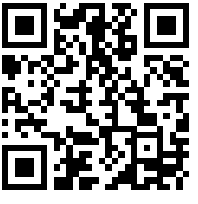

Emergency Health Services digest

NUMBER 4

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Health Services and Mental Health Administration

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This publication was prepared by the
Division of Emergency Health Services
Health Services and Mental Health Administration

Emergency Health Services digest

NUMBER 4

Edited by
George T. Furlong, M.A., M.P.H.

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Services and Mental Health Administration
Emergency Medical Services Program
5600 Fishers Lane, Rockville, Maryland 20852

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INTRODUCTION

Emergency health services are an integral part of day-to-day comprehensive health care. Also, they are the cornerstone of disaster preparedness of any magnitude, whether local accident or national emergency.

The Emergency Health Services *DIGEST* is published periodically by the Health Services and Mental Health Administration's Division of Emergency Health Services. The material will help those engaged in the planning, programming, and delivery of emergency health services to keep abreast of current literature pertinent to their problems. The *DIGEST* may be used as supplemental reading for training courses, as a source of prime material suitable for discussion in planning and training programs, and as resource material on the clinical emergency care of patients in ambulances and hospital emergency departments.

Each issue contains summaries of selected current articles from professional journals and other periodicals. The original source is given with each summary and requests for reprints should be sent to these publishers unless otherwise indicated. Each issue has a cumulative source index which will be continued in subsequent issues.

The Division of Emergency Health Services wishes to express its appreciation to the National Library of Medicine and its MEDLARS program for assistance in searching current literature and to the publishers and authors for permission to summarize the articles.

SPECIAL FEATURE

IS THERE A DOCTOR IN THE HOUSE?

Emergency Medicine, Vol. 4, No. 4, pp. 27 ff., Apr. 1972
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

Emergency Medicine asked 2,000 doctors across the country—mostly GPs and internists—in a sampling of their readers, how well prepared they felt they were to take care of a real emergency and what portion of their colleagues they would trust with their own lives in a medical emergency.

Nearly 600 replied. More than 85 percent were in private practice and more than two-thirds had been practicing for over 10 years.

Over half of them would trust only a few of their colleagues with their lives in an emergency and nine, evidently complete cynics, would not trust any. Nearly half the doctors did not feel confident to take care of a real emergency.

Only one doctor in three had been required to take part in any sort of course in emergency medicine in medical school and less than one of five finished school with any feeling of competence in handling emergencies.

Only about half of the doctors felt capable of intubating a patient and only three out of five had the equipment available in their office or medical bag to establish and maintain an airway.

Dr. Charles Frey, University of Michigan, observes that "for the most part, the doctors feel competent to *treat* acute conditions—but when it comes down to being treated themselves, they are not at all happy with the type of training they have had * * * what they want is an expert. I would interpret this to mean that there is a great need for more experts in the field."

Dr. James Brill, UCLA Medical Center, who has organized a training program for updating the emergency know-how of community physicians, was particularly horrified at the lack of airway equipment. "If they don't have the equipment, they probably don't know how to use it anyway. Only 50 percent have ever intubated a patient! An obstructed airway is the biggest medical emergency we face; 100 percent should know how to manage it."

Dr. Eugene Nagel, University of Miami and Jackson Memorial Hospital, summed it up fairly typically:

"Human nature being what it is, the answers probably are considerably on the optimistic side * * * unconscious self-delusion. Skills deteriorate. And while a doctor may have had some experience with handling a bag-and-mask system, and feels in all honesty that he can claim competence, chances are if faced with one he wouldn't be so confident. I think if you were to take a similar check of doctors who say they feel competent to use a bag-and-mask you could blow that 75 percent competence down to about 40 percent. They think they can do it at a moment's notice, but I doubt it."

Dr. Henry C. Huntley, director of the Public Health Service's Division of

Emergency Health Services, says, "There is no program that has been pushed by medical schools that would provide their students with the necessary skills to meet day-to-day emergencies that they all have to face. What we end up with is a fairly large generation of physicians who have had no training or experience in handling minor trauma, not to mention major."

Question 22 (the last), sought opinions on the current state of emergency treatment or training at the physician's level and asked for suggestions as to what is needed. Some 250 answered this question. They were pretty consistent in deploring the situation. Most suggested some form of continuing education and stressed that the accent had to be on *practical clinical training.*

"Rotation of physicians brings on emergency duty those who have had little or no general emergency care training—gynecologists, proctologists, GPs, etc.," one respondent noted.

Another doctor said, "The emergency room is the real training ground for acquiring the skills necessary for handling life-or-death situations. I would like to see the time come when every MD, no matter what his specialty, would be required to spend at least one week every three years working under competent supervision in a busy, well-staffed and appointed emergency room."

The survey makes it evident that the medical profession is well aware of the lack of instruction in emergency medical care from undergraduate through graduate study and the widespread lack of competence among practicing physicians. But if a dedicated group of people have their way that is going to change.

One of them is Dr. R. R. Hannas, Evanston Hospital (Ill.) and vice president of the American College of Emergency Physicians (ACEP), an organization established to improve emergency care at all levels and to develop more full-time emergency physicians. "We're working toward three goals," he says, "1. to insure that future graduates should know and demonstrate competence in performing basic emergency procedures and understand the pathology underlying emergent conditions; 2. establish at the graduate level means to produce and certify specialists in the field, with residencies completely emergency-oriented; and 3. *we need the means of teaching our own generation some emergency medicine.* Medical centers should develop practical brushup courses."

Missouri's Dr. Stephenson recently conducted a survey of 108 American and Canadian medical schools to determine their programs and future plans. He found emergency care instruction still tends to be presented on a casual basis at many schools though there is a growing awareness of the value of the emergency department as a source of training for medical students. Present courses range from care of patients with multiple injuries, coma and convulsions to problems of space medicine. In several instances instruction is an outgrowth of the Government's MEND (Medical Education for National Defense) program which is credited with a beneficial influence on curriculum changes until it was discontinued some 3 years ago.

Only 33 schools in Dr. Stephenson's survey (*Bull. Amer. College of Surgeons, Vol. 56, No. 4*), reported a formal emergency medical care course. Rotation through an emergency department is now offered as a full or portion clerkship by at least one-third of all medical schools, with several offering specific clerkships in traumatology. But all are still *elective.*

"This lethargy," Dr. Stephenson says, "comes from curriculum committees that still think of emergency medicine as a

kind of glorified first aid, which it certainly no longer is."

The University of Cincinnati and the University of Southern California have started a residency, although they have been given no guidelines and the specialty remains unrecognized. Cincinnati's program has seven residents and the one at USC began July 1971 with three, directed by Dr. Ann Elconin who says, "The important thing we're doing for the cause is developing the first real curriculum. It was on that basis that we applied for and got a grant from HEW. Thanks to the grant, we've been able to extract from each service that part that's relevant to the emergency physician, excluding all else."

The AMA's Council of Medical Education has turned down the ACEP's requests for approval of residency essentials and recognition of the specialty. "They refuse to adapt to the times. There was the same senseless delay when the family medicine came along—the council used the very same words, almost, when they turned it down," Dr. Hannas notes.

Dr. Hannas would like to see a postgraduate course for community physicians patterned after the one given at Massachusetts General Hospital. It offers practical clinical work in the emergency department along with theory. There are about 30 hours of didactic work tied in with over twice that many hours of clinical observation and actual work with acutely ill or injured patients. Dr. Dineen, one of the program directors, contends that such a combination course is feasible in any major academic medical center which has a big hospital, an emergency department handling about 200 visits a day, and a complete and full-time teaching staff. He is also developing, with ACEP and the Harvard department of continuing education, a self-assessment examination for emergency department physicians to pinpoint areas of need. Last year similar postgraduate courses were launched at UCLA Medical Center and in Philadelphia at Hahnemann Medical College and Hospital and Temple Medical Center.

Dr. Thomas Burnap at Harvard University and chairman of the committee on cardiopulmonary resuscitation and emergency care of the American Heart Association, says that almost any doctor if he checks the AHA chapter or affiliate in his area can find a local hospital that regularly offers an AHA lecture-demonstration on cardiopulmonary resuscitation with practical learning sessions on inflatable figures. There are 55 regional centers in the country that act as liaison with local hospitals to make the course available regularly.

Emergency Medicine's survey showed that the longer a doctor had been in practice the more inadequate he felt in the face of an emergency. While 9 out of 10 of the younger doctors had intubated a patient and 98 percent had given closed heart massage, the corresponding figures for their seniors were 43 percent and 84 percent. Nine out of 10 young doctors had defibrillated a patient and were familiar with the uses and doses of the arrhythmia drugs; of the older men only 42 percent and 70 percent answered yes to these questions.

One of the University of Cincinnati program supervisors suggests that there could be an exchange to allow community physicians to take time off for emergency medicine courses. Working residents toward the end of their residency could fill in for the doctor at this practice.

Pressure being applied from the Federal and State governments, the Red Cross, the Heart Association, and hospital groups will spur efforts toward more intensive training.

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EMERGENCY MEDICAL CARE SERVICES

RESCUE AND FIRST AID

ACUTE RENAL FAILURE FOLLOWING ABDOMINAL COMPRESSION FROM A RESCUE ROPE

Russell E. Randall, Jr., M.D., Juan C. Martinez Landaburu, M.D., Melvin A. Mackler, M.D.

JAMA, Vol. 213, No. 10, pp. 1679–81, Sept. 7, 1970
535 N. Dearborn St., Chicago, Ill. 60610

This article reports a unique accident, resulting in acute renal failure, that should alert physicians and rescue workers to watch similar situations.

During a flash flood six men on a rope attempted to rescue a stranded victim clinging to a tree in the current of a swollen creek. They were attached to the ¾-inch Manila hemp rope by six bowline loop knots—this knot cannot slip, tightening the loop—with each loop carried over the head and placed under the axillae. They were let out into the stream approximately 20 feet apart and about 20 men controlled the rope carried through a block and tackle.

When the rescuers were nearly halfway to the stranded victim, they lost their footing and the entire six-man team was dragged downstream; several were immersed under the swift current. The men on the other end of the rope pulled strenuously until the rescuers were pulled to safety. (The stranded victim was later rescued without injury.) Members one through four recalled that the rope slipped to their umbilical region and severe pressure of the current on their backs plus the pressure of the rope across their abdomens caused them to bend double until their faces touched their knees. The rope had not tightened around any of them.

No unconsciousness or water inhalation was apparent in any of them, but members one through four complained of discomfort around the abdomen and in the flanks. Abrasions were noted in these areas when one, two, and four were seen later in a hospital emergency room. Member two was hospitalized immediately while members one and four were hospitalized 3 days later because of nausea and vomiting. When it was discovered that at least three members had acquired acute renal failure in a common accident all members of the team were examined.

The clinical course was characterized by olguria and moderate azotemia which lasted 4 to 5 days followed by an early and dramatic diuresis with rapid recovery. It is presumed that sudden increased abdominal and renal vein hypertension produced renal interstitial edema, hemorrhage, and localized tubular necrosis.

Physicians should be aware of the possibility of such an injury in order to recognize and properly manage similar cases. The lesson to rescue teams is obvious: Ropes, preferably wide supporting structures such as harnesses, should be fitted to or carried against such strong skeletal parts as the thorax or pelvis and not across the soft anterior abdominal wall.

LINEMEN SAVE A LIFE

Emergency Medicine, Vol. 3, No. 11, pp. 44–45, Nov. 1971
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

As cardiac arrest becomes more common among outwardly healthy middle-aged men, precarious working conditions become doubly so. Electrical and telephone linemen are striking examples at risk. These men are really in triple jeopardy—double at risk because the possibility of "natural" cardiac arrest is augmented by the danger of high-voltage electric shock, complicated by their position high above ground supported only by climbing hooks and a safety belt. In the time it takes to release a man from his rig and lower him to the ground he would probably have brain damage or be dead.

This magazine picture spread illustrates the pole-top cardiopulmonary re-resuscitation procedure developed for Atlantic Richfield Hanford Co. by Gordon E. Towne, company battalion fire chief, and Louis S. Dewey, then industrial physician of the Hanford Environmental Health Foundation. The system, reported in the *Journal of Occupational Medicine* (*Vol. 13, No. 8*), is designed to keep the patient alive long enough to get him down to earth.

The program, designed for the typical three-man team, teaches linemen to use an emergency resuscitative system combining closed chest compressions and mouth-to-mouth resuscitation while the ground man summons professional help; then a method of lowering the injured man by his co-workers, using his safety gear.

Intensive practice is an absolute necessity and the linemen, who always work gloved, must be impressed with the importance of doing this procedure *ungloved*.

AMBULANCE SERVICES

CARDIAC DEFIBRILLATION BY AMBULANCE ATTENDANTS

Leonard B. Rose, M.D.; Edward Press, M.D., M.P.H.

JAMA, Vol. 219, No. 1, pp. 63–8, Jan. 3, 1972
535 No. Dearborn St., Chicago, Ill. 60610

Of 735,190 deaths from heart disease in 1969 in the United States, 359,740 were due to acute myocardial infarctions, a rate of approximately 1,000 per day. About 70 percent of these acute myocardial infarction patients die before they reach the hospital, in the first hour or two after onset of symptoms, so cardiac resuscitative measures at the scene, particularly for life-threatening arrhythmias and cardiac arrests, often mean the difference between survival and death.

Mobile intensive care units for the management of myocardial infarction, developed by Royal Victoria Hospital in Belfast, Ireland, have been used in Russia, England, and the United States. The earliest units here were operated by St. Vincent's Hospital in New York City and Ohio State University Hospital in Columbus.

The Oregon coronary ambulance project, organized by the State board of health in cooperation with a private ambulance company, a community hospital, and a county medical society, became operational in Portland in 1969. It operates without any public or tax funds and uses specially trained emergency medical technicians without accompanying physicians or nurses.

It was believed that incorporating the service into the community health delivery services as a financially sustaining operation would be preferable to a subsidized program and would make possible future statewide incorporation. Medicolegal questions were answered when the Oregon Board of Medical Examiners ruled that the use of a portable external electrical defibrillator by trained ambulance attendants would be considered an emergency procedure rather than medical practice and, therefore, would be allowed under the Medical Practice Act.

Four unusually well-qualified ambulance attendants were selected for training. Instruction covered principles of emergency coronary care, recognition of cardiac arrest, techniques of cardiopulmonary resuscitation, electrocardiographic monitoring and extensive drilling in the recognition of arrhythmias on the ECG monitor. There were sessions with a hospital anesthesiologist on techniques of cardiopulmonary resuscitation; and practical experience in the hospital animal laboratory, monitoring and defibrillating large dogs; coronary care unit study, supervised by the nurses; observing patients clinically; recording observations and reading ECG's on the monitoring scope and writeouts.

During the first 3 or 4 months of the project, over 20 registered nurses from coronary care units in four or five major city hospitals volunteered to ride the ambulance during their time off. This gave the trainees additional on-the-job supervision, experience and confidence. September 1, 1969, the first ambulance started operating on the west side of the city and in May 1970, a second unit took to the street on the east side.

Training additional ambulance personnel to maintain and expand the service is being done by Portland Community College where material concerning cardiac emergencies is now included in the annual 72-hour program for emergency medical technicians. Selected graduates will be assigned to one of three large community hospitals where they will receive similar training to that described above.

This project has shown that highly motivated and well-trained allied health personnel can interpret common ECG arrhythmias, especially life-threatening ones; and by cardiopulmonary resuscitation combined with defibrillation can function effectively in certain cardiac emergencies. Using these techniques, this service was able to salvage seven out of 14 patients, five with proved myocardial infarctions, without telemetry, all of whom were subsequently discharged from the hospital.

Projects like this can be community-supported at relatively low cost. With radiotelemetry, contemplated for the future, the rhythm diagnosis can be confirmed by a physician. The project anticipates that under supervision, trained attendants may be administering drugs in certain life-threatening situations.

The authors give three dramatic case histories of patients handled by these attendants; five tables which list the curriculum; standing orders for handling patients with suspected coronary occlusion; medication and equipment in the ambulance; types of patients handled September 1, 1969 to December 31, 1970, and cases of resuscitation and defibrillation.

THE EXTRICATION OF VICTIMS FROM THE ACCIDENT

Louis C. Kossuth, M.D.

Arizona Medicine, Vol. 26, No. 3, pp. 128–30, Feb. 1969

810 W. Bethany Home Rd., Phoenix, Ariz. 85013

Survival from a high speed collision may be directly related to remaining in the vehicle. Proper extrication influences both the degree and duration of disability.

In the medical view, extrication is the initial movement of the injured—whether he is pinned or trapped in the wreckage, or not readily accessible in small enclosed areas, or in an awkward, unnatural position—in such a manner that additional trauma is not added to the injuries already incurred.

The rescuer must decide instantly whether imminent disaster threatens and immediate rescue is imperative. The usual technique of "grab and pull" must be accepted in accidents accompanied by fire, where the vehicle is submerged or submerging, on a congested high-speed highway where the hazard of a second collision is imminent—but this situation allows more careful consideration—or where a vehicle is tottering on the brink of a cliff. But by far the majority of accidents occur with an environment that allows for calm, deliberate, planned extrication.

There are two significant factors: the injuries and the victim's position. The initial rapid examination of the victim must first be directed toward two life-threatening injuries: interference with respiration and severe hemorrhage. With respiration assured and hemorrhage controlled, the ambulance attendant can examine the victim to determine the extent of his injuries and identify the problems that may arise from the victim's position.

Respiration is assured, hemorrhage controlled, injuries assessed, obstruction to extrication noted. Now ask, "How can the victim be moved with maximum gentleness and minimum risk to adding to his injuries?" Logical planning will occur only if training has sufficiently emphasized the dictum, "Splint Them Where They Lie."

PLACING AT REST IS A BASIC PRINCIPLE IN THE IMMEDIATE TREATMENT OF MANY TYPES OF INJURY. The tension and torsion of manual removal can add nothing but additional trauma to a fractured liver, a ruptured spleen, a lacerated muscle, or a perforated gut.

The ambulance attendant must ask the patient where it hurts. Gentle palpation of the posterior cervical neck muscles may not distinguish between a hyperextension soft tissue injury and rotary hyperflexion fracture of the cervical vertebrae, but pain must be the danger signal to the attendant that a cervical injury is present and extreme care must be used in moving the patient. If he does anything which causes pain, the attendant should immediately determine, *How can I be more gentle?* Ambulance attendants must develop the same gentleness in handling patients that a surgeon uses in handling tissue. The attendant must be trained to ask, *Why does it hurt? And we must be prepared to teach him the answers.*

We have condemned the speeding ambulance, but we must also condemn the hasty attendant. DISENTANGLE THE CAR FROM THE VICTIM AND NOT THE VICTIM FROM THE CAR. For the patient between the front and back seats, the rear seat can be lifted up and pushed back while the front seats are folded forward in a two-door vehicle; with a four-door car the rear seat can be removed. For the individual with a back injury in a bucket seat the method of choice is to release the seat and pick it up and transport the occupant seated. A pry bar may be adequate to pry off the door, bolt cutters may free a seat, but many situations will require power cutting tools or acetylene torches.

IT IS ALWAYS PREFERABLE TO

PUT EQUIPMENT ON THE PATIENT THAN TO MOVE THE PATIENT ONTO EQUIPMENT. Fractures of the femur carry threats to lengthy disability from nerve or vascular damage, nonunion, and infection. Immobilizing these fractures before moving the victim helps prevent these complications. The half-ring Thomas splint, or a similar traction splint, is the equipment of choice. If there is not room to apply the splint, a short femur splint that extends from the crotch to the knee (basswood splint, rolled magazines or a board can be used) is placed between the thighs with triangular bandage tied around both thighs above and below the fracture. The patient is gently pulled from the restrictive area. A triangular bandage is placed around the calves and a tie around both feet at the metatarsal arch to prevent rotation of the fractured limb. Move the victim away from the accident and apply the Thomas splint without removing any of the ties.

The innumerable combinations of injury, position of the injured, and position of the vehicle have not been examined sufficiently to teach detailed step-by-step procedures, and such examination will undoubtedly point to yet uninvented equipment that we need. Our objective is clear: HOW DO WE PROVIDE INITIAL MOVEMENT OF THE INJURED SO THAT TRAUMA IS NOT ADDED TO THE INJURIES ALREADY INCURRED?

