

EARLY CARE OF THE INJURED PATIENT

BY THE COMMITTEE ON TRAUMA
AMERICAN
COLLEGE
OF
SURGEONS



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Early Care of the Injured Patient

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Preface

The purpose of this Manual is to improve the quality of the early care of the injured by providing a ready reference for physicians in the care of patients in the emergency department and the early care of patients in the hospital. Thousands of persons receive injuries in the home, on the farm, on the highway, and in industry. Quality early care of these people can reduce death and disability, facilitate rehabilitation, and cut the cost of these accidents.

The American College of Surgeons first published the Manual, *An Outline of the Treatment of Fractures*, in 1931. This paperback pocket manual was written by the Subcommittee on Fractures, from which evolved the Committee on Trauma. The eighth edition of the Fracture Manual was published in 1965. In 1954, the Committee on Trauma published another manual, *The Early Care of Acute Soft Tissue Injuries*, as a paperback pocket manual developed by the Subcommittee on Soft Tissue Injuries. A second edition in 1960 and a third edition in 1965 were developed by the same Subcommittee. In 1960, and again in 1965, the Fracture and Soft Tissue Manuals were combined in a hardcover edition and distributed under the title *The Management of Fractures and Soft Tissue Injuries*.

In 1968, the Subcommittee on the Fracture Manual and the Subcommittee on the Soft Tissue Manual agreed, and the Committee on Trauma approved, that the next edition would be published only as a single manual in a hardback cover. This decision led to the two subcommittees being combined in 1969 as the Subcommittee on Publications, and the decision was made that the next edition would be issued under the title *Early Care of the Injured Patient*.

Rather than a handbook to be carried in the pocket of a house officer, *Early Care of the Injured Patient* is a practical reference book to be used in the emergency department and in the hospital. Although expanded in content, the new Manual remains a guide to the early care of the injured patient, not a comprehensive treatise on trauma. The methods described

have proved successful in most circumstances in the opinion of the authors. No implication is intended that other methods would prove less successful or less acceptable. As implied in its title, the Manual does not cover specialized late care that many injuries require. Neither does it cover the less common or all of the more complicated injuries.

This edition of the Manual represents the contributions of many members of the Committee on Trauma, other Fellows of the American College of Surgeons, and other selected authorities on certain subjects who are not surgeons. The Members of the Subcommittee on Publications extend grateful appreciation to the following people for their valuable assistance and contributions to the present edition of the Manual: Doctors Jerome S. Abrams, William A. Altemeier, C. Andrew L. Bassett, Walter P. Blount, C. Eugene Carlton, Jr., Charles T. Fitts, Charles J. Frankel, Nicholas J. Giannestras, Frank E. Gump, Robert P. Hummel, John R. Jones, Raymond H. Kaufman, Herndon B. Lehr, J. Vernon Luck, John B. Lynch, Robert M. McCormack, the late Harrison L. McLaughlin, Joseph S. Redding, Lee H. Riley, Jr., Robert B. Salter, Russell Scott, Jr., Frederick M. Smith, Preston A. Wade, A. Earl Walker, Dabney R. Yarbrough, and Edward E. Yaskovitz, and to Elise Gaston and Alan R. Kamp. We also thank Robert B. Rowan and Albert E. Meier of the W. B. Saunders Company for their splendid cooperation and patience during preparation of this Manual.

