable and necessary activities have understandably concentrated on the more readily practicable parts of First Aid, which are as a result carried out competently when called for. Subtler but important aspects, such as changes in colour, variations in tone, obliteration of pulses and progressive swelling of limbs cannot be reproduced and, being in consequence less familiar to First Aiders, may escape their attention or lead perhaps to lost opportunities. The needs of an unconscious person, for example, may be more urgent than those of a person with an obvious wound or fracture. Valuable though casualty simulation can be, unless it is used with proper understanding it may seem to emphasize practical skill rather than judgment and sound decision.

As medical knowledge and practice advances the type of First Aid that can usefully be applied necessarily changes.

The most numerous injuries are of small size and carry little risk to limb or life; changes in First Aid have been in matters of detail. Fashions change but the basic treatment for a wound is to cover it with a suitable dressing. With fractures, First Aid is essentially a matter of making the part comfortable and preventing further damage. The use of a splint is only one way of doing this and the concept of splintage might be better replaced by the practice of providing comfortable support.

THE ACCIDENT PROBLEM IN GREAT BRITAIN

Although there can be few First Aiders outside the organized rescue services that have had any experience of serious injury, the fact that some 20,000 lives and many times more limbs are

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endangered by accident each year makes it highly desirable that as many as possible of the population should have some knowledge of what to do. As well as the dramatic effect of injury there are the unnumbered throngs of minor casualties, and those taken suddenly ill are as much in need of knowledgeable attention as are the injured.

The figures in the accompanying table indicate the current size of the problem, which has been growing year by year. First Aid, First Aiders, and their teachers need to keep pace with the advances in both numbers and standards of emergency treatment.

Table 1
In Great Britain in 1966

<i>Deaths from injuries</i>	
Home	8,914
Road	7,985
Burns and scalds	1,081
Total (all causes)	21,566
<i>Injured persons from road accidents</i>	
*Serious	99,838
Slight	284,634

*Casualties requiring in-patient treatment.

A total of 381,539 persons required in-patient treatment in England and Wales following injury alone in 1963 (latest figures available).

PROGRESS IN TEACHING FIRST AID

Some of what has been said may seem to lay the responsibility for shortcoming in present day First Aid practice upon the First Aid movement itself, but fundamentally the lag of First Aid behind the most up-to-date treatment of the injured is due to lack of an holistic approach to their care. What is needed is a return to a broad outlook so that First Aid and hospital treatment shall be properly co-ordinated. It is not sufficient to expect the medical men in First Aid organizations to keep abreast of advances, for most of them have either retired from active medical practice or are engaged in the public health service or general practice, which gives them neither time nor opportunity to keep in close touch with other fields of

PROGRESS IN TEACHING FIRST AID

medicine. Those doctors who devote their time to the treatment of injuries must be prepared to play their part in the development of First Aid to keep it in step with relevant changes in medical and surgical ideas and practice. This is not to suggest that hospital and other suitably experienced doctors should take it upon themselves to lay down the rules and drill for First Aid, but that they should pass on the knowledge upon which the rules and drill should be based.

The problems that arise in the training of large numbers of people contrast strikingly with the direction and supervision of trained hospital staffs. Enthusiasm and a sense of service are outstanding features throughout the First Aid movement but they are not universally matched by intelligence or education. Modern methods of treating injuries, especially serious injuries, require careful attention to detail and perhaps frequent and rapid changes to keep pace with the changes in the condition of the person under treatment. Such flexibility cannot be extended outside hospital, and before a new type of treatment can be offered to the First Aid movement to be included in its training it must be adapted so as to be generally and safely applicable to a variety of conditions that may be distinguishable only by the expert in his hospital with all sorts of diagnostic and therapeutic assistance at his beck and call. Frills must be eliminated, complexity must give way to simplicity in both diagnosis and treatment so that the objective—the useful preliminary care of the injured person—shall be attainable in any foreseeable emergency. The most important step is to inculcate a clear appreciation of the order of priority in treatment; to teach dogmatically the most urgent conditions, how they are to be recognized (which may mean looking specially for them) and how they should be treated. Less serious conditions may also require treatment, but in some circumstances they may have to be passed over for the sake of avoiding delay that might prove fatal. A person dead of respiratory obstruction will have derived no benefit from skilfully applied dressings and splints.

There is, therefore, need for translating definitive needs into terms and practices generally and usefully applicable as First Aid. The translation can be achieved only by the close association of hospital doctors who care for the injured and the directing members of the First Aid movement. Given this it should be possible to keep First Aid well up-to-date. It may be objected that this would lead to frequent changes in First Aid practice and that the frequent issue of revised manuals, would sow confusion in the minds of many First Aiders. This objection is not likely to be serious in practice for advances take place fairly slowly as a rule, and by using appropriate

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amendments and supplements it would rarely be necessary to revise successive editions of First Aid manuals drastically. It may be doubted whether serious confusion would arise, for First Aiders are notably anxious to be up-to-date. However proud they may be of past achievements, they can usually be relied upon to accept and adopt new methods with enthusiasm, especially if the need for changes be made clear to them.