COMMUNICATIONS SYSTEMS

WHERE WOULD YOU LIKE TO HAVE YOUR HEART ATTACK?

Staff Report

IEEE Spectrum, Vol. 8, No. 10, pp. 44–50, Oct. 1971

345 East 47th St., New York, N.Y. 10017

The most dramatic application of telemetry to health care is the transmission of the electrocardiogram (ECG) from a patient in a moving emergency vehicle to a monitoring dispatching point.

The cardiologist makes his diagnosis after viewing the telemetered oscilloscope pattern and then orders the paramedic to take appropriate action. This procedure has legal sanction in the States where this system is used. Hospital mortality of patients managed by the mobile unit is lower than that of patients admitted to coronary care units in the usual way, reducing the mean from 22.6 percent to 12.3 percent.

In Montgomery County, Md., a Heartmobile is used, a vehicle equipped with a demand pacemaker, cardioverter, resuscitator, and ECG and pulse recorder connected to the transmitter of the two-way radio communications equipment. It is staffed by a nurse experienced in treating cardiac patients, a cardiology technician, and a driver who is an experienced emergency room technician. The Heartmobile is credited with saving at least one life each month since it was put in service in March 1970. It is available on weekdays from 8 a.m. until midnight. The equipped vehicle costs about $60,000 and salaries at present amount to about $45,000. Such costs are too high for the average county; those in charge believe future trends for handling coronary attack victims will be in the direction of rescue squads with portable equipment.

Since March 1971 an emergency mobile system has served Nassau County, New York, an area of some 1.5 million people that has heavy traffic problems and many automobile-induced injuries. A county-wide police service is associated with an ambulance service operated by uniformed civilian personnel. Emergency vehicles are available in the county's

eight precincts and there are seven roving vehicles. An average of 10 hospitals receive the victims. The flat terrain makes for reliable radio communications. A remote transmitter and receiver are mounted on a water tower; the main antenna for the hospital base station is atop a new 19-story building.

Patients are monitored during transport by paramedics with portable ECG equipment. The ECG output is used to modulate the mobile transmitter and the resultant demodulated patterns are observed by the cardiologist who gives instructions to the ambulance personnel, possibly to apply voltage pulses from a defibrillator if severe arrhythmia has begun. A cassette magnetic-tape recorder provides a permanent record for analysis and legal protection. Of some 1,300 patients managed in this program, 234 complained of chest pains; 550 were found to have suffered trauma and the balance had other problems; 28 worsened; 18 were resuscitated; and 25 were found dead on arrival at the pickup point. The average time between pickup and hospital arrival is 6.8 minutes. It is planned to extend treatment to the administration of drugs after the paramedical personnel have been given further training.

Less fortunate in terrain, a Hartford (Conn.) system when fully operational will serve a population of over a half million in the city and surrounding communities. Established by Dr. Robert J. Huszar of St. Francis Hospital, the system cost $42,000 for portable equipment for five coronary ambulances and extension of monitoring to two other hospitals. In addition to radiotelephone transceivers, remote receivers, and tower and telephone line rental, the cost of ECG signal modulator and defibrillator equipment is included.

The communications/telemetry equipment, designed by Dr. Huszar, combines a portable ECG signal modulator and monitoring system with existing land mobile voice-communication equipment. The Cardio-Alert amplifies the ECG signal, generates an FM subcarrier, provides a visual and audible heart-rate readout, automatically keys the transmitter by abnormal heart rates, and generates a calibration signal. At the receiving end of the telemetry system, a demodulator and the amplifier give a suitable output for the oscilloscope, direct writer, or tape deck. The system has been designed to provide continuous monitoring at the patient's location and enroute to the hospital with periodic short transmissions of the ECG to the hospital when necessary for evaluation.

The present radiotelemetry system, with base station, transmitter and receiver atop the highest building in Hartford, is connected by telephone line to remote consoles in St. Francis Hospital research laboratory and emergency room. The two-way portable voice-telemetry equipment has been used in a private ambulance for more than 2 years.

Proper ambulance personnel training was essential. The training course requires 240 hours, including 80 hours of ambulance practice using the ECG telemetry and defibrillator equipment.

The use of RF-telemetered ECG indications at Overlook Hospital in Summit, N.J., presented such electronic problems as short battery life of portable units, and intolerable service problems on ECG and similar equipment. These were solved by a long-term contract with a specialty service organization and agreement with manufacturers that all new equipment be serviced by the organization. Lack of ECG memory capability will be taken care of in new equipment with at least 8 seconds of memory. Telemetry transmitters have interfered with cardiac pacemakers during temporary pacing by

blanking out the demand mode. The difficulty has been resolved by alterations to existing transmitters, by testing new equipment for interference, and by improvement in pacemakers that were formerly rendered inactive by such devices as electric shavers.

Pickup antennas placed above false ceilings now provide excellent signals from patients who are not confined to a particular area of the hospital. Telemetry provides freedom of movement, particularly in the CCU after apparent recovery. The patient can sit and stand early, reducing the incidence of pulmonary embolism, and can be monitored while fully ambulatory.

Telemetry from a patient in an ICU can reduce the number of mechanical and electrical connections and it does not constitute a possibly dangerous electrical connection to the patient.

HOSPITAL EMERGENCY SERVICES

EMERGENCY DEPARTMENT UTILIZATION IN AN URBAN COMMUNITY

Arthur R. Jacobs, M.D.; J. William Gavett, PH.D.; Richard Wersinger, M.A.

JAMA, Vol. 216, No. 2, pp. 307–12, Apr. 12, 1971
535 N. Dearborn St., Chicago, Ill. 60610

The results of a recent study of emergency departments in the Rochester, N.Y., area provide a basis for some conclusions about the role of the emergency department in ambulatory care, health data systems, and the organization of services.

A 1-percent systematic random sampling of emergency department cases was taken, January 1 to December 31, 1968, in all seven Monroe County hospitals and in two adjacent Wayne County hospitals.

About 210,000 visits were made to the nine hospitals. It is estimated that Monroe County's population increased 20 percent from 1960 to 1970, but the number of visits to hospital emergency departments increased 95 percent.

In the short run, emergency departments will probably have to be expanded, but in the long run alternate facilities for meeting the ambulatory demand should be considered. In 1966 the Division of Medical Sciences, National Research Council, suggested that emergency units might be developed and categorized as: Type 1—Advanced first aid facility; Type 2—Limited emergency facility; Type 3—Major emergency facility; and Type 4—Emergency facility combined with a trauma research unit.

In the author's study over three-fourths of the patients were referred by a relative or were self-referrals. Only 5.7 percent reported referral by a local physician. About 10.8 percent arrived by ambulance. Over 86 percent walked or arrived by car or bus, suggesting simple medical problems rather than catastrophic illness or injury. Forty-seven percent received treatment commonly performed in physicians' offices. Such life-saving procedures as transfusions, IV fluids, and cardiorespiratory support are rarely used in the emergency department.

After treatment, about three-quarters of the patients were referred to their family physician or sent home, 10.6 percent were admitted to the hospital, and 8.4 percent were referred to the outpatient department.

Blue Cross was the source of coverage for 55 percent, Medicaid/Welfare covered 14.7 percent, and 11.4 percent had no insurance or third-party coverage.

Accidents or injuries accounted for almost half the visits; respiratory sys-

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tem diseases ranked second; and symptoms, senility, and ill-defined conditions ranked third—most of these being "ill-defined." The most common types of accidents were falling, piercing or cutting, and then accidents involving automobiles or bicycles. Nearly as many accidents occurred in the home as in the streets.

Was the visit a "true emergency?" Taking this to mean a problem that should be seen immediately by a doctor and/or problem that requires hospital facilities, 35 percent required the emergency department. This finding was the same as a 1964 survey of one Rochester emergency department—65 percent of emergency department visits did not need the services of a general hospital emergency department.

Monday had the greatest number of visits, although there was no significant difference between the days of the week. The peak hours were 10 a.m., 5 and 7 p.m., the busiest being 7 p.m. and 6 a.m the slowest This utilization has profound implications for staffing.

The study highlights the need for alternate ambulatory services for urban low economic groups. The emergency room should be perceived as only one means of meeting primary ambulatory demand. Community demand for ambulatory care units depends on the characteristics of the units, the patients, and other variables. Emergency departments satisfy a small percentage of the total ambulatory demand.

One solution to the "problem" is to create a formal bipartite organization. One section would serve the emergency case with specialized personnel and facilities geared toward lifesaving action. The other section would be a convenience clinic with much less complex manpower and facilities, designed for primary care. Availability and accessibility of care on one hand, and continuity and comprehensiveness on the other must be evaluated.

Proposed innovations in ambulatory care organizations—prepaid group practices, outpatient reorganizations, convenience clinics, ambulatory health centers in rural, suburban and urban areas, family medicine units—must be evaluated for their merits and impact upon the care system. Evaluation requires relevant community-wide information to insure community-oriented decisions.

A community ambulatory care data system is needed to provide data for evaluation of alternate primary ambulatory health care organizations. Changes will proceed as an evolutionary process with or without coordinated community action. Decisions will be made by private practitioners, institutional administrators, and boards of directors. Their effort will be successful only if they gather data to understand the community system.

EMERGENCY SERVICES

Leon J. Taubenhaus, M.D.

Hospitals, J.A.H.A., Vol. 46, No. 7, pp. 81 ff., Apr. 1, 1972
840 N. Lake Shore Dr., Chicago, Ill. 60611

The spectacular growth and influence of the new American College of Emergency Physicians has established emergency medicine as a bona fide specialty that has done much to upgrade the quality of emergency medical care. However, most published information has been clinical and too little has been published on the organization, provision, and evaluation of high quality emergency service.

Citing many references on emergency care, the author makes the points briefly

mentioned here. Although the hospital remains the traditional center for the emergency service system, emergency service is a community problem and the emergency department is only part of the picture. The point must be stressed until all hospitals accept it. For example, the regional emergency system in rural Tulare County, Calif., transferred the emergency transportation from the fire department to a hospital. It was a successful operation which combined the position of ambulance technician with those of hospital inhalation therapist, electrocardiographic and orthopedic technicians. An essential factor in any regional emergency service is radio communication which must have equipment simple to understand and operate. The radios must be continually monitored, and the range must cover the entire service area, and the price must be within the means of most hospitals.

Although most hospitals have emergency facilities, not all are capable of handling all emergencies. Gibson of Chicago recommends that emergency departments be categorized and utilized in relation to their emergency capabilities. Flashner and Boyd propose a statewide approach: a basic plan of hospital emergency departments combined with ambulance services capable of handling trauma, and supported by regional trauma centers. The New York State Health Department, with State and regional advisory committees, created a program giving priority to training rescue personnel and to equipping ambulances. Emergency care also is being improved in university hospitals where that department traditionally has been more neglected than in community hospitals.

The emergency department director too often is given great responsibility but little authority. He should have authority for administration and nursing and residency training as well as the right to exclude anyone whose activities endanger patient care.

Suits against the hospital and its trustees, plus public demand for quality emergency services have led to the replacement of house officers with mature physicians and to the development of a new specialist—the emergency physician. The American College of Emergency Physicians, 3 years old and 2,000 members strong, is rapidly raising the status of emergency care.

One staffing system is the medical corporation. In one hospital a corporation of 18 to 20 physicians with a five-member board of directors is responsible for the department. An independent management firm handles billing and management. In another type of coverage, there is a physician corporation but the hospital does the billing without charge until a minimum is exceeded and guarantees a minimum physician income. The physician corporation accepts legal responsibility for the emergency care in both arrangements.

Such delegation of liability from the hospital to physician corporation may be invalid in a case of administrative rather than clinical error. In an Indiana case against a radiologist, who was contractually responsible for the total management of his department, the court ruled the fault to be an administrative error and that in administrative matters a radiologist serves as an employee of the hospital. The case is being appealed, but if upheld, it will affect emergency department-emergency physician contract negotiations.

Paraprofessionals as supportive personnel may be a partial answer to staffing and recruiting problems. One authority describes fire-rescue personnel used as paramedics and believes that after training they can provide advanced levels of care.

Another describes emergency technicians used to perform nurse-related duties.

The authorities cited find that: Medicaid made little difference in the utilization of the department; weather has a clear relationship to emergency use and short-range weather forecasts could assist in planning staffing patterns; and economic status, ethnic background and age influence use.

One authority recommends that staffing standards be based on varying emergency department patient loads. With a patient load of 49,000 per year, he recommends five full-time physicians supported by 40 hours a week of part-time physician time, and estimates that 46,000 patients per year require 6.7 8-hour nurse shifts, and 4.8 8-hour attendant shifts per 100 patients per day.

Public expectation and higher emergency care potentials have made the traditional nurse, house staff, or physician-on-call care inadequate.

FACILITIES AND EQUIPMENT FOR THE EMERGENCY SUITE

Harris B. Graves, M.D.

Southern Medical Bulletin, Vol. 59, No. 6, pp. 27–30, Dec. 1971
2601 Highland Ave., Birmingham, Ala. 35205

The *hospital emergency room* is obsolete.

"Emergency suite" better describes the rooms now necessary to care for the patient load and "emergency department" better describes the administrative functions. With the average patient load increasing by 15–20 percent per year, it is obvious that the emergency suite must be designed for efficient, rapid, and competent patient care.

Unfortunately, many architects fail to design efficient emergency suites and it behooves physicians and nurses to study the needs of their emergency department so they may have positive design suggestions. There is no single ideal emergency suite; each will vary with the needs of the hospital and community.

First, consideration should be given to the outside arrival area. The emergency entrance should be well marked, day and night, and signs should be placed at non-emergency entrances redirecting patients. The entrance should be covered and the drive through should be wide enough for two ambulances, but not wide enough for parking. Adjacent parking should accommodate 12 to 14 cars for an annual patient load of 20,000. Entry doors should be wide enough for all stretchers and wheelchairs; should operate automatically and manually, in case of power failure; should be of clear glass, and preferably allow a view of the unloading area. The separate entry and exist doors should be two-in-line to limit wind and outside debris from coming in.

The emergency suite entrance should be so designed that it is possible to stop friends and relatives from accompanying patients into the treatment area. Arrangement of rooms in a square or round configuration saves steps and furnishes a better view of all patients from a central nurses' station.

All corridors should be wide enough for at least two carts to pass with extra space for additional disaster carts. Free exit to X-ray and surgery must be provided to avoid congestion. The number of rooms in the suite will vary with the number of patients seen, but the general rule is that one room is needed for each 2,500 annual patient visits.

Ideally, there should be only one cart per room with room enough to accommodate another. A 10- by 14-foot room is excellent for treating a single patient and can accommodate an additional stretcher.

All rooms should be arranged so they can be used interchangeably with portable equipment. However, some rooms may need a concentration of special equipment (i.e. for eye treatment). A plastic folding door which can close off all or part of the room and deadens sound is desirable. Each room should contain storage for frequently used supplies, in-the-wall suction and oxygen, as well as a sink. Each room should be supplied with an intercommunications system and patient call buttons so a temporarily unattended patient may call for help.

A holding area is questionable. When hospital beds are at a premium, holding beds can be a safety valve, but their use must be monitored closely and the nursing personnel augmented. A consultation room is helpful for talks with anxious relatives, and interviews with police and news reporters. People waiting for patients should have a pleasant area provided with reading material, television, and beverages. Generally two seats are required for each patient seen in an average hour, but there should be room for additional seating in a crisis.

Nurses need a small lounge, centrally located away from public view. On-duty physicians should have an office in the department. If duty hours are extended, sleeping quarters are needed. Toilet facilities for patients, staff, and visitors are mandatory; also disposal facilities for bedpan contents and other wastes.

The suite must be connected to the emergency power supply and be planned for expansion by additional carts or stretchers for a patient overload.

A stretcher bed or cart that will permit everything required for all examinations is almost impossible to buy. Ideally the cart should have an X-ray permeable top to allow radiologic examination; capabilities for elevating the head, flexing the knees, and for semi-Fowler's positioning and the Trendelenberg position. Stirrups should be attached for pelvic examination and there should be belts and side rails for restraint. It should have its own IV standard, brakes capable of holding under stressful conditions, and easily adjustable height.

Each room should be supplied with a stethoscope, otoscope, ophthalmoscope, reflex hammer, sphygmomanometer, flashlight, portable surgical light, Mayo stand, kick basin, and stool.

The cardiac room must have a defibrillator, which should include a monitoring oscilloscope and EKG writeout. If a pacing unit is not included, one should be available nearby. Electrodes may be of the needle or newer tape-on variety. This room also should contain plastic airways, resuscitation bags, Elder valves, laryngoscopes, and endotracheal tubes—all available in infant to adult sizes. A tracheotomy tray should be immediately at hand and all special cardiac medication, intravenous fluids, and equipment should be on a portable cart.

The room used for eye, ear, nose, and throat treatments will need a cart that can be converted to a sitting position, a nasal speculum, double loupe glasses, eye spuds, and eye instruments, as well as eye charts and a slit lamp.

Other department equipment should include a mobile cast cart and electric cast cutter; approximately two wheelchairs per 4,000 patient visits per year; an ice machine for burns, sprains, and strains; an electrocautery unit and X-ray view boxes.

If there is money left over, investigate newer equipment: EKG telemetry; a computer, which has many emergency applications; and closed circuit television. "Never be the first with the newest or the last with the oldest" should be followed in investing in new machines unless an unusual budget is available.

THE MOBILE CORONARY CARE UNIT AND THE INTERMEDIATE CORONARY CARE UNIT IN THE TOTAL SYSTEMS APPROACH TO CORONARY CARE

William J. Grace, M.D., F.C.C.P.

Chest, Vol. 58, No. 4, pp. 363–68, Oct. 1970
112 E. Chestnut St., Chicago, Ill. 60611

The author describes the system of care at St. Vincent's Hospital in New York City in which the patient with acute myocardial infarction is under the umbrella of continuous electrocardiographic monitoring outside the hospital, in the emergency room, in the coronary care unit, and finally in an intermediate coronary care unit.

In the coronary care unit (CCU), enthusiastically received by the public, all patients with acute myocardial infarction are treated in one area and are continuously monitored by ECG, which is under continuous surveillance of trained personnel; all those in charge of the patients have an aggressive attitude toward control of cardiac arrhythmias.

At St. Vincent's, 50 percent of infarct patients either delay, or are delayed, 6 hours or more between the onset of pain and admission to the CCU. Approximately half the delay is due to patient delay in contacting the physician. Other causes are inability to reach a physician, lack of recognition by the physician of the significance of the telephoned complaint, misdiagnosis, and long emergency room wait. Approximately half the recorded episodes of ventricular fibrillation occurred in the emergency room.

Widespread continuing education of the public and medical profession should be used to attack these delays, particularly emphasizing the urgency of immediate skilled care and the prompt monitoring of the middle-aged man with chest pain.

The hospital has achieved a significant decrease in delay during the critical period with its mobile coronary care unit. It helps combat the neighborhood's special problems of: (1) Manipulation of an ordinary vehicle through heavy traffic; (2) a very large working population with no physician in the vicinity; and (3) a surprisingly large number of people who either live alone and/or have no personal physician.

A patient presenting himself to the hospital is generally directed to the emergency room where, traditionally, cuts and fractures are treated first. When the patient with chest pain finally reaches a physician the traditional approach is to take a detailed history and then order an ECG. Many serious arrhythmias appearing in the ER presumably could have been prevented by earlier monitoring.

The emergency room system must triage patients and give first priority to the middle-aged man with chest pain. Presently, St. Vincent's ER clerical and administrative staffs are alerted to attach this patient to an ECG monitor before any administrative or medical history is taken.

Many industrial concerns are establishing a CCU concept which will further decrease the critical time lapse in treatment.

Approximately one death per month among patients still in the hospital was anticipated following discharge from the CCU. For this reason an intermediate coronary care unit was established. In this room, equipped with appropriate medication and equipment for resuscitation and defibrillation, and staffed by nurses instructed in cardiology and electrocardiography interpretation, ECG monitoring was done every 4 hours by interrupted rhythm strips which were read by a resident as soon as they were re-

corded. Continuous monitoring is now done by radio-telemetry.

Among the first 100 patients monitored every 4 hours, five were returned to CCU because of recurrent arrhythmia and congestive heart failure with two deaths. Five others returned for recurrent chest pain without fatalities. There were four deaths in 14 months instead of the anticipated 14 deaths, suggesting the effectiveness of such a unit in decreasing mortality.