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Contents

Chapter 1	
PRIMARY ASSESSMENT AND MANAGEMENT OF THE INJURED	1
Chapter 2	
CARDIOPULMONARY RESUSCITATION	10
Chapter 3	
SHOCK	23
Chapter 4	
INFECTION	33
Chapter 5	
ANESTHESIA	50
Chapter 6	
THERMAL, ELECTRICAL, CHEMICAL AND COLD INJURIES	59
Chapter 7	
BITES	73
Chapter 8	
HEAD	83

Chapter 9	
SPINE AND SPINAL CORD	99
Chapter 10	
FACE	109
Chapter 11	
NECK	123
Chapter 12	
CHEST	129
Chapter 13	
ABDOMEN	147
Chapter 14	
GENITOURINARY TRACT	160
Chapter 15	
GENERAL PRINCIPLES OF FRACTURE TREATMENT	182
Chapter 16	
FRACTURES AND DISLOCATIONS IN ADULTS	210
Chapter 17	
FRACTURES AND EPIPHYSEAL INJURIES IN CHILDREN	327
Chapter 18	
PERIPHERAL NERVES	378
Chapter 19	
BLOOD VESSELS	384
Chapter 20	
HAND	392
Chapter 21	
TRAUMATIC AMPUTATIONS	401
Chapter 22	
PULMONARY INSUFFICIENCY AFTER TRAUMA	409

CONTENTS

Chapter 23	
LEGAL ASPECTS.....	416
Chapter 24	
MANAGEMENT OF MASS CASUALTIES	422
INDEX	427

LIFESAVING PROCEDURES

Chapter 1

Primary Assessment and Management of the Injured

Summary

The management of an injured patient admitted to an emergency department must include a workable sequence such as the following:

1. Make a rapid and initial assessment of the patient's condition, including state of consciousness.
2. Establish and maintain a patent airway.
3. Assure effective respiratory exchange (tamponade open chest wounds, stabilize flail chest).
4. Maintain or restore effective circulatory volume.
5. Conduct a methodical, thorough physical examination.
6. Splint all obvious or suspected fractures immediately and avoid flexion of any patient with a suspected spinal injury.
7. Do not move the patient unnecessarily. Hold to an absolute minimum transfers of the patient (i.e., emergency room area to x-ray to ward to operating room).
8. Obtain appropriate consultation in patients with multiple injuries.
9. The surgeon in charge must coordinate priority and timing for correction of specific injuries.

INITIAL EVALUATION

When an injured patient arrives at an emergency department, the responsibility assumed by the first physician who examines him cannot be overemphasized. This responsibility includes: (a) instituting lifesaving procedures when required, (b) diagnosing the injuries present, and (c) providing an orderly sequence of treatment to correct the injuries.

LIFESAVING PROCEDURES

Although a thorough physical examination is mandatory, a rapid initial survey should be made immediately to evaluate: (a) airway and respiration, (b) heart action, (c) active bleeding, (d) state of consciousness, (e) evident shock without active bleeding, and (f) life-endangering injuries (flail chest or sucking chest wounds). Since the maintenance of useful life is dependent essentially upon the flow of oxygenated blood to the tissues the initial priority treatment must be: (1) to assure an airway, (2) to control hemorrhage, and (3) to maintain an effective circulatory volume.

Airway: If the patient is unconscious or has evidence of trauma about the face and neck, the mouth should be examined, and secretions, blood, and vomitus removed. If facial fractures result in instability of the jaws, an oral airway or nasotracheal tube may be required immediately. Open wounds of the chest must be controlled with pressure, and hemothorax or pneumothorax should be evaluated and decompressed immediately. In crushing injuries of the chest, chest-wall stabilization or positive-pressure breathing may be required. Tracheostomy should be reserved for those cases where the nasotracheal tube cannot be inserted instantly (see Chapters 11 and 12).

State of Consciousness: If the patient is in a state of confusion or is unconscious, the cause may possibly be brain injury, blood loss, hypoxia, excessive alcohol intake, or diabetic acidosis. A tentative decision should be reached immediately, particularly if the cause is suspected to be active intracranial bleeding or mechanical airway obstruction.

Bleeding: Simultaneously with the establishment of an adequate airway the patient should be evaluated for external or internal bleeding. External hemorrhage of the extremities can usually be controlled with a properly applied pressure bandage. Tourniquets should be used as a last resort and only in cases of extremely traumatized extremities in which major vessels have been injured. If a tourniquet must be applied to an extremity, it should be maintained until proper provisions have been made to correct shock. Pressure dressings are also helpful for external bleeding of the trunk and face. The patient must be continually watched for evidence of internal bleeding and shock.