By keeping abreast of advances through the close co-operation of doctors with the necessary time, interest and knowledge, First Aiders can be encouraged to feel, as indeed they are, important members of the greater medical team for the care of the injured. Though disappointed by the excision of outmoded methods of treatment in which they had become expert and taken a just pride, they could be consoled by a recognition that their loss has been the patient's gain. Nor is it all loss, for with injuries of the chest and head it has been shown that active treatment of the right kind can do much to enable patients to reach hospital alive and with a good prospect of recovery. First Aid has a new and increased scope here. There is also the need for careful observation at the scene of the accident and of the patient's condition and progress. The reports that can sometimes be given may be of decisive importance to the hospital doctors, who in their turn must be made aware of the need to seek all the information they can from those who have information to impart.

In addition to general First Aid as at present taught and practised, appropriately modified First Aid should be available to individuals and teams who have frequent experience of accidents. As examples, there are ambulance crews and mine and other rescue services. The practical experience gained by these would serve as a sound foundation for teaching special methods appropriate to the types of accidents they would be likely to encounter. Because of their familiarity with injuries, such persons would be more likely to have a degree of judgment, that would enable them to apply more detailed, more flexible and more advanced methods of treatment with success. Members of rescue teams are, moreover, likely to be carefully picked and therefore to be more reliable than the man in the street who has 'done a bit of First Aid'.

The need is for continual review of First Aid in the light of scientific and other advances in hospital treatment and close co-operation between those who make the advances, those who translate them into First Aid, those who teach and those who learn and do. Given this, the place and importance of First Aid is assured for as long as man is susceptible to injury.

CHAPTER 2

PRINCIPLES OF TREATMENT

The basic principle of First Aid is to provide such care as will benefit the patient preparatory to definitive treatment. The key word is 'benefit', for whether or not good will be done to the injured person will depend not upon the treatment given but upon the usefulness of that treatment in the particular circumstances. Treatment beneficial to a broken leg as the only injury in a person who has to travel far to hospital may be detrimental if that same person is also severely injured in the chest, an ambulance is waiting and hospital is but a few minutes away. Treatment that can be provided is not necessarily treatment that should be provided, no matter how skilfully carried out nor how ingeniously devised.

The most important need is to save life. Compared with this, it is of secondary importance to facilitate definitive treatment. Desperate emergencies are not frequent in the experience of the man in the street in civil life in peace time. Not having had occasion to deal with anything so dramatic, should he be called upon to do so, suddenly and without preparation, he may be bewildered by the number and severity of the injuries before him and have difficulty in recognizing the relative urgency of the several injuries.

GENERAL CONSIDERATIONS

Life may be endangered by the effects of the injuries or by their causes. Among the outstanding effects of injury are severe external bleeding and embarrassment of respiration by obstruction of the airway or damage to the chest. Both can kill very rapidly and both are usually responsive to First Aid. Other rapidly fatal conditions are beyond the scope of First Aid and need not be considered. The causes of injury that need urgent attention are noxious fumes and gases, electricity, burning, the risk of explosion or flood and collapse of a nearby building, vehicle or other structure.

First Aid intended to facilitate definitive treatment of injuries comprises the dressing of wounds and arrest of less severe bleeding; the alignment, when necessary, and the support of broken limbs or spine; the promoting of comfort with pads or pillows, and protecting from an unfavourable environment. This last will often mean con-

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trolling the attentions of bystanders and preventing well-meaning meddling or officious interference. The official recommendation that nuisances be disposed of by a judicious choice of errands and other activities that will take them away from the scene of the accident is admirable. On the other hand, it may be possible to press into service mildly injured persons either as active assistants or as passive observers. Apart from the possible value of their efforts, the fact that they are occupied by something other than their own misfortunes relieves the First Aider of some of his burden and allows him to concentrate his activities where they will be most beneficial.

When there are several casualties, the urge to treat the first one encountered must often be resisted until the general situation has been appraised and the most urgent needs decided. The victims of road accidents may be thrown many yards and land out of sight, especially after dark. Similar scattering and concealment occurs on mountains, in mines and collapsing buildings, and with aircraft and railway accidents. A quick but careful search of the surroundings is important.

COMMON FATAL INJURIES

From 1 to 39 years of age more people die from accidents than from any one fatal disease (*Figure 1*), and the circumstances that most often carry the risk of fatal injuries are worth noting.