RAPE IS AN UGLY WORD

Emergency Medicine, Vol. 3, No. 10, pp. 23–7, Oct. 1971
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

When your patient is a rape victim you have to get involved. That's part of the treatment, perhaps the most important part.

This is the opinion of Drs. John Emich, Joe B. Massey, and Celso-Ramon Garcia of Philadelphia General Hospital who reported its program in the *Journal of Obstetrics and Gynecology (Vol. 33, No. 1)*. This emergency room management plan was developed to meet the rape victim's multiple needs and to contribute information about patients given scant attention by medical researchers. The program can easily be adapted to the family physician's office practice.

Program objectives are: (1) Immediate care of physical injuries; (2) prevention of venereal disease; (3) prevention or alleviation of psychologic damage; (4) medicolegal examination with documentation for law enforcement authorities; and (5) prevention of pregnancy.

Injuries. Any type of injury may be associated with rape. Most of the genital injuries were found in children. Full assessment can't be done by gingerly examining a frightened child already in pain. And the examination intensifies the emotional trauma. Examination and repair must be done under general anesthesia, so when a doctor suspects genital injury, he should get the child to the hospital promptly to keep infection and unnecessary scarring from complicating the problem.

Injuries can be the same as those of childbirth: midline tears extending down into the rectal sphincter and sometimes all the way up the rectal mucosa and tears around the periurethral area. Surgical repair is very similar to that used for perineal lacerations after delivery. In a child to minimize scarring, use the finest absorbable suture material, the smallest needles, and handle the tissue very gently.

Many women are beaten and hit with assorted objects, resulting in a fractured nose, mandible, or cheekbone; or a ruptured spleen, or injured kidney is a possibility. Order X-rays as for any other trauma to make sure there are no hidden injuries or fractures.

Prevention of venereal disease. For diagnosis of gonorrhea obtain smears from the cervix, vagina, and when indicated, anus. Perform serologic tests to determine whether the patient had syphilis before the rape; it takes a month to 6 weeks for serology to become positive after exposure. All patients are given an intramuscular injection of 2,400,000 units of benzathine penicillin G as prophylaxis. Patients under four receive the same amount in a divided dose. Those allergic to penicillin receive erythromycin or tetracycline, 500 mg. four times a day for 15 days. If after 48 hours the cultures come back positive for gonorrhea, give the patient 4,800,000 units of procaine penicillin. Girls under 10 receive half the dose.

Medicolegal Examination. As far as the court is concerned, the most important aspect of a doctor's examination is careful inspection of all body surfaces. He will be

asked to describe in detail any evidence of trauma or force, or their absence. The doctor's testimony may be the only available evidence to support the patient's claim of trauma. He may be called upon to testify as to the state of the patient's clothing.

A copy of the "suspected rape" form, prepared by the American College of Obstetricians and Gynecologists to help doctors get the necessary data and authorizations, may be obtained by writing the College at 79 West Monroe St., Chicago, Ill. 60603.

Evidence. Any foreign body, fibers, or hairs should be collected. Microscopic examination of the washings of any dried secretions from the perineum and thighs will be important evidence. Record in detail the findings of speculum and bimanual examinations with emphasis on any evidence of trauma, especially in the introitus. Erythema of the posterior fornix is a common observation after coitus, which when forced or repeated may cause superficial abrasions.

Take smears from the vulva, vagina, and cervix. The vagina is rinsed with saline, aspirated, and the fluid placed in a test tube for sperm count. Private laboratories may be reluctant to accept the responsibility for testing and storing specimens, so the doctor may have to take it on himself. If the specimens are sent to a laboratory, use registered mail.

For permanent fixing for indefinite storage, slides of spermatozoa are air dried, then fixed for 10 minutes in methanol and 30 minutes in Giemsa stain, rinsed in a buffer solution and air dried again. Put on cover slips.

Obtain blood and urine samples if there is evidence or suspicion the patient is under the influence of drugs or alcohol. If there is evidence of early gestation, a pregnancy test is in order.

Preventing Pregnancy. Pregnancy prophylaxis is offered to all victims who were not protected by contraception: oral diethylstilbestrol, 25-mg tablets taken twice a day for 5 days. Patients are cautioned in writing that the drug is not guaranteed effective.

All patients who become pregnant following rape can have their pregnancies terminated at the hospital, conforming with the guidelines of the American College of Obstetricians and Gynecologists.

Psychologic Damage. All the victims brought to the hospital are now seen by a psychiatrist either before or after the physical examination. It is estimated that only 10 to 30 percent of rapes are reported to the police; a larger percentage probably see their own physicians.

Everyone concerned wants to bury the matter. If it is reported to the police they are often suspicious of the victim's story. A curtain of silence descends around her. If she turns to her doctor, he must not hush her up. Listening sympathetically may be the most important thing a doctor can do.

Emotional symptoms follow a fairly consistent pattern: acute anxiety for a day or two, followed by a settling down that may indicate adjustment. But frequently severe symptoms appear weeks or months later: depression, withdrawal, lessened ability to concentrate, or psychosomatic disorders that may never be connected with the rape.

In a young child rape is always a time bomb bound to go off, unless promptly defused and the results can be shattering. All young children who have been molested or raped should eventually be referred to a child psychiatrist. Statistics show that the majority are victims of members of their households or family friends; and in 50 percent of the cases he had been drinking, yet the child receives little emotional support.

Within 48 hours of the time that all

patients are brought to the hospital, a psychiatric social worker makes a home visit. This has resulted in more return hospital visits for gynecologic follow-up and vital psychiatric referrals.

RESOURCES FOR THE OPTIMAL CARE OF PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

Study Group Chaired by Paul N. Yu, M.D.

Circulation, Vol. 43, No. 5, pp. A-171-83, May 1971
American Heart Assn., 44 East 23 St., New York, N.Y. 10010

An estimated 1 million people in the United States suffer from acute myocardial infarction or sudden coronary death each year.

The vast majority of deaths may be classified as: (1) Sudden and unexpected, (2) occurring the first 2 hours after onset, probably from ventricular fibrillation and usually before the patient reaches a hospital, (3) deaths from arrhythmias in the hospital, and (4) from cardiogenic shock and cardiac failure. Despite all therapeutic measures, the cardiogenic shock mortality rate still is 80 percent.

Prior to the establishment of Coronary Care Units (CCUs), the average hospital mortality rate from myocardial infarction was about 35 percent; the rate among patients treated in CCUs is less than 20 percent.

Because preventable deaths occur before patients reach medical attention, this study group's detailed report proposes a system to shorten the delay between the onset of symptoms and therapy. A community stratified system of coronary care is proposed, meaning that medical facilities within a community are organized into a three-level system. The organization of such a system will vary with local needs and resources, but with effective planning the proposed system can be adapted to meet the needs of almost every community.

The three-level strata include:

1. *Life-Support Units* to prevent and treat cardiac arrhythmias, perform cardiopulmonary resuscitation, and stabilize patients before transfer to a CCU. Ambulances and all hospital emergency areas should be included. Units might be considered for factories and plants, large office buildings, metropolitan airports and railroad stations, stadiums, convention halls, and race tracks. The units should be easily recognized, their locations indicated on major roads, and entrances clearly marked. Physicians and the community should be familiar with their presence and functions.
2. *Coronary Care Units* for continuing definitive in-hospital care of patients with myocardial infarction. The reporters cover in detail CCU design, staffing, equipment, support staff and services, organization and operation.
3. *Regional Reference Center* for comprehensive cardiovascular care. These centers usually have staff cardiologists and cardiac surgeons; coronary care training programs for physicians, nurses, and allied health personnel; and facilities for specialized studies and cardiovascular surgery.

Important elements of the system are: (1) Public and professional education to decrease the interval between onset of symptoms and the decision to seek help; and (2) the development of local mechanism to bring the patient into the system rapidly. The establishment of emergency telephone information centers might be considered.

It cannot be overemphasized that the

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system's cornerstone is organized, continuing community planning for effective coordination.

TRAUMA WORKSHOP REPORT: TRAUMA IN CHILDREN

J. Alex Haller, Jr., M.D., James L. Talbert, M.D.

Journal of Trauma, Vol. 10, No. 11, pp. 1052–54, Nov. 1970
Williams & Wilkins Co., 428 E. Preston St., Baltimore, Md. 21202

Trauma is the fourth leading cause of death in the general population of the United States, but it is the leading cause in children! Trauma research is sadly neglected, but research in children's trauma is virtually ignored.

Young children respond to serious trauma qualitatively and quantitatively differently from adults. For example, their limited chest volume makes abdominal distention and diaphragmatic elevation greater threats to them than to adults. The tiny blood volume of a young child makes any blood loss assume dramatic importance and a child has excessive and rapid heat loss. Transfusions of large quantities of cold blood and fluids may seriously further this loss. Blunt trauma is responsible for about 80–90 percent of children's serious injuries. External evidence of internal injury may be misleading and result in serious operative delay, especially when multiple injuries involve the head, which they do much more often than in adults. Also, a young child may be unable to express his pain and to localize his symptoms and serious injuries may have a disastrous effect on his emotional well-being.

Trauma in children is further complicated by the sources of their injuries, including poisoning and caustic burns from ingestion of toxic substances, electric shock and flame burns, machine injuries, the battered or neglected child syndrome, near-drownings, and the high percentage of pedestrian injuries which occur in small children. Finally, emotional trauma seriously interferes with management. Because of small children's limited reserves and the rapidity with which they may deteriorate, emergency transportation—including personnel trained in infant resuscitation, simplified transit treatment and direct communication with receiving hospital—is particularly important.

This paper advocates specialized regional centers for definitive treatment to supplement community hospitals, develop management techniques and conduct studies of trauma in children to cover:

1. Pathophysiology of injury in infants and young children.
2. Delivery methods of emergency care.
3. Techniques of intensive care and response to injury.
4. Thermal and metabolic effects.
5. Wound healing.
6. Continuous intravascular monitoring of blood gases and cardiac output in young children.
7. Effects of hyperalimentation on stress and wound healing in infants.
8. Respiratory support and long-term ventilation in infants.

WHY WASH A DIRTY WOUND?

Emergency Medicine, Vol. 3, No. 11, p. 127, Nov. 1971
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

Scrubbing certainly isn't a new idea, but two investigating surgeons at the University of Minnesota, Richard F. Edich and Owen H. Wangensteen, have come up with a new rationale for the practice

that explains why scrubbing extends the period when antibiotic therapy is most effective. That is important when you consider how seldom you see a patient within an hour after he has been injured.

Scrubbing removes the coagulum that forms over an exposed wound as time passes and gives the chemotherapeutic agents readier access to the injured cells and contaminating bacteria within.

Scrub gently every wound with a saline solution or one containing hexachlorophene or other germicide *before* administering antibiotic. Gross bacteria infection is far less likely to develop in wounds so scrubbed than in those closed without cleaning, whether you apply antibiotic directly on the wound or inject it into a vein or muscle.

The surgeons drew their conclusions from a series of animal studies they conducted (reported in *Am. Jour. of Surgery, Vol. 121, No. 6*). First, they confirmed that antibiotic therapy alone was significantly more effective when given within an hour after wounding. With any delay in treatment beyond 3 hours, gross infection developed in a far greater percentage of delayed closed wounds than those closed primarily.

On the basis of these findings alone, antibiotics should probably be administered *before* rather than after so-called dirty surgery—which they suspect may already be too late.

The difference between scrubbed and unscrubbed wounds was striking. Gross infection developed in about half of the unscrubbed wounds closed primarily and in all those in which closure was delayed, but in less than 20 percent of the scrubbed wounds.

Dr. Edlich says, "If the wound is as much as 3 hours old, preliminary scrubbing is essential if the antibiotic is to have any appreciable effect. If the wound is obviously fresh, it is often sufficient just to close it, administer an appropriate antibiotic and let it go."

So do your debriding, your medicating, and your stitching—but first get out the scrub brush.

LEGAL ASPECTS

A GOOD SAMARITAN

Neil L. Chayet, J.D.

Emergency Medicine, Vol. 3, No. 1, pp. 216–17, Jan. 1971
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

When in Vermont you had better be a Good Samaritan—or else. To be or not to be is no longer a question for physicians in that State.

The Vermont Legislature recently enacted a law that goes far beyond any in the United States which seeks to deal with a possible Good Samaritan by protecting him from liability if he stops to aid an accident victim. The physician—or anyone else who happens by—is required by the Vermont law to render aid in an emergency on pain of criminal penalty.

Key sections of the statute provide:

Section A. A person who knows that another is exposed to grave physical harm shall, to the extent that the same can be rendered without danger or peril to himself or without interference with important duties owed to others, give reasonable assistance to the exposed person unless that assistance or care is being provided by others.

Section B. A person who provides reasonable assistance in compliance with subsection A of this section shall not be liable in civil damages unless his act constitutes gross negligence or unless he will

receive or expect to receive remuneration. Nothing contained in this subsection shall alter existing law with respect to tort liability of a practitioner of the healing arts for acts committed in the ordinary course of his practice.

Section C. A person who willfully violates subsection A shall be fined not more than $100.

Why do physicians, and many other people, refuse to help someone in distress? The reason most often given is fear of a lawsuit by the injured person. Less often expressed is the more generalized fear of "involvement," of lost time on being called to testify. The reason least often cited is that they don't know what to do to aid the victim.

Most of these excuses don't stand up. No lawsuits arising out of a true Good Samaritan situation have been documented anywhere in the country. A check of major malpractice insurance companies failed to uncover any claims that have been settled out of court. The fear of involvement in litigation is also unrealistic because most personal injury cases are settled out of court. And a few hours of a doctor's time would hardly justify his refusal to save the life or ease the pain of a seriously injured person. Lack of knowledge is inexcusable in a physician.

The effect of Good Samaritan laws, which purport to excuse the physician from liability as long as he acted "in good faith," "without fee," and "other than in the ordinary course of his practice," have been disappointing.

The Vermont law—which applies to all persons—represents a bold step forward in dealing with the probem by imposing criminal liability for failure to aid another person. The law requires that such failure will be "willful," which presents some legal problems of proof, but the statute should prove more effective than those which merely dispense immunity from liability.

CLINICAL MANAGEMENT OF CASUALTIES

MULTIPLE INJURIES

GENERAL TACTICS AND THERAPY IN MULTIPLE INJURIES

Jorg Bohler

ACTA Anaesthesia Belgium, Vol. 19, No. 3, pp. 257–67, Dec. 1968
Dr. H. Reinhold, Secretaire de Redaction Avenue de Manoir 19, B–1180 Brussels, Belgium

This paper is confined to the treatment of multiple injuries in the acute phase—1 or 2 days postinjury (as they are handled at the reporter's hospital in Linz).

These cases always present an acute emergency and the axiom "time means life" must be applied. The required hospital staff must be immediately available. The patient is admitted in a room equipped for resuscitative measures and diagnostic procedures, contiguous to an operative theatre reserved for traumatic surgery. The anaesthetist who should be the clinical physiologist of the hospital, is the most important staffer in the immediate treatment of severe injuries.

Diagnostic evaluation is done in two steps. Rapid examination of respiration, circulation, consciousness, and degree of shock is followed by emergency measures. A second more complete examination of vital functions is then done, with complementary treatment.

Emergency thoracotomy is done only in case of important, persistent hemorrhage, wound of the heart, or pneumothorax persisting after aspiration.

Refractory shock in absence of external or chest bleeding must induce a check for abdominal bleeding.

Skeletal examination, is first done by scanning with image amplifier and definitive X-rays are taken for suspicious areas. In all severe road accidents an X-ray of the pelvis is taken.

Cerebral injuries are given careful clinical attention. Carotid angiography is not performed during the acute stage. If necessary, use of a trephine is preferred.

In lesions of major arteries of the limbs, circulation must be reestablished within 6 to 8 hours to avoid crush injury syndrome.

Fractures of the spine, of the jaw, and lesions of the eyes and hands must receive early attention.

After surgical treatment, the patient is kept in the intensive care unit under supervision of the anaesthesiologist in collaboration with the surgeon.

As far as possible these patients should be looked after in large general hospitals. If first emergency treatment is given at a smaller hospital, the patient should be transferred to a large hospital as soon as his condition is stabilized.

SPECIFIC INJURIES AND CONDITIONS

APPLICATION OF THE "G-SUIT" TO THE CONTROL OF HEMORRHAGE IN MASSIVE TRAUMA

Bruce S. Cutler, M.D.; Williard M. Daggett, M.D.

Annals of Surgery, Vol. 173, No. 4, pp. 511–14, Apr. 1971
J. B. Lippincott Co., E. Washington Sq., Philadelphia, Pa. 19105

There has been a recent resurgence of interest in the use of external counterpressure to control intra-abdominal hemorrhage, first described by Crile in 1903.

W. J. Gardner and others described the clinical use of external counterpressure by means of a commercially available "G-suit" in the treatment of massive abdominal hemorrhage secondary to gynecologic catastrophes, ruptured abdominal aortic aneurysm, and other large vessel injuries. Crile suggested in 1906 that external counterpressure might be useful in the management of acute trauma.

This report presents a brief clinical experience with the application of the "G-suit" to patients with massive trauma. The study was carried out at a U.S. Army Clearing Company in Vietnam from January to July 1969. The Company received casualties directly from the field by helicopter, provided emergency resuscitative care, and evacuated those requiring immediate surgical operation—normally a 45-minute helicopter trip—to the surgical hospital.

The study was prompted by the large number of mine and booby trap injuries which cause extensive trauma to the lower extremities, perineum, and pelvis. These injuries had been uniformly fatal despite vigorous resuscitation, including massive transfusion. Almost all patients died either enroute to, or shortly after arrival at, the surgical hospital.

In this study there were four members of the U.S. Army and four Vietnamese, all with extensive trauma to the lower extremities, pelvis, and perineum and all considered, on basis of past experience, to have extremely poor prognosis. The use of the "G-suit" was considered a desperate measure. Commercially available "G-suits" were inflated to a pressure of 30–40 cm. water, which was maintained during helicopter evacuation by clamping the input tube.

A very brief history is given on the eight patients. All evacuated arrived at the medical facility in profound hypotension from massive blood loss secondary to acute trauma. In the past most such patients died enroute. With the "G-suit", seven of the eight were successfully evacuated and four survived.

This experience with the "G-suit" gradually evolved over 6 months. It soon became apparent that the most effective resuscitation consisted of immediate application of the "G-suit" and simultaneous administration of whole blood through upper extremity or subclavian veins.

Results of this study suggest that external counterpressure can help temporarily to support the circulation and improve chances for survival while blood is replaced and the patient is transported. In small hospitals, with limited personnel and whole blood reserves, the "G-suit" may help resuscitate severely traumatized patients during transportation to larger medical facilities.

BLEEDING: CONSIDER THE WHOLE BODY

In Consultation

Medical World News, Vol. 13, No. 14, pp. 21 ff., Apr. 7, 1972
1221 Avenue of the Americas, New York, N.Y. 10020

The problem of internal bleeding is considered in question and answer form

by Drs. Mahlon H. Delp, Peter T. Bohan, Professor of Medicine and chairman emeritus of the department of medicine at the University of Kansas Medical Center; Eddy D. Palmer, chairman of the department of internal medicine at Morristown (N.J.) Memorial Hospital; and Sidney Gutstein, associate attending physician and assistant to the chief of medicine at Albert Einstein College of Medicine in the Bronx, N.Y. The following is a composite of their answers to several questions:

Signs and Symptoms: Weakness, rapid pulse, pallor, decreased blood pressure, shock, and vomiting blood in a large majority of GI cases. Those adults with massive GI bleeding without external show of blood are likely to be suddenly nauseated, weak, and may faint. The pediatric patient is not as sensitive to blood in the stomach and not as likely to vomit blood; but a child's lower tract is more sensitive to blood, and bloody diarrhea is likely.

Common Causes: Trauma, loss of vascular integrity, erosive disease processes, and neoplasms. Internal bleeding occurs when the supporting elastic tissue and skin are damaged or faulty (uncommon). Some purpuras are secondary to hypersensitivity to medication, a vast number of intravascular causes—usually referred to the hemotologist—severe liver disease. Causes of GI bleeding in adults: (1) duodenal ulcer; (2) in large metropolitan areas, esophageal varices, usually a complication of cirrhosis of the liver and portal hypertension; (3) erosive gastritis; (4) gastric ulcer, often acute stress ulcer; and (5) erosive esophagitis. The main sources of low bowel bleeding in older persons are carcinoma and diverticulosis.