Shock: Shock must be anticipated in every seriously injured patient. The first step is to establish an adequate intravenous lifeline, preferably a plastic catheter, which is not as easily dislodged from a vein as the standard intravenous needle. At the time the intravenous infusion is started a blood sample should be drawn for blood type and crossmatching to insure sufficient blood for subsequent treatment. The cause of shock may not be immediately apparent. The patient should be evaluated for internal hemorrhage in the peritoneal cavity, chest cavity, or crushing injuries of an extremity.

MEDICAL HISTORY

The patient must be approached in a calm reassuring manner which will help allay much of his anxiety and apprehension. The physician must not convey a sense of panic to the patient through hasty purposeless actions or an excited tone of voice.

During the course of the initial examination, most of the relevant immediate history can be obtained. Information that is helpful, if it can be obtained, concerns the exact type of accident which has occurred, the position of the patient at the time of the accident, and his subsequent displacement. It is particularly helpful to know if a passenger in an automobile accident has struck any object such as the dashboard, windshield, or rearview mirror. In addition, it is desirable to obtain information relating to the length of time since the injury, and any prior treatment, particularly with narcotics or analgesics, or intravenous therapy that may have been administered before arrival in the emergency department.

In addition to the detailed information about the accident, it is also desirable to survey the patient's past history with particular emphasis on any prior incidence of cardiac or pulmonary abnormalities, renal abnormalities, or associated metabolic diseases such as diabetes. The patient should be questioned specifically about any drugs, such as digitalis, and steroids, that he has taken regularly or recently. A history of excessive alcoholic intake or narcotic usage can provide useful information, if it can be obtained. In addition, it is important to determine whether the patient has received previous immunization with tetanus toxoid and whether or not he has any known sensitivity to drugs, particularly penicillin. Any information relating to previous untoward experience with anesthesia or any past evidence of abnormal bleeding is important. Knowing when the patient last ate is important if anesthesia is to be administered.

Ideally, this information should be obtained from the patient if he is able to give it. If not, as much information as possible should be obtained from the available relatives or friends if any accompany the patient.

EXAMINATION OF THE PATIENT

Once the attending physician has evaluated the patient's state of consciousness, has assured the presence of a patent airway with good respiratory exchange and an adequate circulation, and has attended to any obvious bleeding, his next step is to conduct a thorough and careful physical examination. The patient should be completely undressed; if necessary, scissors should be used. Until the examination is completed injudicious moving of the patient should be avoided, and if there is a suspected fracture of the spine, the patient must be kept flat on the table. If it is necessary to turn the patient for examination or treatment he

should be rolled from side to side "like a log" with the spine kept straight—neither flexed nor extended. If the patient complains of localized pain or obvious wounds the examiner's immediate attention should be directed to this area.

After the physician has evaluated the major or obvious injuries he should conduct a thorough methodical examination to avoid overlooking associated injuries. Undiscovered injuries are usually overlooked because a detailed examination of all parts of the body has not been carried out. Too often this means that an extra trip to the x-ray department must be made after a day or two for films that should have been made at the time of admission.

An orderly examination must include the following areas even in the absence of related symptoms: head and neck, thorax, abdomen and pelvis, genitalia and rectum, and the extremities.

HEAD AND NECK

First, the examiner quickly but gently palpates the scalp with both hands in search of previously undisclosed lacerated wounds, depressed fractures, foreign bodies, deformity, swelling, hematoma, tumor, or points of tenderness. In the absence of symptoms the cervical spine is palpated in order to detect pain, tenderness, muscle spasm, limitation of motion, deformity, or crepitus. Any suggestion of a positive finding is an indication for x-ray examination of the cervical spine, including oblique views because of the frequent complaints of "whip lash." Movements of the mandible and occlusion of the teeth are similarly checked.