In persons of working age, head injuries and injuries of the trunk, often affecting several parts, are the main causes of death, which may be rapid. Table 2 shows that of the persons dying of such injuries in one large city, a third or more were dead on arrival in hospital. In the lower part of the Table are the less frequent but rapidly fatal injuries and the frequent but less rapidly fatal consequences of injury.

TABLE 2
Cause of Death from Injury in One Large City in One Year

<i>Main causes of death</i>	<i>Total number of deaths</i>	<i>Number of deaths before reaching hospital</i>
Head injury	88	30
Multiple injuries	42	18
'Shock and haemorrhage'	25	11
Fracture of femur	42	7
<i>Subsidiary causes of death</i>		
Pulmonary embolism	17	2
Pneumonia following injury	79	1
Noxious gases	8	7
Miscellaneous causes	10	4

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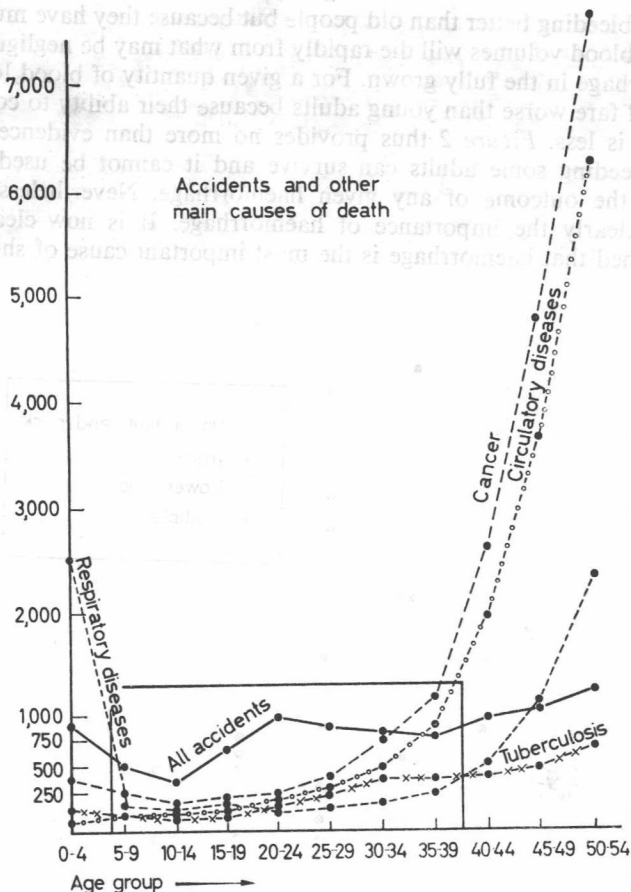


Figure 1. Accidents and other main causes of death

THE LETHAL EFFECTS OF INJURY

Bleeding and shock

Figure 2 shows the importance of bleeding after injuries of various parts of the body and the speed with which as much as half the total blood-volume (about 5 l. in an adult) can be lost. These figures refer to injured people who survived long enough to reach hospital and have their blood volumes measured. Larger and more rapid losses occur in quickly fatal cases.

The speed and quantity of bleeding has an importance that varies with the age of the injured person. Weight for weight children

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tolerate bleeding better than old people but because they have much smaller blood volumes will die rapidly from what may be negligible haemorrhage in the fully grown. For a given quantity of blood lost, the aged fare worse than young adults because their ability to compensate is less. *Figure 2* thus provides no more than evidence of what bleeding some adults can survive and it cannot be used to predict the outcome of any given haemorrhage. Nevertheless, it shows clearly the importance of haemorrhage. It is now clearly established that haemorrhage is the most important cause of shock