Common Sites: In a general hospital population, 90 percent of important GI bleeding is from the upper tract; also occurs in central nervous system, pulmonary system, abdomen, kidneys, bladder, uterus, skin, and soft tissues. It can occur in almost any system.

In Central Nervous System: Major disaster may spring from lost integrity of blood vessels within the brain. Bleeding into the brain itself usually produces severe headache or a major neurologic deficit of sudden onset, most likely in hypertensive patients. In subarachnoid bleeding, severe headache is usually associated with severe stiff neck.

In the Pulmonary System: The most common cause today is carcinoma; also tuberculosis, bronchiectasis, abscess, and ordinary lobar pneumonia. Bleeding in the lung occurs in a rather dramatic fashion in an occasional patient with mitral stenosis.

From the Kidney and Bladder: Renal bleeding usually is due to some inflammatory process, not often to trauma. Bleeding into the GU tract is most often due to glomerular nephritis or other infectious process. Bladder bleeding is usually due to stones, an inflammatory process, or a neoplasm.

Is blood's appearance diagnostically useful? Dr. Palmer: Absolutely not. *Dr. Gutstein:* Yes. If vomited blood is bright red chances are the patient is bleeding from a lesion in the esophagus or stomach; if coffee-ground material, somewhat below the stomach—usually from duodenal ulcer, although that can be bright red. A black bowel movement usually indicates upper GI bleeding. Bright red or maroon-colored material usually signifies severe upper intestinal or lower bleeding from the left colon.

Iron Deficiency Anemia As Clue: First, one must rule out occult bleeding. If a patient has iron deficiency anemia, he should not just be put on iron pills. Because it is so easy to treat, withhold treatment until a careful search is made for the cause.

Test for Suspected Occult Bleeding: A common and accurate test to examine the stool for occult blood is the guaiac. Every patient should have a rectal examination at least once a year. Whenever occult blood is found, a proctoscope examination is mandatory. If that is negative, a barium enema and GI series ought to be done.

Distinguishing Between Acute Episode and Chronic Condition: With a large blood loss in an acute episode the red cells will appear normal on peripheral smear. In recurrent bouts of bleeding, the body's iron is markedly diminished and red cells are pale and small.

Signs After Trauma: Focal and lateralizing neurological signs, episodes of unconsciousness followed by periods of lucidity and a return of unresponsiveness, suggest bleeding in the central nervous system. Bleeding from the ears suggests skull injury or basilar fracture of the skull. Coughing blood should suggest a thoracic cage injury and perhaps lung puncture. Changes in auscultation of the chest or development of dullness to percussion suggests bleeding into the pleural space. For trauma-induced bleeding in the abdomen, look for increased abdominal wall muscular tone with rebound tenderness and/or distention.

A ruptured spleen can be difficult to diagnose, so be particularly suspicious if the patient has fractures of the left lower ribs. The patient can exsanguinate rapidly, if a diagnosis is not made. If the spleen ruptures freely into the abdomen, the patient is usually in shock, or has tachycardia and hypotension. The diagnosis can be established if blood is drawn from the abdomen by needle. A subcapsular hematoma—the spleen is torn but the splenic capsule holds the blood within the organ—is hard to diagnose, except by angiography.

The important sign of GI bleeding after trauma is vomiting of blood. The nature of the injury might serve as a warning. Ordinary steering wheel injury with sudden compression of the lower chest is quite capable of causing bleeding from the stomach, cardia, or duodenum.

Tests for Suspected Bleeding. (1) Quick evaluation calls for a history, physical examination, ECG, and routine lab studies; (2) the amount of blood loss may be less crucial than the rapidity of loss. Watch the vital signs: blood pressure, heart rate in particular, to a lesser degree the hematocrit and hemoglobin; (3) seek the blood source in the upper GI tract by carrying out in quick order: esophagoscopy, gastroscopy, duodenoscopy and upper GI X-ray studies. For the lower GI tract consider selective arteriography because endoscopy and ordinary contrast roentgenography are usually disappointing.

Unless a patient is in shock, X-ray promptly. The percentage of positive findings is much higher, particularly for duodenal ulcers. After a GI series the whole abdomen is obscured by barium for hours and arteriography is useless. If there is any question the bleeding is not from the upper tract, aspirate the gastric contents to check for blood.

Determining a ruptured aneurysm. A ruptured aneurysm in the abdomen may cause abdominal, back or flank pain radiating to the groin and/or thighs; the pulse goes up, the blood pressure drops; and over 4 to 6 hours the hematocrit drops.

Bleeding from an intracranial aneurysm, usually in young adults or teenagers, is ushered in with violent headache, stiff neck, perhaps unconsciousness. A thoracic aneurysm rupture is total disaster. With intra-abdominal bleeding from an aneurysm there is often time to save the patient surgically. Be suspicious of an aneurysm bleeding into the GI tract if the patient tells of a little bloody vomitus

a day or two before the crisis. There is not much time to get the patient to emergency surgery if an aneurysm ruptures.

Non-Surgical Methods of Treatment. Rest, quiet, and blood transfusions. Bleeding into the central nervous system simply requires quiet, and mild sedation is desirable. The degree of blood pressure elevation is an important factor in cerebral hemorrhage.

For GI bleeding, secure four or five units of blood to transfuse the patient if necessary. For bleeding from peptic ulcers and esophageal varicosities secondary to portal hypertension, keep the patient quiet, put him on antacids, perhaps use icewater lavage, feed and give the patient milk. Ice water lavage is the most useful emergency means of stemming bleeding in the upper GI tract. About two-thirds of the cases can be stopped by instilling ice water and removing until the returns are clear.

The best treatment for bleeding from esophageal varices is tamponade of the esophagus by the Sengstaken-Blakemore tube.

Feeding Patient with GI Bleeding. The patient is best off eating a pretty full diet, including ground meat and fluids. Food, water, electrolytes and vitamins are best utilized if taken by mouth.

Other Treatments:

1. Sedatives and vasoconstrictors are not ordinarily used.
2. When diagnosis is erosive gastritis, atropine is worth trying.
3. Dextran is not usually used. A rapid, safe and effective volume expander is normal saline if the patient does not have heart failure. The best substitute for blood is probably resuspended red cells for patients with borderline cardiopulmonary competence.
4. For shock get on quickly with whole blood replacement, stop bleeding, plus large doses of corticosteroids.
5. For patients on *anticoagulants,* if the prothrombin time is over 40 seconds, consider bleeding is due to the anticoagulant—a medical emergency. Give vitamin K, 10–50 mgIM, if the patient is on sodium warfarin. Stop the anticoagulant and transfuse the patient if necessary. If the patient is on heparin, use protamine instead of vitamin K. Intravenous vitamin K, perhaps 20 mg a day, can also be helpful in chronic liver disease if the prothrombin time shows delay.

Transfusion Complications. With banked blood, problems can develop because of its low platelet count and low calcium. Every eighth or tenth unit of blood should be freshly dawn, and give calcium with multiple transfusions.

Ligation Indicated. Every case is individualistic, but, in general, if the patient has bled rather continuously for 24 hours and nonsurgical means have not worked and if a unit of blood is required every couple of hours, it ordinarily would be time to do surgery. For any ulcer—except possibly in the esophagus—that stops bleeding only to start again, probably no other treatment short of surgery will permanently end bleeding.

Evacuating Extravascular Blood. Blood should be evacuated when there is: Massive pleural bleeding; free bleeding in the abdominal cavity; in the urinary bladder; and within the bowel where blood can be quite dangerous to the patient with borderline liver competence—usually treat such a patient with repeated enemas.

Preventing Recurrence. 1. In central nervous system, control blood pressure and avoid medications that increase bleeding; 2. in the pulmonary system get at the cause; 3. for peptic ulcer, get the patient to take antacids when the stomach is essentially empty, certainly before going to bed; 4. for esophageal varicosities secondary to portal hypertension, control the

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cirrhosis and modify the hepatitis. A prophylactic portacaval shunt may be indicated. The patient must be kept free of ascites and needs antacids.

DRUG ABUSE: STREET LEVEL EMERGENCY

George R. Gay, M.D.

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241 E. Saginaw, East Lansing, Mich. 48823

Changing drug patterns in San Francisco's Haight-Ashbury have predicted national and international trends since 1967 with the epidemic use of "speed" (Methamphetamine), then "barbs," and finally heroin. 1970 was the year of the middle-class suburban junkie, and 1971, the multiple-drug user. This barometer indicates 1972 will be the year of the Vietnam junkie, according to the author who treats addicts in a heroin clinic. In October 1971 (when this paper was given), the veteran was in the middle of the "lag phase," enjoying his life style. The lag phase—from 1 to 3 years—is the time between the user's introduction to heroin and the time he seeks professional help because the habit becomes intolerable.

In 1971 one-third of the clinic patients were women, and 75 to 80 percent were white, blue-collar junkies. The average age remained the same as for the previous year's suburban group, 23.3. Ten years before, the average age was 33. More than 25 percent were heavily into "snow" or cocaine. The author believes cocaine will be the drug of 1972.

The writer believes the medical profession has created a problem by psychiatrically pigeonholing the drug user as an individual with a specific personality defect, only capable of rehabilitation through prolonged hospitalization and pyschotherapy. As the unhappy result, there is a very low incidence of success with the drug user as patient, and the psychiatrist as therapist.

Young users are under tremendous peer pressure and all types of drugs are available on the street. Patterns of drug abuse are socially activated and a societal hierarchy is established. At the bottom—away from big cities—is the glue sniffer. Right above him come the "dopers" or "barb freaks"—barbiturate, tranquilizer, sedative hypnotic users. They show signs of dissipated health and sloppiness, they drool and "fall out" (stop breathing).

Next up on the list are the "juiceheads" or alcoholics. Then come the cigarette smokers with persistent cough, bad breath, stained teeth, and incipient emphysema. Just above them come the "speed freaks," generally well regarded, quiet, peacable, introverted, they give off "good vibes." They may fall a lot lower on the scale if malnourished, paranoid, or violent in any way, or infected with hepatatis or abscesses. Next comes the "cokehead." Cocaine, drug of the rich man, dealer or pimp, may be doled out like champagne. At the top of the list is the "smackhead" or heroin user. Marihuana is used by two-thirds of the patients at least once a day in place of the evening cocktail.

The core hippies and true "gurus," who used acid and other psychedelics as an almost religious ethic, were the first to arrive in Ashbury. Then came the hangers-on and weekend hippies, then the "teeny-boppers," and finally the "walking crazies," the psychopathic deviates who cannot make it in a larger, structured, less permissive society.

A comatose overdose victim as blue as his jeans may be dumped on the doorstep. Sometimes a phone call for help

comes from a few doors or blocks away. The author warns: *Don't waste time* by (1) looking for pinpoint pupils, (2) getting out intubation equipment, or (3) looking for fresh needle marks.

The main thing is to get the airway open and the patient to breathe. Mouth-to-mouth resuscitation is always available and effective.

Expect multiple drug abuse. Beware of Quaalude which drug users dig because it really makes them feel goofy. Users mix sedative hypnotics with wine, tequila, and other hard liquor, then shoot a bit of heroin and "fall out." If he has taken smack from Saigon it is pure heroin and you may see a case of pure opiate overdose: pinpoint pupils (unless anoxia has caused dilation), respiratory depression (apnea to two or three shallow-gasping respirations a minute), and clammy, cyanotic skin.

If a junkie wandered in off the street, flaked out, and flopped down, first: *Clear his mouth.* Pull the chin back and extend the angles of the mandible upward and outward. If the patient is not breathing properly, use mouth-to-mouth resuscitation, pink him up. Check the pulse right away in any case. By the time he has taken several good breaths his pulse will be regular.

Now the patient needs to be "reversed." Put a tourniquet on his arm and inject intravenously 1 cc. of a narcotic antagonist. (The author uses Nalline or Lorfan.) Within 20 seconds the patient should be sitting up. If he isn't, you have a differential diagnosis and are dealing with probable multiple abuse.

All resuscitation efforts will fail if mechanical obstruction to the airway is not removed. Remember, complete obstruction is silent; partial obstruction is noisy. So listen for snoring or crowing sounds of a partially occluded airway.

Dopram (Doxapram HCl), a non-specific respiratory stimulant, will make the lightly narcotized patient begin to breathe like a locomotive. Don't use it if there is any question of acidosis, prolonged unattended unconsciousness, or if it is a patient who should have no hypertension (e.g., with a head wound). The dosage is about 5 cc. given one time.

After the airway is established, and the patient is pink, breathing well, and has a good heartbeat, take care of secondary matters. Take a urine specimen to assess blood and urine levels of barbiturates; draw blood for chemistries and acidosis level; and accordingly inject bicarbonates, steroids, and other little wonder drugs from the crash cart. Problems with regurgitation and aspiration of vomitus should be approached as a pneumonia, and treated in a hospital.

Overdose—Street Level Treatment

The patient may have received street-level treatment. To stimulate him, his friends will slap him around, so a doctor may encounter a patient with blood or broken teeth in the mouth and a number of superficial abrasions. The author warns physicians to look for two street techniques: (1) Junkies may take regular table salt in the amount of the "junk" taken, mix it with a little water, then inject it subcutaneously on the back or elsewhere. This causes pain as well as subsequent tissue slough and abscess; and (2) The other is an IV injection of milk which can produce lipoid pneumonia.

These OD patients must be watched for several hours because they may have taken Methadone which may outlast the antagonist given, whereupon they lapse into a coma and may die.

EPIDEMIOLOGY AND GENERAL MANAGEMENT OF POISONING BY PESTICIDES

Wayland J. Hayes, Jr., M.D., PH.D.

Pediatric Clinics of North America, Vol. 17, No. 3, pp. 629–44, Aug. 1970
W. B. Saunders Co., W. Washington Square, Philadelphia, Pa. 19105

In recent years, pesticides were involved in 5 to 6 percent of accidental ingestions of dangerous materials and accidental deaths associated with solids and liquids.

These proportions have decreased steadily since 1947. The improvement may be due to emphasis on the safe use of pesticides. Poison control centers, a valuable information source on accidental poisoning, probably have reduced the incidence of child poisoning. However, they often fail to receive reports on the majority of fatal intoxications.

There have been no extensive epidemics of pesticide poisonings in this country, but their occurrence elsewhere is reason for continuing caution.

A 1961 study of fatal pesticide poisonings showed: over 50 percent of the cases were associated with childhood; about 8 percent with incompetency other than childhood; at least 11 percent with some misuse of containers; 15 percent were connected with a work situation in the broadest sense; 58 percent were associated with compounds other than DDT; the majority of deaths from pesticides followed ingestion, but in occupational poisoning it is difficult to assess the extent of both respiratory and dermal exposure; 30.6 percent were among nonwhite persons, although they constituted only 11.5 percent of the population that year; and the majority were males (63 percent of the children and 69 percent of the adults), apparently reflecting boys' tendency to explore, and greater occupational exposure to pesticides by men.

Diagnosis. Recognition of pesticide poisoning in children is less of a problem than other substances because: (a) Parents generally recognize them as dangerous and report such accidents; (b) pesticide container labeling is carefully regulated and accurate; and (c) pesticide analysis is possible in some laboratories of medical examiners, State health departments, agriculture colleges, and by the Food and Drug Administration. There is no simple way to distinguish poisoning from diseases of other origins. Some very common signs are: vomiting, convulsions, or other overactivity of the central nervous system, and collapse. Suspicion of poisoning is increased if there is severe illness without fever.

Treatment may involve: (a) removal of the toxic material, (b) symptomatic care, and (c) physiological and specific antidotes. The importance of the first two cannot be overemphasized. If the patient is conscious, vomiting is preferable to lavage in most instances. The safety and effectiveness of syrup of epicac is well established. After as much material as possible has been removed, activated charcoal is valuable for limiting absorption of remaining poison.

Many pesticides may be absorbed in dangerous amounts by the uninjured skin. Minor injuries may greatly increase this absorption, which is generally slower but more prolonged than that from the gastrointestinal tract. If skin contamination is suspected, the patient should be thoroughly washed with detergent and water without delay. Do not neglect the hair and scalp. After the skin is thoroughly washed, a little more parathion can and should be removed with alcohol.

The authors mention organic phosphorous compounds, their poisoning effects, and treatment with physiological and specific antidotes.

MORE THAN THEY CAN CHEW

Emergency Medicine, Vol. 3, No. 11, pp. 23–9, Nov. 1971

Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

Over 2,000 deaths each year in the United States are caused by inhaled or ingested foreign bodies, according to the National Safety Council. In most instances, the victim never reaches a doctor's office or hospital, but of those who do live to receive professional attention, almost 100 percent survive.

The most regrettable cases are the patients who die because of inappropriate emergency treatment. For example a foreign body only partially blocking the airway, might be shifted by ill-advised maneuvers so that it cuts off all air or becomes more inaccessible.

First Aid Don'ts by the Committee on Foreign Body Accidents of the American Bronchoesophagological Society:

- Don't undertake the job that requires a team of specialists-bronchoscopist, radiologist, and anesthetist.
- Don't turn the patient upside down to shake the obstruction loose.
- Don't thrust a finger down the patient's throat.
- Don't pound the patient's back.
- Don't feed the patient a ball of bread to blunt and dislodge a pointed object like a pin.

What To Do:

1. If the patient is breathing, first ease his panic by assuring him he is in no danger of suffocating if he remains calm.
2. With a partial airway secure, get him to a hospital staffed and equipped to handle this kind of trauma.
3. If he coughs violently, let him. As long as he coughs he can get enough air into the lungs to sustain him.
4. If he ceases to cough and becomes unconscious, give mouth-to-mouth resuscitation, blowing in air more forcibly than normally to force it past the obstruction.

Detection: Search for a history of a foreign body accident. Look for a history of esophogeal disease and be even more suspicious for a foreign body in patients who present symptoms of respiratory disease. Misdiagnosis of symptoms as a respiratory disease can be fatal. Initial symptoms sometimes subside quickly and reappear days, months, even years later when the patient has forgotten the episode, and so his coughing and wheezing points to respiratory disease.

Suspect a foreign body in respiratory patients who do not respond to drug therapy. Antibiotic therapy can mask the condition. The patient goes home apparently cured, but returns in days or weeks with the same complaints, a typical picture of recurrent pneumonia unresponsive to therapy.

Dr. Clyde Pyman, of the Royal Children's Hospital in Melbourne, reporting on 230 cases in the *Medical Journal of Australia* (*Vol. 1, No. 2, 1971*), noted that 85 percent were four years or younger and almost 90 percent of this group had foreign bodies lodged in the bronchus. The larynx was more often involved in infants up to 1 year. He was able to classify his patients into six groups, depending on initial symptoms:

1. *Wheezing* occurred in over half the cases, accompanied occasionally by coughing. Wheezing may be confused with asthma, but the tip-off will be the sudden onset, especially when there is suspicion of a recent inhalation. Air-tapping, which causes the symptom, showed on X-rays of almost 90 percent of the patients.
2. *Cough,* with or without fever, was the second most common symptom, varying from long-standing without toxic manifestations, to recent onset with varying degrees of respiratory distress, fever, loss of appetite, and vomiting. In almost all instances "cough alone"

indicated a foreign body in the bronchus and was accompanied by lung collapse.

3. *Cough only* cases are most likely to be complicated by antibiotic therapy. Drugs improve the general condition, but the cough persists and X-rays still show lung abnormalities. The detection of air-trapping or the delayed discovery of a possible inhalation history calls for diagnostic bronchoscopy; but delay it until antibiotics relieve the severest symptoms of "pneumonia," because general anesthesia is inadvisable with severe respiratory distress.
4. *Bloody expectoration* is most commonly caused by recent inhalation of a sharp traumatizing foreign body, such as a pin, wire, or needle, but in some cases it has no apparent cause or is traceable to a bronchial object which was present for months or years without symptons. By the time the patient comes to X-ray there is usually well-marked lung collapse and possibly bronchiectasis.
5. *Stridor* was encountered only in cases of a largyngeal or a subglottic foreign body, occurring alone or accompanied by cough, dyspnea, or hemoptysis. Misdiagnosis is easy when stridor only is presented because a likely assumption is that the patients have laryngotracheobronchitis. Therefore, direct laryngoscopy is indicated for any patient with this condition whose history indicates a possible foreign body, or who shows no improvement in 5 to 7 days. Threatened asphyxia was the prominent presenting symptom in patients with severe respiratory distress, including cyanosis and unconsciousness. In some previously well patients distress came on suddenly and usually with reliable history of a foreign body inhalation. In a very few patients, threatened asphyxia came unexpectedly on the heels of unresolved pneumonia. Suddenly, especially if physiotherapy has been ordered, the foreign body moves into the trachea or into the main bronchus on the opposite side, precipitating intense tachypnea and perhaps cyanosis, with ultimate loss of consciousness. The tip-off here is that the asphyxial features are out of proportion to the physical findings.
6. *No symptoms* were presented in about 5 percent of the patients. The foreign body was located in some instances by X-rays and in the others where X-ray showed nothing, by bronchoscopy.