In the absence of obvious wounds, the neck is examined for venous distention, hematoma, tumor, adenopathy, unusual arterial pulsation, or displacement of the trachea. Paresis of facial muscles and the trapezius muscle or sternomastoid, indicating damage to cranial nerves VII or XI, is recorded. In the oral cavity, evidence of bleeding, deformity, tumor, missing or loose teeth, or paralysis of the soft palate (cranial nerve IX) or tongue (cranial nerve XII) is noted. Extraocular movements and pupillary responses are observed with great care and are recorded. The critical, early eye signs which clearly localize a brain injury may be transient, and the first examiner may be the only one to see them.

THORAX

The rib cage is palpated quickly and carefully for asymmetry, deformity, points of tenderness, fracture, retraction, bulging, or subcutaneous emphysema. Expansion is observed, and the two sides are compared. The precordium is palpated to estimate the impact, rhythm, and rate of the heart beat. Then, by percussion and auscultation, the cardiac outline is delineated, and the character of heart sounds, areas of dullness and flatness, rales, and evidence of mediastinal shift are noted. If a sucking wound is present, it is securely covered with a thick pad of sterile gauze to

avoid further build-up of intrapleural pressure while the examination is being completed. Finally, the spine can be palpated enough without moving the patient to disclose obvious deformity or points of tenderness and spasm that may give a clue to the presence of a fracture.

ABDOMEN AND PELVIS

Spine and Pelvic Bones: The examiner continues his palpation of the dorsal and lumbar spine and the sacrum. Palpating the iliac crests and applying gentle pressure over the anterior superior iliac spines may elicit tenderness, suggesting pelvic bone fractures or joint separations. Gentle pressure directly over the pubic symphysis may elicit pain or tenderness, suggesting disruption of the pubic symchondrosis or fractures of the pubic rami.

Indwelling Catheter: If any suspicion of pelvic fracture exists at this point in the examination, a catheter should be introduced into the bladder at once and left in place. The incidence of disruption of the anterior urethra is high with pubic fractures. It is easy to pass a catheter into the bladder soon after injury; a few hours later, edema, hemorrhage, and extravasation of urine may make it impossible. By this simple expediency the surgeon may be saved hours of tedious dissection needed to find the ends of an avulsed urethra, and the patient may be saved much pain and disability (see Chapter 14).

Abdominal Palpation: The abdominal wall and flanks are palpated for hematoma, muscle spasm, localized tenderness, distended loops of intestine, solid viscera, or tumors, and the findings are checked by percussion. Unusual pulsations or vascular thrills are noted and checked by auscultation for presence of audible bruit. Auscultation for peristaltic sounds is time-consuming and unproductive at this stage of the investigation, although it may be significant later.

When the abdominal examination has been completed, the observer checks the abdominal and cremasteric reflexes as a part of the neurological survey. If abnormal responses are elicited, a rapid attempt is made to determine abnormal sensory levels on the trunk.

Wounds: Open wounds are not probed during examination. They are protected by sterile dressings or sterile towels. Protruding masses of omentum or intestine are covered with sterile saline dressings and are not returned to the peritoneal cavity until adequate preparations have been made for thorough exploration of the abdomen.

Bleeding: Obviously dangerous bleeding from the wound demands immediate exploration. In rare instances it may be possible for the examiner to control intraabdominal bleeding with fist pressure on the aorta while the surgical equipment is being readied and anesthesia is being induced. This procedure may sometimes be lifesaving. However, it is so exhausting even to the most vigorous surgeon that preparation for abdominal exploration must be made in a matter of minutes.