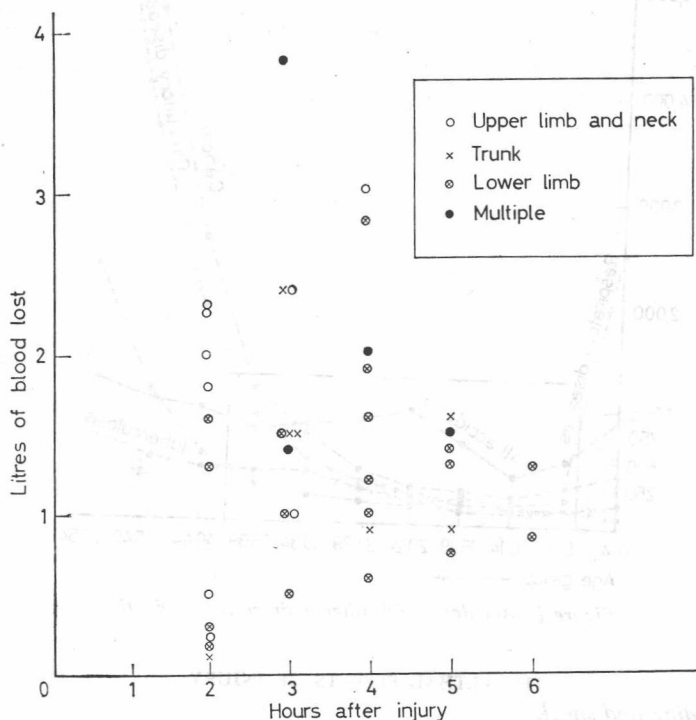


Figure 2. Speed and quantity of bleeding after various injuries

after injury, and it follows from this that First Aid is almost powerless in treating haemorrhage shock, for which blood transfusion is necessary. It can, however, do much to limit and retard the progress of events caused by external bleeding. Nothing can be done to stop internal bleeding, but a suitable posture, avoiding disturbance, reducing pain and preventing chilling may help to mitigate its effects.

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Injuries of the chest

First Aiders have a part in the treatment of shock caused by injuries of the chest. In some cases the cause is not bleeding but other influences on the action of the heart and respiratory mechanism. The circulation is impaired but it may be a mechanical impairment, responsive to simple mechanical methods of treatment.

The current emphatic repetition of 'Treat for Shock' is admirable in as much as it keeps before the First Aider the fact that shock is serious and may develop insidiously or with dramatic suddenness, but it implies a much more effective role for First Aid in this respect than is justifiable. 'Treat for Shock' is meaningful and proper advice to the doctor in hospital who has all that he needs, but it is misleading to the First Aider who may feel impelled to 'treat' the casualty instead of dispatching him without delay to those who can treat him.

Shock caused by burns and scalds is due largely to a fall in the volume of blood in circulation and its treatment too is beyond First Aid. Shock caused by disease is outside the scope of this book.

Multiple injuries

With severe and multiple injuries the simple picture of haemorrhagic shock due to a single serious injury is greatly complicated by the influences of the various injuries upon each other. Severe shock may mask serious injuries of the trunk; so may unconsciousness or a severed spinal cord. Profound haemorrhagic shock may cause unconsciousness because the reduced amount of haemoglobin available cannot supply the brain with the oxygen it needs (anaemic hypoxia). Severe injuries of the chest may do the same and for the same reason; they may also interfere with the oxygenation of a normal quantity of haemoglobin (hypoxic hypoxia) or with the free circulation of a normal quantity of fully oxygenated haemoglobin (stagnant hypoxia). There may be evident damage to the head but it is not necessarily responsible for an accompanying state of unconsciousness.

A good example of this sort of complex interaction was presented by the driver of a van in collision. She was at first conscious and 'not shocked' but soon became unconscious and on arrival in hospital about an hour later she had a systolic blood pressure of 40 mm Hg, was profoundly unconscious, faintly cyanosed and breathing with slight stertor and paradoxical movement of the sternum and nearby chest wall. There was a faint bruise of the brow but no other sign of head injury. The profound shock suggested severe haemorrhage, possible in the abdomen, and if so urgently requiring

transfusion. On the other hand, the damage to the chest made it likely that injury of the lungs or heart was responsible for the shock and that transfusion would be dangerous. Was the unconsciousness caused by head injury, by hypoxia due to oligæmia or by hypoxia due to defective respiration? It transpired that bruising and a small puncture of the heart were most likely the key to the puzzle and the cause of both shock and unconsciousness.

Fortunately, the First Aider is not concerned with the niceties of clinical diagnosis in such a case. It is sufficient for him to recognize profound shock and loss of consciousness and to proceed accordingly, with the object of preserving life.

Suffocation

Impaired ventilation of the lungs is the other rapidly fatal consequence of injury and its importance has emerged with dramatic clarity in recent years. Much more can be done by First Aid to treat this than to treat shock, and it is important to recognize the essential simplicity of the manner and causes of suffocation.

The object of breathing is to exchange gases between the atmosphere and the blood. Gases must therefore be both present and enabled to pass from alveoli to atmosphere. The refreshing movement of air in a building is referred to as ventilation, and it is helpful in clearing away the sense of awe and mystery induced in the lay mind by medical jargon to use a familiar term to denote a familiar process.

The airways—Much emphasis has been laid, and rightly so, on artificial respiration, and no less detailed attention needs to be paid to ensuring a clear airway before and during efforts to reproduce the movements of respiration. It is a frequent experience to receive in hospitals persons whose limbs have been carefully splinted and whose wounds have been adequately dressed but whose breathing has been completely ignored.

Careful instruction in the physical signs of inadequate ventilation is obviously necessary but formal teaching is best driven home by practical experience. It is not easy to simulate defective ventilation in tests and competitions and though a First Aider may be well aware of its causes, signs and dangers when faced with an oral or written examination, he may not be presented with anything resembling it in competition work and may fail to recognize it in a genuine emergency.

It is an exaggeration to say that any person unconscious after injury has inadequate ventilation but it is a harmless one and,