Dr. Bunker in *Consultant (Vol. 5, No. 8)* makes the following suggestions for detecting and removing foreign bodies:

- When X-raying, take both inspiratory and expiratory films. Studies also will reveal such secondary complications as bronchiectasis, lung abscess, empyema, and pneumothorax.
- Before referring a patient, phone ahead to be sure an endoscopist is available and report cardiovascular problems and other pathology he should know. In a real emergency, arrange to have the endoscopist ready and waiting for the patient's arrival.
- Where speed is important arrange for a police escort.
- When possible, send a duplicate of the foreign body to aid selection of the best instrument for grasping it.
- Never give crackers or dry bread to a patient. These stimulate gastric secretions which can interfere with esophagoscopy.
- Use morphine, but judiciously, in adults with esophageal foreign body. It will relieve pain and may relax the cricopharyngeal muscle enough to pass the body harmlessly into the stomach.

- Never give respiratory depressants, particularly to children, if there is marked obstruction to breathing. Death in such cases usually comes from exhaustion, so the patient needs to conserve all his strength to breathe.
- Proteolytic enzymes may be used very cautiously for impacted meat in the esophagus. Used judiciously, their digestive action may let the meat pass into the stomach. These enzymes should not be used if you suspect the meat contains bone or if there is disease present in or adjacent to the esophagus.
- Removal of a foreign body from the esophagus or tracheobronchial tree always requires endoscopy supplemented by a large variety of special instruments used by thoroughly trained people. Any other approach to removal must be considered meddlesome treatment fraught with danger. This applies specifically to the passage of a stomach tube to dislodge a foreign body or blindly groping in the esophagus with a uterine forceps to grasp it. The greater danger is perforating the esophagus, and secondary mediastinitis may occur from overriding the foreign body. By far the most important consideration all the experts state, is to maintain a high index of suspicion for a foreign body.

NEW APPROACH TO MANAGING THE PATIENT WHO NEARLY DROWNED

E. Warner Ahlgren, M.D.

Medical Times, Vol. 98, No. 11, pp. 75–82, Nov. 1970
Nassau County (SE), Port Washington, N.Y. 11050

With increased swimming facilities and public knowledge of the A B Cs (*A*irway, *B*reathing, and *C*irculation) of resuscitation, a large number of near-drowning victims reach emergency rooms. Treatment is focused on ventilation, hypoxemia, circulation, and acidosis—an extention of emergency resuscitation A B Cs.

Ventilation. Efforts to drain water from the lungs waste time and are futile. Breathing must be evaluated after the airway is cleared to determine the kind and amount of ventilatory support needed. The patient may need periodic administration of intermittent positive pressure breathing (IPPB) with bronchodilators given by mask, or endotracheal intubation with or without continuous intermittent positive pressure ventilation (IPPV). Continue therapy until the lungs are stable, expanded, and efficient.

Hypoxemia. Low arterial blood oxygen tensions (PaO_2) follow asphyxiation. Treatment is simple: 100 percent oxygen by mask or endotracheal tube. It is important to administer high concentrations of oxygen early, at the site if possible, and continue in the hospital. High humidity should be provided with the oxygen whether or not the patient is intubated. Mist tents with oxygen-driven nebulizers are ideal.

Circulation. Asphyxia duration varies with the patient. If the pulse rate or blood pressure is feeble or absent, external cardiac compression must be applied and continued until circulation is reestablished, using oxygen and cardiotonics to aid ventilation. In the emergency room a cutdown must be done, a large bore catheter placed in a vein. Ringer's lactate solution is adequate initial fluid. It is essential to maintain a record of pulse rate and blood pressure and monitor the electrocardiogram with a cardioscope during the first 24 to 48 hours. Keep cardiac re-

suscitation equipment and appropriate drugs at hand.

Acidosis. As soon as possible, even before laboratory studies are done, give the patient sodium bicarbonate, 1 mEq/Kg estimated body weight. Subsequent doses may be required over the first 8 to 12 hours. A base deficit of 5 mEq/L of whole blood or less need not be corrected after the first 24 hours once the patient's condition is stabilized.

Nearly all hypoxic patients vomit. Confusion may arise in determining if the chest X-ray shows aspiration pneumonitis or immersion pneumonitis, or both. Immersion pneumonitis, often unrecognized, is a patchy perihilar, not peripheral infiltrate. This infiltrate may persist for seven or eight days. Outside of supplemental oxygen, IPPB with a bronchodilator and chest physiotherapy, no treatment is required.

Hypothermia, frequently evident, may be considered protection of the hypoxic cerebrum. Its management is simply gradual warming during continuous temperature monitoring.

On the Scene First Aid (ABC):

1. (A) Establish and maintain *A*irway.
2. (B) Institute mouth-to-mouth *B*reathing.
3. (C) Begin external cardiac compression if necessary to maintain *C*irculation.
4. Summon ambulance.
5. Administer 100% oxygen as soon as possible (via a positive pressure ventilator if necessary).

At the ER—Resuscitation Care Continues:

1. (A) Maintain *A*irway.
2. (B) Maintain *B*reathing.
3. (C) Maintain *C*irculation (defibrillate if necessary).
4. Administer:
   a. Sodium bicarbonate, 1 mEq/Kg estimated Kg body weight;
   b. 100% oxygen;
   c. IV Ringer's lactated solution, 10 ml/Kg body weight for the first hour;
   d. Foley catheter in urinary bladder;
   e. *Laboratory studies:* serum electrolytes, arterial blood gases, type and cross match for packed red blood cells (if fresh water drowning), hemoglobin, and hematocrit.
5. Take portable chest X-ray.
6. Transfer to intensive care unit.

Intensive Care Phase—Management continues with refinements:

1. (A) Revaluate *A*irway and insert nasotracheal tube if necessary.
2. (B) Revaluate *B*reathing; administer high oxygen concentration and if necessary, begin mechanical ventilation.
3. (C) Revaluate *C*irculation; monitor EKG; treat shock; watch for fibrillation.
4. Correct acid-base disturbance in accordance with arterial blood gas values; administer sodium bicarbonate.
5. Adjust electrolyte administration according to serum electrolyte values.
6. Adjust fluid intake to maintain high urine output.
7. Repeat laboratory studies every 4 to 6 hours.

Detailed clinical management histories of three patients illustrate this treatment.

PUNCHING A WAY TO THE TRACHEA

Medical World News, Vol. 13, No. 9, p. 60, Mar. 3, 1972
1221 Avenue of the Americas, New York, N.Y. 10020

Too many people choke to death or suffer irreversible brain damage in the time it takes a physician to make an inci-

sion in the patient's trachea and intubate him.

Dr. Louis Abelson, associate attending in anesthesia at Prospect Hospital in the Bronx, N.Y., has designed a cricothyrotomy cannula featuring a bayonet-shaped trocar in a 7-gauge sheath that can be punched directly into the trachea. Anyone trained in emergency procedure should be able to use it, he says.

The first step, which should take a maximum of 1 minute, is to locate the cricothyroid space with the index finger and insert the cannula into the exact midline. The trocar spreads the tissues as it penetrates, providing hemostasis. The sheath has a circular marker about a half inch from the forward end to indicate at what point the trocar should be withdrawn. The flange is then attached to the skin with adhesive tape, which comes with the device, and the oxygen tube assembly is hooked up. A chimney outlet prevents overdistention of the lungs when oxygen is piped in.

The device, patented in 1965, costs about $17. The anatomical curve of the cannula permits proper positioning in the trachea and the bayonet-shaped point minimizes skin snag. Adequate respiratory exchange can be maintained for 8 minutes and longer.

It has been adopted for teaching purposes at various medical schools, and is used by the New York City fire department. It is part of the first aid equipment of a number of professional sports teams.

THE TOXIC EMERGENCY—AN OVERVIEW

Alan K. Done, M.D.

Emergency Medicine, Vol. 3, No. 10, pp. 45 ff., Oct. 1971, and Vol. 3, No. 11, p. 146, Nov. 1971

Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

The precise approach to poisoning will depend upon its nature and severity, but certain steps should be followed in treating a case of known or suspected poisoning.

Suspect poisoning in any patient with an acute onset of unexplained illness. There are a number of steps you can take to diagnose, assess, and confirm poisoning.

Search the place where the patient was found or recently visited. In accidental poisoning of a child, a spilled container is usually found. When an adult attempts suicide somewhere there will always be a container.

Bring in the container and all remaining contents. Accurate identification may hinge on the precise spelling of a brand name; the label frequently identifies the contents; treatment information may be provided; the label will give the manufacturer who can be contacted. The container and its contents provide the best clue to an estimate of the dose taken. If you know how much was in the container originally, how much is left, and can estimate how much was previously used, you have at least an idea of the maximum amount the patient could have ingested.

If only the brand name is given, identify the potentially toxic constituents by calling the nearest poison information center or look at the text by Gleason, Gosselin, Hodge, and Smith: *Clinical Toxicology of Commercial Products* (Williams and Wilkins, Baltimore, Md.) which has a brand name listing.

Emptying the stomach is usually the best means of stopping toxic action. The importance of thoroughly cleansing contaminated skin should not be overlooked because some poisons are absorbed very effectively through the skin. As a rule of

thumb, empty the stomach if you see the patient within 4 hours after ingestion. It can be longer if the agent is known to delay gastric emptying, like many depressants, or is highly insoluble, as aspirin. Use gastric lavage or induce vomiting; the latter usually is the procedure of choice. Forceful emesis is more effective than lavage, probably because portions of the small intestine also are emptied. An emetic may be worthwhile even when the patient has vomited.

The most widely used pharmacologic emetics are syrup of ipecac and apomorphine. Apomorphine produces more rapid and forceful vomiting but syrup of ipecac is less expensive, safer, and less likely to aggravate poisoning symptoms. A dose of 15 to 20 ml., syrup of ipecac usually produces vomiting within 15 to 20 minutes. Apomorphine has an advantage when the poison is extremely toxic material, rapidly absorbed. The recommended dose of apomorphine hydrochloride is 0.1 ml./kg. subcutaneously. Occasionally it produces protracted vomiting which can be terminated with one of the narcotic antagonists.

Do not induce vomiting if the patient is in, or you suspect he may go into coma or convulsions, or he has taken a caustic which damaged the esophagus, or a petroleum hydrocarbon which poses a threat of aspiration pneumonia.

If the patient is comatose, do a careful gastric lavage, preferably with a cuffed endotracheal tube in place. It is probably safest not to empty the stomach of a petroleum hydrocarbon by either means unless the amount ingested is large—an ounce of kerosene for example—or the hydrocarbon is a vehicle for a more toxic substance. Then, if gastric lavage is elected, it should be performed with the patient on his side or prone with his head down. Have suctioning equipment available. Since chemical pneumonia produced by petroleum hydrocarbons is directly related to low surface tension, getting the material into a thicker solution, like mineral oil, may minimize this hazard.

When you have evacuated the stomach, to eliminate any unremoved poison, there is some merit in use of a cathartic, such as 10 to 30 gm. of sodium sulphate.

Simple dilution can be used to retard absorption of poison left after gastric evacuation, or as first aid until you can get to lavage or induce emesis. Water would probably suffice, although milk should be just as easy to obtain and might offer additional absorptive properties. However, you must take care not to give such large volumes of fluid that they force the poison through the pylorus.

Activated charcoal is a good nonspecific adsorbent which should be used far more extensively; indeed, it probably should be used routinely in the treatment of poisoning. It will adsorb most materials to at least some degree and is highly effective against many—except cyanide, which poisons the charcoal.

It is important to use the right type of charcoal. It should be of vegetable, not mineral, origin and should be a fine powder. Activated charcoal, USP, fulfills these criteria. Don't suspend charcoal in water far in advance of its administration because the adsorption sites become saturated with water molecules. *So make your slurry of charcoal and water immediately before you give it.*

Central nervous depression is one of the commonest and most overtreated symptoms. Do not give a stimulant drug to a depressed or comatose patient. In treating nervous stimulation it is important to use short-acting drugs. Chlorpromazine is the drug of choice for stimulation from amphetamines. Phenothiazine tranquilizers are preferred over barbiturates in many other types of stimulant poisoning—the exception is any agent that produces atropinelike effects which may

be potentiated by a phenothiazine. For status epilepticus the treatment of choice is intravenous diazepam or the ultra-short-acting barbiturate, probably methohexital. For a barbiturate to reverse excitation, use a short-acting drug such as amobarbital, until the patient is stabilized.

Hypotension or shock in an acutely poisoned patient may be oligemic or paralytic in origin. Fluid loss requires plasma volume expanders, including whole blood on occasion. Vasopressor drugs may be needed in paralytic hypotension, but remember with some drugs the increase in blood pressure is not necessarily accompanied by tissue perfusion; indeed, renal blood flow may be seriously reduced. Good choices are metaraminol phenylephrine, or the more potent levarterenol bitartrate.

Cerebral edema may occur. The edematous brain can be shrunk quickly by intravenous infusion of hypertonic solutions such as mannitol or urea. This effect is short-lived, however, and is followed by some rebound. Corticosteroids in high doses will reverse cerebral edema but their effects are delayed for several days. Start both treatments simultaneously.

For acidosis, also common in poisoning, it is usually sufficient to administer liquids, adding only 15–20 mEq. of sodium bicarbonate per liter. With very low blood pH occasionally seen due to salicylates, methanol, and other substances, it may be necessary to administer alkali to correct life-threatening acidosis.

Treat renal failure as if from any other cause, but since the kidney may be the only route of poison excretion, dialysis may be necessary.

Attempting to "wash out" poison by forcing excessive quantities of fluid on the patient is seldom of value and may precipitate congestive cardiac failure.

Osmotic diuresis with infusions of hypertonic solutions of urea, mannitol, or other agents, while touted as useful, only removes a few poisons more rapidly. Alkalinization of the urine in conjunction with osmotic diuresis has been used successfully, but again it is not easy to know when to use this treatment.

Exchange transfusion, a laborious procedure fraught with dangers of transfusion reactions, sometimes offers the only hope, especially when the poison is undialyzable and in small infants in probably the procedure of choice.

Eventually the 1971 safety packaging act will help prevent accidental poisoning in children, but there will be a continuing need to remind parents to keep potentially toxic materials out of reach.

TOXIC EMERGENCY ANTIDOTES.

Emergency Medicine, Vol. 3, No. 11, p. 146.

There are specific antidotes for a very limited number of poisons. Too often valuable time is lost and vital measures are delayed while the physician searches for an antidote that doesn't exist.

When you deal with a poison not included here, forget about antidotes and concentrate on the other types of treatment discussed previously.

There are two categories: *local antidotes,* which act—usually in the stomach—to detoxify or diminish the absorption of the poison, and *systemic antidotes,* which counteract the effects of poison already absorbed. For a poison except cyanide that has no specific local antidote, USP activated charcoal in water—make up a fresh slurry, not in advance—has some antidotal value. Charcoal inactivates ipecac, so if you want to induce vomiting, give the emetic first.

Treatment of amphetamine poisoning with barbiturates is generally unsatis-

factory, but ordinary therapeutic doses of chlorpromazine are highly effective. Pralidoxime chloride plays an important role along with large doses of atropine in the treatment of poisoning due to many of the anticholinesterases, notably the organophosphates.

In treating acute iron poisoning a specific chelator of iron, deferoxamine is a systemic antidote.

For patients with lead poisoning and symptoms of encephalopathy the preferred treatment is to administer dimercaprol and then edathamil calcium disodium. In poisoning from ethylene glycol treatment with ethanol prevents the formation of toxic metabolites; in methanol poisoning this treatment must be combined with alkalinization to correct acidosis.

WHAT DO YOU DO WITH AN UNCONSCIOUS PATIENT?

Arthur Winter, M.D.

Emergency Medicine, Vol. 2, No. 7, pp. 15–19, July 1970
Fischer-Murray Inc., 280 Madison Ave. New York, N.Y. 10016

Seeing a patient in unexplained coma is one of the most harrowing emergencies for a physician. Speed in starting treatment may be of the utmost importance to the patient's survival, but coma comes in many guises and the wrong diagnosis could be fatal. How do you find out what's wrong?

Syncope is a brief loss of consciousness and the patient recovers quickly. *Coma* is usually prolonged and the patient is entirely unresponsive to painful or other stimuli. The patient in *semi-coma* is unable to respond quickly to questions or stimuli.

The sudden onset of coma is always a medical emergency. You want immediately to check the patient's vital signs: temperature, pulse rate, and blood pressure—but above all keep him breathing.

Watch how the patient breathes. Slow, shallow respiration may signify barbituate intoxication; deep, labored breathing suggests diabetic acidosis; with Cheyne-Stokes respiration—deep, labored breathing alternating with periods of apnea—brain damage is likely to be severe. If one cheek puffs out when the patient exhales, that side of the face may be paralyzed.

From relatives or friends, try to get a medical history: first, about the present episode, how quickly it came on, and was it preceded by specific signs or symptoms? and *second,* about previous trauma, and either positive or suggestive evidence of a medical or psychological condition, and drug or alcohol use. The unconscious John Doe brought to the hospital without identification and unaccompanied by anyone who can give you a clue is perhaps your greatest diagnostic problem. A child in a coma or semicoma may be the victim of the *battered-child syndrome,* in which case a history from the parents—and even the child in lucid moments—may not be reliable.

The causes of coma can be either intracerebral or extracerebral. And don't forget there can be more than one cause. In unexplained coma, use all your senses throughout the examination.

Smell. Smelling may reveal the odor of alcohol on the breath. The fruity odor of acetone can be a clue to diabetic acidosis. Uremia may be detectable. A fetid breath, with attendant loss of electrolytes into the bowel, may mean bowel obstruction.

Sight. Look for external signs of trauma—bruises, bleeding, cuts, open wounds. Burns around a child's mouth may mean he has taken corrosive poison. *Battle's sign,* discoloration over the mastoid process behind the ear, indicates

probable skull fracture, as does bleeding from the ears. What *color* is the patient's skin? If bluish or cyanotic, he is anoxic, maybe with respiratory or cardiovascular problems. Pallor may indicate anemia or shock. Jaundice suggests possible hepatic failure. Reddish skin could be sunburn or febrile disease, bacterial or viral or drug reaction. Bright cherry red could be carbon monoxide poisoning. *Needle marks* may mean drug addiction. Rashes or petechiae might be an infection or blood dyscrasia. A bleeding or scarred tongue may be a sign of epileptic attack.

Touch. Feel the skin. Elevated temperature with very dry skin is likely to mean heat stroke. Palpate the abdomen. Enlargement of the liver or kidney are meaningful. If the abdominal wall is distended, spastic, or rigid, or you detect fluid in the cavity, consider the possibility of some abdominal catastrophe.

Hearing. You may be able to hear a certain flatness on simple percussion of the skull which will suggest an expanding lesion. Fast heartbeat could mean intrinsic tachycardia or shock; if slow, digitalis intoxication, or myocardial infarction; if irregular, atrial fibrillation or a more serious arrhythmia. Rales, wheezes, ronchi, or absence of breath sounds over the lungs may indicate pulmonary disorders, and failure to hear bowel sounds over the abdomen may mean obstruction or ileus.

Keep the patient's age in mind, but don't give it too much importance. Some physical clues may indicate depth of coma or presence or absence of paralysis: spontaneous movement and is it bilateral, or does only one arm and one leg move? If you raised an arm or leg and let go does it plummet? Are tendon reflexes equal? Is there any external rotation of leg and foot, indicating paresis on that side? Examine the eyes carefully. Blood tests and urinalysis should be done as soon as the patient comes in. A spinal tap may provide useful information, but avoid it if you have found papilledema. Skull X-rays may be necessary to reveal a fracture. A comatose child with bruises should have a complete set of X-rays of chest and extremities which may show old, healed fractures leading to suspicion of the battered-child syndrome. If you suspect a brain lesion and the patient's condition permits, echoencephalography will take about 10 seconds to detect any shifting in brain structures.