GENITALIA AND RECTUM

After the abdominal examination has been completed, the genitalia are checked for open wounds, herniation, subcutaneous hemorrhage, or extravasation of urine. A drop of blood at the urethral meatus may represent a significant urethral injury. Since this may be the only early finding it should not be overlooked. A digital examination of the rectum is then carried out to observe sphincter tone, fecal content, presence or absence of tumors or normal pelvic organs. Displacement of the prostate should be evaluated during rectal examination (see Chapter 14). Abnormal contours of adjacent pelvic bones may confirm the presence of a fracture. The finding of gross blood or clots in the rectum may provide a clue to disruption of the rectum or lower colon, which may require immediate surgical intervention. In the female, bimanual pelvic examination is performed.

EXTREMITIES

Upper Extremities: In the absence of obvious deformity or grotesque position which would suggest a fracture, the extremities are examined individually in accordance with the systematic routine. First the examiner flexes the elbow and passively rotates and abducts the humerus through the normal range of motion; then he flexes and extends the elbow and wrist and rotates the forearm through the normal range of pronation and supination. If the patient is conscious and cooperative, these maneuvers are repeated with active movement while the observer exerts passive resistance to the successive muscle groups. Biceps, triceps, and distal radial reflexes are then checked, and any gross abnormality of sensory pattern is noted. The hands are examined simultaneously while the patient goes through the normal movements of the wrist, thumb, and fingers. This simple routine should make apparent any fractures or dislocations, avulsion or weakness of muscle groups, or nerve deficits that had not been disclosed previously. Check the pulses for evidence of injury to the arteries.

Lower Extremities: The lower extremities are similarly evaluated. With the knee flexed, the hip is abducted and rotated passively through its normal range; the knee and ankle are similarly investigated, and the stability of the knee joint is checked. When practical, the extremity is put through the same maneuvers actively, against muscle resistance. Knee jerks, ankle jerks, and plantar reflexes are elicited, and abnormal sensory patterns noted.

Any puncture wound in the vicinity of a joint should be considered a penetrating joint wound until proven otherwise (see Chapter 15).

MEDICATIONS

If pain medication is initially indicated, it should be administered intravenously. The absorption of intramuscular medication is uncertain

during periods of shock, and if repeated doses of narcotics are given intramuscularly, the subsequent establishment of adequate circulation may result in absorption of excessive amounts of the drug with undesirable respiratory depression.

ROENTGENOGRAMS

Only after lifesaving measures and a complete physical examination have been performed should roentgenograms be ordered. This avoids the pitfall made by inexperienced physicians of performing a preliminary examination and sending the patient to an x-ray department for examination of the more obvious injuries. After the initial x-rays a more detailed physical examination may reveal additional findings that require a second trip to the x-ray department. Every effort should be made to minimize the number of times a patient must be transferred from a stretcher to an x-ray table.

In many instances, it may be possible to have adequate x-ray equipment available in the emergency department so that most of the necessary examinations can be carried out there. In the event the patient is to be moved to another area, it is imperative that any obvious fractures or suspicious fractures be splinted prior to the time the patient is moved. Of course, splints should be applied immediately and not reserved for transporting the patient. In addition, if a suspected injury of the spine is present, the patient must be handled accordingly (see Chapter 15).

QUESTIONS TO BE ANSWERED BY PRIMARY ASSESSMENT OF THE INJURED

After completing the preliminary survey of the patient, the examiner should be able to answer some of the following questions:

1. Does the patient urgently require immediate surgical treatment?
2. Does the patient require additional supportive therapy, to be followed by a definitive operation as soon as he has been adequately prepared?
3. Are further diagnostic procedures indicated, and, if so, what?
4. Does the patient require additional immobilization or fixation before being moved?
5. How should he be transported?
6. Will an additional period of observation be advantageous before definitive treatment is undertaken?
7. Can he be treated as an ambulatory patient?
8. Is prophylactic administration of antibiotics and tetanus antitoxin or toxoid indicated?
9. What type of anesthesia should the injured person be given?