Supportive therapy must be given the unconscious patient from the very beginning. Do whatever you must to keep airway open and the patient breathing.

Take measures to correct conditions. Reduce an elevated temperature. Raise a low temperature by wrapping the patient in warm blankets. Restore low blood pressure to physiological levels as soon as possible. Correct fluid and electrolyte imbalance and hypoglycemia promptly. Use drugs as needed. Gastric lavage is important for diagnosis and tr atment in poisoning and drug overdose.

Broad-spectrum antibiotics should be given as soon as you determine that infection is present. If you suspect an extradural hemorrhage when the patient's condition is deteriorating rapidly, you must sometimes drill a burr hole to see whether there is a clot on the brain and to relieve pressure before you do anything else.

The important thing is to observe and examine. Too often, diagnostic errors are made because no one looked carefully enough.

WHEN AN ARTERY GETS CUT

Emergency Medicine, Vol. 3, No. 11, pp. 74 ff., Nov. 1971
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

Arterial injuries won't wait. You have to diagnose and act fast to outwit death or avoid amputation. However, arterial injuries complicate less than 4 percent of skeletal trauma suffered by the man in the street.

British surgeons, G. Slaney and F. Ashton, reporting in *Postgraduate Medical Journal* (*Vol. 47, No. 5*), hold that a poor outcome is due to slow-motion diagnosis and hesitant, conservative management.

Causes: (1) Deceleration injuries; (2) penetrating wounds; (3) crushing injuries; (4) fractures or dislocations, and (5) iatrogenic mishaps in angiography, intra-arterial injections, and cardiac catherization.

Tell-tale signs: Diminished or absent radial pulse, persistent arterial bleeding, large or expanding hemotoma, major hemorrhage with hypotension or shock, bruit either at or distal to the site of suspected injury, injury to related nerves, and wound near a major artery.

Deceleration wounds usually result from high speed and a sudden stop, but they can occur when a car is only going 30 miles an hour or less. Deceleration can transect a major artery completely without any external signs or broken bones. Suspect an aortic rupture in any deceleration injury. Take a chest X-ray and if it shows widening of the superior mediastinum or a hilar mass, suspect aortic rupture, especially when you can't see any damage to the sternum or thoracic cage.

The diagnosis will be pretty well clinched if the radial pulse is diminished or absent, indicating impaired blood flow to the left arm, and if blood pressure differs between the upper left and right arms. Ischemia in the legs is another clue. In a few patients signs of acute ischemia to the spinal cord may mislead you to think it's traumatic paraplegia. With any of these signs, confirm the diagnosis with an aortogram.

Take an EKG to check for heart contusion; the tracing will mimic myocardial infarction. Do a thorough check for flail chest, airway obstruction, intraabdominal hemorrhage, and multiple fractures. Be on guard for deceleration injury to the viscera.

Finding and treating these patients fast seems to be the magic formula. Repair is made by a simple left heart bypass and replacement of damaged segment by a Teflon or Dacron graft.

Suspect arterial injury when a penetrating wound lies over the route of a major artery, when a closed injury is linked with a rapidly increasing hemotoma, and when there is associated skeletal injury. Assume arterial injury in fractures of the neck of the humerus, supracondylar fractures of the humerus or femur, and posterior dislocations of the knee. *Signs:* Distal arterial insufficiency; absent pulses, especially in an otherwise healthy patient with good pulses in the contralateral limb; pallor or patchy cyanosis; coldness; paresthesia; loss of feeling; paralysis, sometimes with severe ischemic pain.

Diagnosis can be made on clinical signs without angiography. *Don't be fooled into attributing severe vascular insufficiency in a damaged limb to traumatic arterial spasm unless an exploratory operation has definitely ruled out an organic cause for acute limb ischemia.* Even if you do diagnose spasm, do not equivocate on treatment. In every case of traumatic arterial spasm investigated surgically, an organic lesion has been discovered. Rarely, the vessel itself may be intact but obstructed by acute angulation or compressed by a hematoma or adjacent fracture. More commonly, a clot causes the spasm. Arteriotomy will usually reveal an intimal tear with thrombus superimposed on it; fix the tear and no more spasm.

After adequate circulatory volume is restored and pulse returns to all but the injured limb, early exploration is advised. The operation should be performed within eight hours, and no later than 12 hours after injury.

Watch for traumatic arterial thrombosis, peripheral traumatic aneurysm, and arteriovenous fistulae. If signs of arterial insufficiency continue for more than two hours, vascular lesion probably exists; get your patient to the OR for exploration.

Peripheral traumatic aneurysms are most often associated with a comminuted fracture of the tibia. The patient, if treated by internal fixation, complains several days later of pain in the calf with edema and swelling. Be careful you don't diagnose this as a deep venous thrombosis and take the disastrous step of prescribing anticoagulant therapy. Examination will show distal arterial insufficiency.

Arteriovenous fistulae are usually produced by stab or missile injuries. Palpation will detect a distinct thrill and within a few hours you can usually hear a bruit. Both artery and vein should be repaired as soon as the fistula is detected to avoid possible heart failure.

CORONARY CARE

BLOWS THAT HURT THE HEART

Medical World News, Vol. 13, No. 7, p. 55, Feb. 18, 1972
1221 Avenue of the Americas, New York, N.Y. 10020

Blunt blows to the chest, often suffered in automobile accidents, may cause more cardiac injuries than statistics indicate, according to Boston surgeons Irving M. Madoff and Gerard Desforges. Cardiac trauma is under-reported and some cardivascular injuries may be overlooked, especially in cases of multiple injuries which demand immediate attention.

Physicians are advised to watch carefully for the following diagnostic signs (in decreasing order of importance): hemopericardium, widening of the mediastinum, recurrent hemothorax, new murmurs, ECG changes, tachycardia, variable cardiac rhythm, and fractured sternum.

Reviewing 25 cases from their own practices, the surgeons point out that 21 were injured in automobiles, two were hit by cars, and two suffered industrial accidents. Two patients with fractured sternums and one with only a contused chest went into atrial fibrillation. One patient required surgery, the other cases were resolved by medication. Of the 23 auto accident victims, two with broken ribs had myocardial infarctions, cause unknown, and 11 others had ECG changes indicating less serious heart injury. A blow to the chest of a 15-year-old driver ruptured the wall between the ventricles. Three of the 25 patients died and autopsies showed at least one major cardiac trauma had gone undiagnosed.

Patient observation should be accompanied by electrocardiogram, chest X-ray, cardiac catheterization, or aortograms when indicated; and the prudent use of pericariocentesis, since intrapericardial bleeding is one of the most insidious complications of cardiac trauma.

BURNING SENSATION AND POTENCY OF NITROGLYCERIN SUBLINGUALLY

Herbert W. Copelan, M.D.

JAMA, Vol. 219, No. 2, pp. 176–79, Jan. 10, 1972
535 N. Dearborn St., Chicago, Ill. 60610

The unwitting use of deteriorated nitroglycerin confuses the diagnosis and

treatment of angina pectoris. If the potency of each tablet were known the confusion would be eliminated.

The clinical impression that fresh nitroglycerin causes a sublingual burning sensation that provides a practical index of potency was tested. This paper is a detailed report of the test and findings summarized very briefly here.

Thirty inexperienced subjects were tested in a double-blind study with fresh and artificially aged nitroglycerin. Each subject was tested with two tablets—one fresh, one aged. Medication was administered so that half the subjects were tested first with the fresh drug, the other half with the aged drug.

The first tablet was placed under the side of the tongue and at 30 seconds was inspected for dissolution. The subject was asked if the tablet had any taste or caused any feeling under the tongue. If not, he was asked directly about the presence of burning, stinging, tingling, sourness, or sweetness. After one minute systemic vasodilation effects were studied, the pulse rate recorded at 2, 5, 10, and 20 minutes, at which times the subject was asked if he felt anything. If no symptoms were volunteered, he was asked specifically about the presence of headache, flushed feeling, light-headedness, or dizziness. One hour later a similar trial was conducted with the second tablet.

Twenty-seven subjects reported immediate *sublingual burning* with the fresh drug and decreased or no burning with aged tablets ($P<0.001$). Surprisingly, the faint sweetness of nitroglycerin, a true taste sensation, had no value as an index of freshness.

Fresh drug caused more systematic effect ($P<0.001$) and this correlated with burning sensation ($P<0.02$ and $P<0.001$). Localized sublingual erythema and vasodilation occurred simultaneously with burning, suggesting that the sensation indicates potency by reflecting topical activity.

A sublingual burning sensation of fresh nitroglycerin would seem to be a practical index of potency because it is recognized immediately, is simple and distinctive, and reliably identifies active medication. The index is readily applicable clinically because it can be used for diagnosis, establishing dosage, and subsequent treatment.

CPK: 'AN UNDERRATED TEST' FOR INFARCTS?

Medical World News, Vol. 13, No. 8, p. 30, Feb. 25, 1972
1221 Avenue of the Americas, New York, N.Y. 10020

The level of creatinine phosphokinase (CPK) activity in serum has long been considered a diagnostic clue in determining whether a myocardial infarction has occurred, but many physcians maintain that CPK activity increases for only a short time following infarctions, so tests for this enzyme do not help in recognizing an attack which took place several days earlier.

Evidence contradicting the belief that the enzyme's postinfarct elevation is short-lived has been collected by a Minneapolis pathologist, who believes the CPK determination is an underrated test.

Dr. Leonard V. Crowley, clinical assistant professor of laboratory medicine at the University of Minnesota Medical School and pathologist at St. Mary's Hospital, says studies he performed in 1969–70 indicate that almost 90 percent of the patients he followed had high CPK levels 4 days after their infarcts and half of these for as long as a week. His most recent evaluations of CPK testings on 36 myocardial infarct patients, most of them middled-aged men who were checked for CPK, SGOT, LDH, and

HBD up to two weeks after their infarcts, indicates that postinfarct CPK tends to drop off more rapidly than does SGOT activity. It also shows CPK to be a measurable clue in many patients for a longer time than generally recognized, and it is not influenced by congestive heart failure and such other conditions as liver disease.

LIDOCAINE INTRAMUSCULARLY IN ACUTE MYOCARDIAL INFARCTION

Victoria Bernstein, MRCS, LRCP, CRCP; Melvyn Bernstein, MB, CHB, FRCP; John Griffiths, BSC, MB, BCH; Dwight I. Peretz, MD

JAMA, Vol. 219, No. 8, pp. 1027–31, Feb. 21, 1972
535 N. Dearborn St., Chicago, Ill. 60610

Ventricular fibrillation is a major cause of death in the early stages of myocardial infarction. The advent of early detection and treatment of arrhythmia in coronary care units has significantly reduced mortality from this cause. At present, however, a significant number of patients do not survive long enough to reach the hospital.

This paper is a detailed account of a study carried on in the Medical Intensive Care and Coronary Care Unit at St. Paul's Hospital, Vancouver, B.C., to further reduce this mortality.

Two hundred milligrams of lidocaine hydrochloride were given intramuscularly for controlling ventricular premature beats in 40 patients continuously monitored. Only patients who exhibited more than five unifocal premature ventricular contractions per minute or multifocal ventricular contractions were studied. There were 27 men and 13 women and the mean age was 62.5 years. In 14 patients serum levels were determined by gas chromatographic techniques.

The treatment abolished premature ventricular beats in 30 of the 40 patients. Eight of the failures had persistent premature ventricular beats over a long period before admission to the hospital. Serum levels and clinical results showed that effective drug concentrations were reached between 15 to 30 minutes after injection and that therapeutic levels were maintained for at least 60 minutes. The arrhythmia reappeared in eight patients between 2 and 3 hours following injection, confirming the therapeutic range established by the serum levels.

None of the patients exhibited any untoward reactions to the drug. There were no complaints of pain at the site of injection and no evidence of inflammation or tissue necrosis there in any patients.

Intravenous infusion is convenient in hospital, but difficult outside. It would appear that the intramuscular route would be more convenient for use prior to hospital admission and possibly in those hospital patients in whom intravenous infusion may be undesirable.

Since the early stages of acute myocardial infarction, premature ventricular contractions are often the forerunners of serious ventricular tachyarrhythmias, it would appear that the intramuscular administration of lidocaine would be a useful form of therapy when patients have sustained an acute myocardial infarction outside the hospital. This medication may help to prevent the development of fatal arrhythmias prior to hospital admission. This therapy may be used by the physician or trained paramedical personnel.

THE PREHOSPITAL PHASE OF TREATMENT FOR MYOCARDIAL INFARCTION

A. A. Jennifer Adgey, MB, MRCP; J. F. Pantridge, FRCP

Geriatrics, Vol. 27, No. 5, pp. 102–10, May 1972
Lancet Publications, Inc., 4015 W. 65th St., Minneapolis, Minn. 55435

In all age groups 40 percent of deaths from acute myocardial infarction occur within one hour of the onset of symptoms. Among middle-aged and younger men the rate rises to 63 percent. The majority of deaths occur outside the hospital and it is likely that most result from ventricular fibrillation.

Many factors are involved in delayed intensive care: (1) Delay in seeking medical advice; (2) the doctor may be unaware of the high risk of sudden, preventable death from an apparently mild coronary attack; (3) the ambulance service may not come immediately; and (4) much time may elapse between the patient's arrival at the hospital and his transfer to the coronary care unit.

Patient delay might diminish with increasing public awarenes of the importance of seeking medical help promptly.

The mobile coronary care unit, started in Belfast in 1966, delivers intensive coronary care to the patient at the scene of the infarction as soon as possible after the onset of symptoms. When the mobile team arrives electrocardiographic monitoring is begun and therapy continues until pain has been relieved and a stable rhythm established when the patient is moved into the ambulance. Monitoring is continued during transport. Direct transfer from the ambulance to the hospital coronary care unit is ensured with monitoring continuing, bypassing the emergency room where early deaths from myocardial infarction occur.

The major objective is the prevention of death from rhythm disturbances. The patient seen early after the onset of symptoms and thought to have had a mild infarction is at as great a risk of developing ventricular fibrillation as the patient considered to have had a severe infarction. In the followup of 160 long-term survivors of ventricular fibrillation, patients who had ventricular fibrillation within 4 hours of the onset of symptoms were younger, tended to have had a mild attack, and had the most favorable long-term prognosis.

The mobile unit removes the risk of dysrhythmic death during transport. Rhythm disturbances were common among patients seen early. Sixty-five percent of the 284 patients who came under intensive care within an hour of the onset of symptoms required therapy before transport. Sixty percent required therapy for bradyarrhythmia, ventricular dysrhythmia, or supraventricular tacharrhythmia, and 12 of these 170 patients had dysrhthymia associated with acute left ventricular failure. Fifteen patients required therapy at the attack site because of left ventricular failure unrelated to rhythm disturbance.

Bradyarrhythmia occurred more frequently in patients with posterior infarction than in those with anterior infarction. Forty-five percent with posterior infarction had bradyarrhythmia within the first hour and 25 others developed it later. Sixty-four percent with posterior infarction had bradyarrhythmia at some time. There is reason to believe that the ideal heart rate after acute infarction is about 90 per minute.

The reduction in hospital mortality results from a reduced incidence of shock and pump failure. It is of interest that patients seen early showed a significantly lower incidence of shock and a lower hospital mortality than those seen after three hours, although all were managed in the same way and the age range was 30 to 86. This finding differs from experience elsewhere which indicates that a high proportion of patients admitted during the first

few hours will increase the overall mortality whereas admitting patients several hours after infarction produces a lower hospital mortality.

The lower mortality among those seen early in the study indicates the need for prehospital therapy, including the relief of pain and stabilization of the rhythm prior to transport to the hospital coronary care unit. It seems likely that cardiogenic shock is related to the magnitude of the area of myocardial damage. Experimental evidence shows that following coronary ligation reduction of the blood pressure and heart rate resulted in an increased area of myocardial injury and the elevation of the blood pressure limited the area of myocardial injury.

Since measures to reduce the appallingly high mortality in cardiogenic shock are singularly unrewarding, effort should be directed toward preventing shock by early initiation of intensive care. In view of the limitation of antiarrhythmic drugs in the management of early arrhythmias, it would appear that if there is to be a reduction in the early high mortality from primary ventricular fibrillation and in the hospital mortality from shock and pump failure, there is no alternative to prehospital coronary care.

TURNING IN AN OFFBEAT PACER . . . AGAIN

Emergency Medicine, Vol. 3, No. 12, pp. 72–3, Dec. 1971
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

Cheap transistor radios are used to detect mechanical failures in a prestigious medical device—the implanted cardiac pacemaker. The pacemaker patient becomes his own best monitor.

Once or more a day he tunes the AM radio to 550 KC and holds it over his pulse generator. Each time an impulse is discharged into his heart, the radio picks up the change in electric potential and gives off a rasp of static, a metallic click. By counting the rate of these clicks for a minute, the patient can tell whether his pacer is firing properly. If the rate is slower, faster, or different from what he has been told by his doctor to expect, he goes immediately to a hospital for a thorough testing and tune-up.

This simple, inexpensive test saves patients from having to traipse to distant hospitals for monthly checkups. The transistor test is also more effective than a periodic examination in picking up sudden breakdowns—such as a broken wire—that can occur minutes after the patient leaves the doctor's office.

Three types of pacers are used now: fixed rate or asynchronous, atrial-sensing, and ventricular-sensing (all described by Dr. Edward R. Dorney in *Southern Medical Journal, Vol. 64, No. 7*). The patient must be trained to understand his particular pacer's function, so he can recognize variations that spell trouble.

The *asynchronous pacer* is the easiest for the patient to check. Set to fire at a preselected rate—usually 70 to 75 per minute—it completely controls the pacemaking function. To check it, the patient listens for the clicks produced in the radio and counts them for one minute. If the rate increases or drops by more than three to five clicks per minute, or becomes erratic, he should see his doctor at once. By taking his pulse as he counts radio clicks, he can also check the integrity of the wire connecting the generator to his heart. If there's a break, the pulse won't immediately follow each click.

The *atrial-sensing pacer* doesn't fire at a fixed rate; it follows the normal physiological speeding and slowing of the atrial rhythm, thereby delivering a synchro-

nized atrial "kick" that increases cardiac output by as much as 30 percent. This pacer should be checked twice a day. With the radio on the pulse generator, the patient counts the clicks and his pulse for one minute. Then he exercises for a short period to accelerate the heart rate. If the pacer's rate varies synchronously with the physiologic pulse, it is in good working order. If the pacer fails to speed up after exercise and remains around 60 to 70, either the atrial wire isn't sensing, the pulse generator is losing power, or the atrial rate has topped 120, causing the pulse generator to block down. If the pulse remains at 60 to 70 despite the exercise, the patient should see his doctor.

There are two types of *ventricular-sensing pacers:* the "synchronous standby" and the "blocking standby;" both sense the voltage of the ventricular complex.

The "synchronous" type, which synchronizes with normal depolarization, has a basic firing rate of 70 per minute, with a resting phase divided into two stages. It is checked much the same as the atrial pacer. During exercises the wearer checks to see that it is following the rise and fall of his pulse. Then to be sure the pacer is capable of firing on its own, he places a magnet, provided with the pacer, over the pulse generator; then shifts into an asynchronous mode. Any deviation from 70 clicks per minute is a sign of danger and should be checked by the doctor.

The most frequently used pacer is the "blocking standby type." This simply stands by when spontaneous ventricular depolarization occurs at or above 70 beats per minute. But when the patient's ventricular beat drops below 70, the pacer takes over at 70 and continues until the normal spontaneous rate resumes. This is monitored just like the synchronous standby type: counting clicks and pulse for one minute, then holding the magnet over the pulse generator and counting clicks for another minute. If the rate while the magnet is applied seems to drop below 70 or is rapid or irregular, the pacer should be checked by experts.

Patients should be alerted to the fact that batteries tend to wear out at predictable intervals. The patient no longer needs to be anxious. Any time he needs to be assured, he can tune his transistor to the good news.

All concerned can rest more easily knowing even if the news is bad, a patient will hear it in plenty of time to reach a doctor to keep it from getting worse.

BURNS

ELECTRICAL BURNS

Emergency Medicine, Vol. 3, No. 11, pp. 36 ff., Nov. 1971
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

Burn patients with electrical injuries are unique and their treatment from ER to OR is likely to be complex and difficult.

Good care starts *at the accident scene.* The victim may be unconscious, and in respiratory arrest or ventricular fibrillation. Prompt artificial respiration and closed cardiac massage could save many such patients who die each year.

The victim usually makes contact with his hand and the current causes spasm which makes him grasp the hot wire more tightly. Use a rubber sheet, wooden pole, or other nonconductive material to detach him. Never touch him directly. Cut the power off if possible. Electric shock patients often have fallen, so be careful of possible broken bones and spinal injuries.

In the emergency department the patient is likely to be in shock. The involved

skin surface is not a guide to fluid replacement because the surface wound may mask massive deep tissue injury. Give fluids rapidly, preferably Ringer's salt solution, until an adequate urine volume is established—greater than 50 ml. per hour—and shock symptoms lessen.

There are three kinds of electrical injuries.

1. *Injuries characterized by entry and exit wounds,* signifying that the body has served as internal conductor of the current. The entry wound is yellowish-grey, surrounded by a red hyperemic area, usually cold, bloodless, painless, and often on the hand. A foot is a common point of exit, but in most patients there is more than one exit wound, usually rounded and charred with depressed edges, similar to that of a bullet.
2. *"Arc" burns* produced by current coursing external to the body from contact point to ground—the body itself may or may not have served as ground. Arcing current when it grounds externally causes much more surface damage. The burn depth depends on how close the current is to the skin. They can be extremely deep.

   When the body serves as ground there will be another circumscribed deep wound. The entry points on flexor surfaces frequently produce "kissing" wounds—the result of severe tetanic muscle contraction that brings a less resistant surface near the electrical source.
3. *Thermal burns,* caused when current ignites clothing or other object, are usually full thickness.

   Accurate recognition of all three kinds of wounds is essential to therapy, but is often obscured by the coexistence of all three in one area.

In estimating internal damage to the body consider hemochrogen excretion. Most pigment excretion can be identified as myoglobin. The persistence of port-wine or reddish-black urine indicates massive muscle injury.

Experts differ on the time for debridement. Some argue for delay; others claim early debridement is necessary. Some say debride an extensive wound as soon as possible, but delay for small wounds on the extremities. Some advocate liberal use of fasciotomy to maintain blood flow in early postinjury swelling of an extremity. Even when amputation is mandatory, initial fasciotomy will permit salvage at the lowest level possible. Most experts agree that amputations should be performed early.

Infection is a serious problem. A tetanus shot is indicated if the patient has not had one in the last year or so. Antibiotics may mask symptoms.

Once the patient has been patched up, he may call the family doctor about some long-lasting or late-appearing complications: impotence, convulsive disorders, severe recurrent headaches, cataracts, cholelithiasis or osteoarthritis.

EVALUATION AND TREATMENT OF THE BURNED PATIENT

Major P. William Curreri, M.C.; LTC Basil A. Pruitt, Jr., M.C.

The American Journal of Occupational Therapy, Vol. 24, No. 7, pp. 475–80, Oct. 1970

6000 Executive Blvd., Suite 200, Rockville, Md. 20852

The evaluation and treatment of the patient with a large thermal injury requires the knowledge and skills of a diversified medical and paramedical team.

Frequent physical examination by the physician is required during the resuscitative phase of treatment when physiologic and metabolic processes change rapidly.

Nursing personnel require specialized training to recognize and respond to specific problems of the burned patient. The importance of physical and occupational therapists cannot be overemphasized for their combined efforts are required to maintain motion in burned and unburned joints and to prevent skin contractures.

INITIAL CARE

When the thermally injured patient is first seen in the emergency room, make a rapid physical examination for life-threatening injuries. The establishment and maintenance of an adequate airway, the treatment of internal or external hemorrhage, and the conversion of an open chest wound to a closed wound are mandatory. Such associated injuries are not uncommon, particularly in a vehicular accident.

Emergency resuscitative therapy requires the insertion of a line for IV fluid. During the first 48 to 72 hours, it is recommended that medication be administered intravenously because perfusion of soft tissues may be decreased, causing irregular absorption of intramuscular medication. Most patients with full-thickness burns require little analgesia since the sensory nerve endings also are destroyed, but small intravenous doses of analgesics are recommended to prevent respiratory depression from narcotics. Penicillin prophylaxis against streptococcus is recommended for the first 4 or 5 days.

In the emergency room a urethral catheter should be inserted for the accurate measurement of urinary flow. If active bowel sounds are not detected on auscultatory examination of the abdomen, it is recommended that a nasogastric tube be inserted to remove gastric secretions and thus prevent vomiting and aspiration of gastric contents.

In patients with severe face and neck burns, the physician must evaluate frequently the adequacy of the upper airway. In general, tracheotomy is discouraged since severe complications frequently result from a foreign body in the trachea of a burn patient. There are two absolute indications for tracheostomy: (1) Airway obstruction preventing adequate oxygenation of the blood; and (2) inability of the patient to expectorate bronchial secretions or expel vomitus. Pressure or volume ventilators may be needed to maintain adequate arterial oxygenization following tracheostomy.

Finally, frequent and careful evaluation of the circulation to the distal extremities is mandatory. Skin elasticity is lost with full-thickness thermal injury and the eschar is unable to stretch in response to the increased volume of underlying soft tissue in circumferentially burned limbs. Therefore, pressures within the extremity rise until they exceed the venous pressure and venous occlusion results. With inadequate venous drainage more edema ensues until arterial and capillary circulation is threatened.

Failure to recognize and treat this syndrome may result in the unnecessary loss of a distal extremity. As escharotomy (incision through the burned skin and subcutaneous tissue to viable subcutaneous fat) will relieve the increased pressure. Escharotomies are performed parallel to the long axis of an extremity on either the lateral or medial side and should extend across the joints over which there is full-thickness burn. The physician should perform escharotomies at the first indication of diminished blood flow, indicated by loss of sensation, loss of motor function, cyanosis, and diminished capillary refill.

ACUTE CARE

Following treatment of life-threatening injury and initial resuscitative care, it is necessary to elicit a medical history and perform a complete physical examination,

including an estimate of the burn's magnitude.

Evaluation of the burn depth is made by gross appearance, the presence or absence of sensation, and knowledge of the burning agent. Second-degree burns usually follow brief flash explosions or short exposure to scalding water. They appear bright red, often are associated with blister formation, have wet surface, and the patient frequently complains of severe pain. Third-degree burns most frequently follow flame contact or electrical injury. The burn wound is usually dry, inelastic, and anesthetic. Visible superficial veins are often thrombosed.

Once an estimation of the injury magnitude is made, the physician is able to calculate the intravenous fluid requirements. During the first 2 days, the patient requires crystalloid solution (Ringer's lactate or normal saline) colloid solution (Plasmanate® plasma or dextran) and free water. After 48 hours, the requirement for crystalloids and colloids is markedly decreased and IV fluid replacement primarily consists of free water to replace evaporative loss from the burned surfaces. Each patient's fluid resuscitation is individual; the above only estimates requirements.

The burn wound itself should be debrided of blisters and loose nonviable tissue, by placing the patient in a large Hubbard tank where he can be partially submerged in water and the wounds thoroughly cleansed with an antibacterial soap solution. Hair is shaved from thermally injured skin. At the same time the physical therapist and occupational therapist can evaluate joint function and plan a program of exercises and activity to maintain motion and prevent contracture. The patient is allowed to dry for 15 to 20 minutes after which the burns are covered with a topical antibacterial agent such as Sulfamylon. Daily wound debridement and use of a topical antibacterial agent is continued until the eschar has been entirely removed. Thereafter the wound is covered with cutaneous homografts (skin from cadavers) which is changed at 3- to 5-day intervals until the wound is ready for autografting (application of skin from the patient). *Subgraft suppuration or lack of adherence of the homografts may necessitate more frequent changing of these dressings.*

SPECIAL CONSIDERATIONS

Major emphasis must be placed on the preservation and maintenance of function. Every possible encouragement should be given the patient to use his burned extremities actively. Pain and edema tend to limit motion. Pain associated with second-degree burns often can be relieved by covering the burn with homograft as soon as the superficial debris has been removed. Edema fluid may be markedly reduced by elevation of the extremities.

Full-thickness burns on the dorsum of the fingers often involve the underlying extensor mechanism and may extend into the proximal or distal interphalangeal joints. Crossed Kirschner wires are placed through the joint space to maintain fixation until a firm union of the phalanges has occurred.

Underlying fractures associated with burns present a unique problem because a plaster cast cannot be used without serious risk of invasive infection of the burn wound. Nearly all fractures of long bones in burned extremities are treated by balanced skeletal traction with exposure of the burned skin, enabling debridement and grafting during the long immobilization.

The occupational therapist will frequently consult the patient's physician in planning a program of increasing physical activity during convalescence. The at-

tendance of nursing, physical therapy, and occupational therapy staffs with the physician allows daily interchange of ideas and coordinated team effort. The first three weeks postburn, the occupational therapist is responsible for the construction and application of fiber glass extremity splints manufactured on the ward from individual impression molds of the patient's extremities. It may be necessary to construct new splints several times in the first 10 days postburn because the *size and configuration of the extremity changes as the edema resolves.*

As soon as the wound has been autografted, the physical and occupational therapists intensify their activities to regain and maintain joint function. Finally, the occupational therapist provides the patient with aid to enable him to function on discharge. The most frequent permanent disabilities are nerve palsy, amputation of digits, and joint contracture. A brace will often provide satisfactory control of nerve palsy. Diminished range of joint function often can be compensated by specially constructed extension handles for eating utensils and trade tools. Total rehabilitation of the amputee is not complete until he has completed prosthetic training and has been instructed in skin care.

EMERGENCY HEALTH PROGRAMING AND TRAINING

COMMUNITY

HOW IS EMERGENCY CARE IN YOUR COMMUNITY?

Henry C. Huntley, M.D.

Emergency Medicine, Vol. 4, No. 4, pp. 51 ff., Apr. 1972
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

Better community emergency medical care is the top priority challenge facing the profession today. There is probably a greater disparity between present technology and the practice of emergency medicine than in any other field of medical care.

Community lethargy is costing an estimated 60,000 premature deaths annually and untold disability.

Studies show that a disproportionate number of deaths from injury occur in rural areas and a person's chances of dying from automobile accident injury is four times as great in some California counties as in others. More than one-fifth of the Michigan highway fatalities in 1969 were considered salvageable; almost all could have been saved by an adequate airway, IV fluids, chest intubation, and better care on the way to the hospital.

Excess mortality in automobile accidents is ascribed to: (1) poorly equipped ambulances staffed by untrained attendants; (2) patients transported long distances; (3) frequently no physician on night duty when patients arrive; and (4) lack of specialty staffs and equipment to care for multiple injuries.

A study in one of Philadelphia's best hospitals showed that the chief emergency medical care deficiencies occurred in the hospital: diagnostic errors coupled with a lack of timely specialized therapy (*Surgery, Vol. 56, No. 4*).

The author provides a statistical breakdown on "Emergency Services: What They Are;" a list of references on the subject, "For Your Emergency Bookshelf;" and presents "Emergency Services: What They Should Be;" and standards recommended by the U.S. Department of Health, Education, and Welfare's Division of Emergency Health Services, which he directs.

Studies of ambulance services show that: (1) Funeral homes still provide two-fifths of the Nation's services; (2) only one out of 33 hospitals now provides this service; (3) less than one-third of the ambulances have all the equipment recommended by the American College of Surgeons, and less than half carry bag-mask resuscitators or oropharyngeal airways; (4) only half the services surveyed have both a driver and an attendant on every run; of these, 78 percent reported that attendants routinely render first aid at the scene; (5) about 62 percent of the attendants have received the equivalent of *advanced* Red Cross first-aid training,

33 percent *standard* first aid, and 5 percent no training; and (6) less than 10 percent of the ambulances can communicate by two-way radio with hospitals.

What should you as a physician be doing about all this? Dr. Huntley suggests that physicians should: (1) Focus their attention on the hospitals where they work and on the communities where their patients live; and (2) join together to take an inventory of the community's potential resources which might help minimize some of the problems; (3) join other physicians in examining the hospital emergency department. Take a look at the ambulance cases coming in. Better yet, go along on some runs. Then ask yourself whether the care provided on the run and in the emergency room is the kind you want for your family; (4) help form an emergency medical care council to coordinate the work for the whole community. The participation of many community groups will be needed. Communities will have to be stimulated to provide for emergency medical care in their annual budgets as they do for police and fire protection.

Schools, Red Cross and others will be able to train people in first aid. Emergency medical technicians will have to be trained, preferably in hospital-based programs; allied health workers will have to supplement this training outside the hospitals.

Work with county medical societies on regional aspects of the problem. Consult with local health officials, the mayor's office and other community agencies. Set long-range and short-range goals. It must be a team effort—get on the team!

THE JACKSONVILLE STORY

Captain John W. Waters

The American County, Vol. 37, No. 3, pp. 19 ff., Mar. 1972

1001 Connecticut Ave. NW., Washington, D.C. 20036

Jacksonville, Fla., 532,000 population, has developed an Emergency Medical System (EMS) considered by many experts the finest in the country.

Less than 4 years ago the situation was chaotic. Private ambulance companies and funeral homes competed for business and offered very poor service. As a result of a campaign by the news media, public opinion, and the inauguration of a new consolidated County-City Government, the situation was corrected. Private ambulance operations were stiffly regulated and all emergency ambulance service was taken over by the fire department.

Nearly all EMS calls to the Fire Department Emergency Operations Center come from home phones or special emergency street corner phones. The center had direct telephone and radio communication with all hospital emergency departments and the county medical society's switchboard. Time punch cards are kept on each run and 24-hour tape records of all communications. There are nine rescue squads distributed through the city. In 1969–70 the average response time was 4.2 minutes, with the expanding population moving toward the city limits it now exceeds six minutes. However, the first trained help arrives in an average of 4 to 5 minutes.

The ambulance has a roomy box-type body mounted on a one-ton chassis and is fully equipped as a mobile "emergency room." At 50,000-mile intervals the body is lifted off, and the worn chassis replaced by a new one. The cost for a 10-year period is approximately half that of a limousine-type.

Four ambulances are hospital-based to provide rescue personnel with inhospital training and better ambulance-hospital coordination. Crews are rotated so each

man is hospital-based about 5 months a year. This results in extremely close cooperation between rescue personnel and hospital emergency staffs.

Emergency Medical Technicians (EMTs) are extensively trained: first aid, the 80-hour DOT Emergency Medical Care course, lectures by physicians on medical subjects, inhospital training observing childbirths and autopsies, giving EKGs, drawing blood, and working as part of the cardiac resuscitation team. Formal exercises and frequent written tests are required and hundreds of on-duty hours are spent in the emergency department. Over 50 men are enrolled in an evening 60-semester-hour Associate Arts degree program in Emergency Medical Technology at Florida Junior College, perhaps the first in the Nation. As a result of this training the city obtains $5 million in malpractice insurance for all EMTs for a $4,500 annual premium. Chief Fire Surgeon Roy M. Baker, prominent cardiologist, program supervisor, and 10 assistant fire surgeons, squad supervisors, are all dollar-a-year men.

The EMT at the scene, with radioed advice of a hospital physician, makes diagnoses and renders treatment with the full blessing of most physicians and sanctioned by an amendment to the Florida Medical Practices Act, promoted by the Florida Medical Association.

First priority is placed on checking the victim's airway and stopping bleeding. If serious injury is suspected, an IV expander is started to combat shock. While IVs can be started by the EMT, drug administration must be prescribed by a physician via radio or phone.

After initial stabilization, great emphasis is placed on proper extrication and use of backboards. Patients are kept on backboards until they are X-rayed. Less than 5 percent of the ambulance runs to the hospital are done at high speed with light and siren. Enroute the patient is given antishock therapy and monitored on an oscilloscope, if required. The hospital is notified of the nature of the injury, vital signs and ETA of any serious case, in which case the patient can be wired to the oscilloscope until a physician examines him.

The reduction in automobile fatalities has been spectacular. When the program was initiated in 1968 there were 15,846 accidents involving 8,669 injuries and 131 deaths. In 1971 accidents increased to an estimated 22,500 (based on 11 months), with about 12,380 injuries but only 117 deaths!

The save rate on injury victims was 99 percent. In terms of deaths per thousand accidents the reduction was 38 percent, but the number of auto deaths in Florida rose 7.8 percent. The advanced EMS is largely responsible for the save rate. New automobile safety features and a beefed-up highway law enforcement system had their effect. Yet in the surrounding seven rural counties, with the same factors involved, the death rate per thousand accidents was over four times greater than Jacksonville's.

Prior to 1968 nearly all victims were placed in an ambulance and rushed at high speed to a hospital where many turned out to have only minor injuries. In 1971 rescue units responded to 18,204 calls, but they transported only 8,427 to hospitals a significant workload reduction on the emergency departments and Rescue Branch.

Rescue ambulances have been fitted with special cardiac gear and rescue crewmen receive special cardiac training, including defibrillation and cardiopulmonary resuscitation (CPR). Two-way radio communications can be maintained with emergency room physicians and all ambulances are equipped to telemeter EKGs by radio. On all suspected heart attack

cases two ambulances, or an ambulance and fire engine, are dispatched.

Statistics on heart attacks are not as complete as those on automobile trauma. In January, 1972 two units were dispatched on 165 calls; 158 required transportation and treatment; 113 of these had suggestive cardiovascular symptoms, the other 45 suffered from respiratory distress and various illnesses. Eleven suffered heart or breathing arrest while in the hands of Rescue and were given CPR or drugs; three died before reaching the emergency department; and eight were delivered viable. Of the 107 suggestive heart patients transported, 97.2 were delivered viable to emergency. If, according to past experience, half proved not to be heart patients, the safe delivery of true heart patients would be over 94 percent.

As citizens became aware of the immediate availability of help, more rescue units were needed, but at the same time four more ladder companies were recommended by the underwriters. The EMS's innovative solution was to convert four excess pumpers as triple-threat units, manned by three men each, designated as Quick Response Squads (QRS). Hose was removed freeing space to stow special rescue equipment carried by ladder companies; racks were made for 35- and 40-foot ladders, adequate for most suburban fires. Five hundred feet of 1½-inch preconnected hose is carried for firefighting and QRSs have a full complement of first aid equipment. The men are given a special 7-week course at the fire school, including 120 hours of medical training. These units can act as engine company, ladder truck, or rescue unit; they initiate treatment and often have the patient ready to go when the rescue ambulance arrives. Total conversion cost less than $3,000. Four QRSs assigned to the suburbs eased the Rescue Branch load and enhanced their ability to extricate and treat victims.

With 13 rescue-oriented units, far in excess of the usual resources in a city of its population, the 840-square-mile city still had time distance problems. There were 49 fire-fighting companies in 41 stations, strategically distributed, so in 1971 a formal policy was adopted to dispatch a company along with a rescue squad on all serious medical cases. Trained in comprehensive first aid and carrying first aid kits and oxygen they can initiate treatment until a rescue unit arrives with more sophisticated equipment and EMTs who can transport victims. In the last 6 months of 1971, 25.2 percent of all responses involved medical emergencies rather than fire. In a number of cases their prompt arrival saved lives.

A charge of $22.50 is made if the patient is transported, no charge for onscene treatment only. The charge is more a deterrent to needless calls than a revenue source. The cost per capita yearly in tax dollars is $1.18.

Public education still is needed. The rescue branch mailed emergency number stickers to all citizens and the service has been nationally publicized. Yet in January 1972, 23 percent seeking emergency medical rescue service called the police department. The fire control center which handles rescue got the message secondhand. In addition, a year's study of heart attack patients admitted to five hospitals showed that 67 percent drove to the hospital instead of calling the rescue branch—a dangerous practice that cost a number of lives.

There are seven helicopters at three naval Air Stations, over 15 at the Army National Guard, and three hospitals have heliports. By agreement with the Navy, the rescue branch furnishes EMTs and medical equipment and they provide aircraft and crew. A number of successful medical air evacuations have been made on request from rural counties, including

the rescue of casualties from an explosion disaster when 27 seriously injured patients were brought to Jacksonville hospitals; 26 survived.

The Jacksonville EMS believes its capability should be extended to the surrounding rural areas as a model of an urban-rural area EMS and has requested Federal funding for such a project.

MEDICAL AND PARAMEDICAL

OPERATING ROOM NURSING AND EMERGENCY

J. Cuthbert Owens, M.D.

AORN Journal, Vol. 12, No. 5, pp. 46–49, Nov. 1970
8085 E. Prentice Ave., Englewood, Colo. 80110

Emergency health care is becoming more important in the health care activities of every community.

In order to be broadly prepared for their increased emergency responsibilities in hospital intensive care, coronary care, and other special units for serious diseases and conditions, nurses need special undergraduate and graduate courses.

There is even greater need for increased responsibility and training in other aspects of the emergency medical care system. Studies reveal that nursing personnel frequently have been neither educated nor indoctrinated as to their duties in the management and organization of emergency medical services. Training in emergency procedures is scanty and discouraged in the absence of the physician.

Despite the patient's implied consent to allow anyone knowledgeable to assist him during a critical situation, nursing officials generally state that no nurse should "practice" emergency care or perform procedures without supervision. The nursing profession is not totally responsible for this resistance to accept further responsibility. The medical profession has not only accepted this withdrawal but encouraged less nursing responsibility during an emergency. Interestingly, the few courses in emergency care presented for nurses have been oversubscribed, evidence that nurses are receptive to change.

The writer recommends many changes in responsibilties and training for nurses and other personnel:

- Reconstitute and supplement nursing school programs in emergency care.
- Train and indoctrinate all nurses involved in emergency care in all phases from site to OR, as well as in recovery room, intensive care, coronary care, and other special units.
- Train nurses to: take medical histories and screen patients; institute pulmonary and cardiac resuscitation; stop hemorrhage; institute IV fluids; monitor shock by methods other than physical signs and sphygmomanometer; take an electrocardiogram; insert a nasogastric tube; splint, debride and dress wounds; and be well informed in new methods of emergency communications.
- Medical centers should employ nurses from small hospitals as substitutes during vacations, relieving seasonal shortages and giving "on the job" training.
- Hospitals should develop OR nurse refresher courses for former nurses, for part-time work as needed; continue "on the job" training for permanent staff; and indoctrinate new personnel with films on videotape or cartridges.
- OR nurses should participate in daily and periodic audits.
- Hospital clerks, far too often the initial

"screeners" of emergency patients, should be required to have first aid training.

- Central dispatcher training in emergency medical communications and first aid should be required at large medical centers. Nursing personnel need similar communications training where central dispatchers are not available.
- Ambulance attendants and OR technicians need to be trained and used as emergency medical technicians inside and outside the hospital.
- Paramedical fields should be coordinated in small hospitals to allow individuals to become knowledgeable in more than one discipline.

RECOGNITION AND TREATMENT OF MEDICAL EMERGENCIES IN THE DENTAL OFFICE

J. V. Woodworth, M.D.

JADA, Vol. 81, No. 4, pp. 887–93, Oct. 1970

American Dental Assn., 211 E. Chicago Ave., Chicago, Ill. 60611

More medical emergencies happen in the dentist's office today because more drugs are used, more older patients have dental surgery, and dentists perform more procedures.

To prevent emergencies the dentist must have a full medical history of each patient. Because many dentists have not been trained to take and evaluate these histories, the author includes a sample which is suitable and would only take a few minutes of the patient's time. The answers indicate which drugs to avoid, forewarn the dentist of possible emergencies, or indicate possible need for medical consultation before starting dental treatment.

The public expects the dentist to handle an emergency quietly, decisively, and judiciously. Several conditions require the rapid action of drugs. The dentist must have a unit of drugs available which he can use quickly. The following table lists medications for inclusion in such a kit.

TABLE=Kit for dentist to use when medical emergencies arise in dental office

Proprietary Name	Generic Name	Mode of administration	Dose	Indication	Amount for Kit
Adrenalin solution aqueous 1:1,000.	Epinephrine.....	IM or IV.....	0.2 to 0.5 ml.	Acute drug reaction, acute asthma attack.	2 amp of 1 ml.
Benadryl.....	Diphenhydramine hydrochloride.	Oral, IM or IV.	10 to 50 mg.	Acute drug reaction.	2 amp 50 mg/ml.
Nalline HCL....	Nalorphine hydrochloride.	IM or IV.....	5 to 10 mg.	Respiratory distress caused by narcotics.	2 ml amp. 5 mg/ml.
Solu-Cortef Mix-O-Vial.	Hydrocortisone sodium succinate.	IM or IV.....	50 to 250 mg.	Drug reaction, adrenal insufficiency.	100 mg Mix-O-Vial.
Nitroglycerin....	Glyceryl trinitrate.	Sublingual...	0.4 mg...	Angina.....	25 tablets.
Glucagon for injection.	Glucagon.....	SQ, IM, or IV.	0.5 to 1.0 mg.	Insulin reaction.	1 amp.
Aspirol.....	Aromatic ammonia.	Inhalation....	0.4 ml...	Syncope.....	6 Aspirols.

The main object of emergency treatment is to maintain or restore breathing by supporting respiration and circulation. It is the dentist's responsibility to know where he can obtain the most rapid definitive care in case of an emergency.

The author details symptoms and initial emergency treatment, including appropriate drug therapy, for the medical emergencies outlined hereafter.

Drug reactions require immediate therapy and may be termed constitutional reactions, allergic shock, or anaphylactoid shock. In the dental office they are most likely to occur after the administration of penicillin, local anesthetic, or aspirin.

Prevention of anaphylactic shock. No drug should be given to a patient whose history suggests any type of allergy to the drug. Only medications definitely indicated should be used. Topical application of antibiotics, particularly penicillin, should be avoided. Drugs should be administered orally when feasible, but intramuscular injections should be used when necessary for adequate drug levels. When a reaction develops there may not be time enough to obtain help from a physician and death may occur in a few minutes. Resuscitation must be instituted immediately. The dentist should know where he can get assistance and the location of medical facilities nearby.

Although the patient may seem fully recovered from a drug reaction, it is the dentist's responsibility to see that he receives further medical treatment. Drugs used to counteract anaphylactic reaction will wear off shortly and the symptoms may return when medical assistance is not available.

Cerebrovascular and cardiovascular emergencies. An adequate history will alert the dentist to previous problems and help him avoid situations that may precipitate either a cerebrovascular accident or a myocardial infarction. "Strokes" and "coronaries" are more likely to occur under stress and strain of dental surgery, after the use of certain drugs, or after long, tiring procedures. Angina pectoris is a daily problem with many people. Strokes are likely to occur in elderly patients with a history of hypertension or vascular disease. The most probable incident will be either a transient period of cerebrovascular insufficiency manifested by a short period of syncope and transient weakness of an extremity, or of a progressing total paralysis of one side.

The stress of dental procedures and fear of pain could produce angina in a susceptible individual. Give an angina patient short appointments, use local anesthesia, and provide appropriate sedation.

Arrangements should be made for further medical care if an emergency occurs; and the patient's physician should be notified immediately.

Insulin reaction and diabetic coma

Before oral surgery, food should not be withheld from a diabetic patient taking insulin. After surgery if the patient is unable to follow his usual solid food diet, he should take supplemental liquid nourishment.

Diabetic acidosis may occur in the patient with an infection and requires an immediate referral for treatment. The dentist may be forewarned if the patient develops acetone odor on his breath, becomes seriously dehydrated, complains of loss of appetite, or appears seriously ill and does not respond appropriately to treatment.

Insulin reactions may occur when the patient failed to eat regularly. Frequently the patient may be unaware that he is developing a reaction and appropriate steps may have to be taken by the dentist despite the patient's objections. In the early stage, a reaction can be controlled by giving the patient sweetened fruit juice or a candy bar.

Acute adrenal insufficiency is more common now that corticosteroids are used to treat many diseases. The dentist is forewarned of the possibility by medical history or the presence of one of the diseases for which the drugs are used. In either case, consult the patient's physician before undertaking any dental procedure. If the patient might develop adrenal insufficiency, his physician will usually prepare him with supplemental drugs.

Convulsive seizures may occur at any time, with or without warning. The dentist may witness a grand mal or petit mal seizure. The dentist should avoid any action that might precipitate an attack of epilepsy. Do not use such stimulants as amphetamines. Appropriate premedication is indicated. General anesthesia may be indicated for extensive procedures. Seizures may be precipitated by tension, anxiety, and the pain of dental procedures. After a seizure the dentist should see that the patient receives appropriate medical care; in most instances he should leave the office with a responsible individual accompanying him.

THE REGISTRY OF EMERGENCY MEDICAL TECHNICIANS—AMBULANCE

Roddy A. Brandes

The American County, Vol. 37, No. 3, p. 43, Mar. 1972
1001 Connecticut Ave., NW., Washington, D.C. 20036

Studies and publications on the need for improved emergency health services emphasize two needs: (1) That ambulance personnel have adequate training; and (2) that an examination and certification system for these paramedicals is necessary.

The latter has been implemented by establishing the Registry of Emergency Medical Technicians—Ambulance.

In January 1970, the Commission on Emergency Medical Services, AMA, invited organizations involved in emergency medical care to a conference to consider the basic concept of a registry, which received overwhelming acceptance

The purposes of the Registry are:

A. To promote improved delivery of emergency medical services by:

1. assisting in training programs; 2. establishing qualifications for registration; 3. conducting examinations to assure competency; 4. establishing a registration system; 5. establishing procedures for revoking registration certificates for cause; and 6. maintaining a directory of registered technicians.

B. To assist individuals who have completed emergency medical technician programs to raise their level of competency.

The American Medical Association, the Employers Insurance of Wausau, and the Ambulance Association of America (a national organization of private operators), advanced funds to start the Registry.

When this article was printed approximately 3,000 examinations had been given by some 50 physicians. Applications were pouring in for future examinations, indicating the paramedicals' willingness to improve their profession.

The more sophisticated training programs teach intravenous feeding techniques, but many States prohibit anyone other than a physician from performing this simple task. Many States prohibit anyone other than a physician to diagnose a patient's condition. *How can a trained person treat injury if he cannot diagnose the injury?* Laws must be researched to amend or rescind those which obstruct proper and needed emergency proce-

dures. Should the effectiveness of any trained emergency medical crew dealing with life-saving requirements be subject to antiquated laws or should the right to live prevail?

We must call upon the health professional, the medical community, or some medical organization to accept the task of researching the permissive and restrictive laws of each State dealing with the subject. They should publish a compendium with recommended changes so State legislators will be knowledgeable of needed changes and enact them.

Never before has the human body been catapulted at speeds we accept today as normal travel. Vehicles are engineered to reach ever increased speeds, highways are built to accommodate and encourage higher speeds and States increase speed limits with each assembly.

If lives are to be saved under such conditions, the task of emergency medical care must be explored systematically and realistically. The Registry and its advanced training program is only the first step.

TECHNICAL

DEFECTS IN MEDICAL ELECTRONICS DRAW HEAVY FIRE FROM HOSPITALS

Michael P. London

Electronic Design, Vol. 19, No. 22, pp. 22 ff., Oct. 28, 1971
Hayden Publishing Co., Inc., 50 Essex St., Rochelle Park, N.J. 07662

Unreliable and defective equipment is being delivered to hospitals at an alarming rate. The problem has become acute in recent years because of the increasing hospital use of electronics in patient monitoring systems while there is a lack of trained personnel to operate and maintain the sophisticated hardware.

These facts have emerged from an *Electronic Design* spot check in which extended interviews were conducted with a sampling of hospitals. Asked to comment on the findings, major manufacturers of hospital equipment stressed these points: It is difficult to get specifications for medical equipment; there is a lack of communication between doctors and engineers; equipment is subject to abuse; and, possibly of prime importance, the medical electronics industry is young and still learning, and sometimes lapses in technique are unavoidable.

The electrical engineer who is director of scientific and medical instrumentation at the Downtown Medical Center in Brooklyn, N.Y., said his department performed acceptance tests on several thousand pieces of equipment when the hospital opened 4 years ago, and so it was able to develop a set of valid statistics. About 40 percent of the equipment did not meet the manufacturer's performance specifications, or were unsafe for use on patients or by medical personnel. As for equipment received more recently, primarily for the intensive care and coronary care units, large numbers of instruments still arrive defective, following the same defect patterns found earlier.

At Roosevelt Hospital in New York City the director of medical electronics, who has had much the same experience, believes there will always be defective equipment in any reasonably sized shipment of electronics; either it has not been put through quality controls or has incurred a defect in shipping.

The technical director of Medical Engineering Groups at Massachusetts General Hospital points out that they have about 50 percent defects that have to be corrected by the manufacturer, many ob-

viously involved in shipping. He believes there is too much special ordering in medical electronics so that it is difficult for manufacturers to get the bugs out of designs.

The director of electronics and instrumentation at Presbyterian Medical Center in New York City says the Center has nowhere near the 40–50 percent defect figure given by other hospitals because he buys equipment from his list of manufacturers who produce good equipment. He says there are "good" and "bad" manufacturers; those that are good are very, very good, but those that are bad are likely to be atrocious. This article gives a number of examples of specific equipment from the "good" and "bad" sources and the manufacturers' rebuttals.

Most hospital spokesmen believed manufacturers' quality control is the source of most trouble. The problem is considered so serious at Roosevelt that new equipment is not accepted unless quality control personnel from the manufacturer is present to receive it. The group at Massachusetts General checks all equipment to see that it passes the hospital's and manufacturer's specs, then does "stress testing."

There is no set pattern of defects. Components are apparently not fully checked before they are used in medical devices. Meter relays, for readout and display of heart rate and arterial pressure, have been criticized for high failure rate; replacement is expensive and the equipment must be completely dismantled. Arterial and venous pressure tranducers have been found with defective arms that can produce pressure measurements as much as 50 percent off. Roosevelt always runs a water manometer check on new tranducers to establish an external calibration before the unit is used because they have found that the internal calibrations are more often incorrect than not. (On the other hand, hospitals very often may break tranducers by putting excessive pressure on them.) Circuit defects are common. Roosevelt's director of electronics believes the biggest failure in design, apart from reliability, is the complexity of systems and that there should be more emphasis on simplicity.

In 1970, the Michigan Association for Regional Medical Programs investigated medical equipment at 12 hospitals around Detroit. They found that: 40 out of 79 electrocardiograph monitors tested for vertical gain were inadequate; 47 percent had current leakage exceeding 10 μA, the recommended maximum, and over 10 percent exceeded 50 μA; defective components or wiring were found in 21 percent. Much the same results were found among tested pacers and defibrillators.

In industry's defense, a staff vice president in the Electronic Industry Association said that center to the problem is that the demand and the market place have not shaken down enough to know what is going to be made in the next year or two. "Nobody is making schlock equipment on purpose," he said.

One manufacturer's general manager pointed out that responsible members of the industrial community are constantly working with medical personnel to make products more useful and reliable. Most companies understand that they are in the medical business and are concerned about reliability and quality, but in this fast growing industry competition is coming in from other fields and new engineers do not always fully understand the business.

The hospital has obligations, too. A medical electronics product, especially one for patient monitoring, must be considered a life-support instrument. Often the hospital may break equipment by improper use and some hospitals do not do preventive maintenance. Hospitals are not

very knowledgeable about the use and care of electronics, but they should have competent engineering facilities. Small hospitals should join others so that together they can afford them.

The Association for the Advancement of Medical Instrumentation, a national group of physicians, hospital engineers, and industry personnel, has about 15 subcommittees developing equipment standards. Although the standards are voluntary, they could have teeth if hospitals insist that manufacturers conform to them. The Food and Drug Administration is drawing up a set of voluntary standards for test classification procedures for cardiovascular and orthopedic devices.

The technical director at Massachusetts General Hospital said that in the final analysis, the immediate solution rests with the hospitals. If there is nobody to check equipment, it doesn't matter what the law is. You must have engineering groups paid by the hospital to police all purchases to provide good quality control.

ELECTRICITY IN HOSPITALS: ELIMINATION OF LETHAL HAZARDS

Gordon D. Friedlander

IEEE Spectrum, Vol. 8, No. 9, pp. 40–51, Sept. 1971
345 East 47th St., New York, N.Y. 10017

The problem of accidental electrocutions in U.S. hospitals has been the focus of increasing attention for the past 3 years.

The number of fatalities allegedly attributable to electrocution range downward from Ralph Nader's 1970 claim of 5,000 per year to a very small figure over the same statistical period. The Food and Drug Administration after checking scores of articles published between 1963 and 1969 summed up about 115 deaths and more than 1,600 injuries annually "from all medical equipment" during the 6-year period.

Arnold S. J. Lee, director of electronics and instrumentation at Presbyterian Hospital, New York City, believes there already has been an "enormous overkill" in bringing the safety problem "in a lurid manner" to the public's attention. He claims that not a single patient has been electrocuted during his association with the hospital.

A. K. Dobbie, electrical safety engineer of the United Kingdom's Department of Health, London, categorically stated "in the United Kingdom no patient has died of electrocution in the past 10 years."

But Charles K. Spauldling, New England Deaconess Hospital, and chairman of the Boston Patient Safety Committee, says, "From available data, the problem of electrical hazards in hospitals is not unfounded but indeed real and serious. What is unreal is our inability to solve the problem."

There are two modes of electric shock in hospitals: macroshock and microshock. Macroshock is electric shock due to contacts applied to the exterior of the body. Here currents in the range of 100–300 milliamperes can cause heart fibrillation. All hospital patients are exposed to macroshock from defective devices such as lamps and bed-adjusting motors—just as they might be outside the hospital. But, in addition, macroshock may result from a defective electrocardiograph machine in operation after well-prepared electrodes are applied to the patient's body.

Microshock is much more serious. It applies to every patient who has a lead or electrical conductor from the interior of the heart extending out through the body surface; but the number of such patients "wired" to pacemakers or cardiac catheters is very small. Currents as little as 50 μA caused by voltages as small as 5 mV

can produce ventricular fibrillation under these conditions.

Minimization of macroshock can be accomplished by the effective application of conventional safety methods. However, the minimization of microshock requires a carefully designed and controlled electrical environment for the patient and a discipline to "keep him there." Techniques for reducing microshock are described at length in this article because they involve the solution of engineering problems.

David Lubin, administrative engineer at Sinai Hospital in Baltimore, believes hospitals could take useful initial steps toward investigating, documenting, and detailing the problems of low-current shock. Such action, leading to practical solutions, would entail:

- The recognition that electrical faults resulting in accidents are usually the result of operator error or equipment defects.
- Better training programs for physicians, surgeons, technicians, and nurses who will handle and operate electric and electronic equipment.
- The installation of equipotential grounding systems throughout the hospital to provide a comprehensive and complete "yardstick of electrical safety."
- The establishment of a biomedical engineering department under the supervision of a competent biomedical engineer.

The Emergency Care Research Institute (ECRI), a nonprofit organization in Philadelphia primarily concerned with biomedical research, conducts a formal *Health Devices Evaluation Program*, providing comparative evaluations, hazard warnings, and technical guidance to the medical community.

According to ECRI director Dr. Joel J. Nobel, the program's priority for evaluating a class of equipment is established, then a five-step procedure is pursued:

1. A detailed test protocol is written and passed upon by experts in that particular field.
2. Units for evaluation testing are obtained from all significant manufacturers of the device.
3. Parallel testing of all units is conducted in which the manufacturers specifications are confirmed, engineering tests of performance and safety are rated, and clinical tests in a real operating environment are performed.
4. A preliminary report on each device is written and sent to its manufacturer for comment and to encourage corrective action where needed.
5. A final composite report (containing data gleaned from the four preceding steps) is prepared and issued.

Results of the evaluation program are published in a monthly bulletin. Dr. Nobel has urged hospitals and medical-engineering staffs to adopt "prepurchase selection programs" to evaluate the competing claims that equipment salesmen have for their products. If a failure or hazard in the equipment is noted the supplier should be informed immediately for the purpose of consultation and comparison evaluation with his testing. He has recommended that a pool of biomedical engineering talent be established to determine priorities in evaluation. Such a pool would:

1. Write up detailed testing protocols and specifications tailored to each class of equipment.
2. Obtain sample devices from appropriate manufacturers on an off-the-shelf basis in which no evidence of selective quality control by the manufacturer would be apparent.

But the highest quality medical-electric

equipment is of little value if placed in the hands of untrained or poorly instructed personnel. Insufficient training programs often compound human ignorance and negligence factors. Hospitals, unlike most other institutions, operate on a 24-hour basis seven days a week. It is particularly urgent that qualified staffs, both medical and technical, be on hand at all times to use safe and reliable equipment in the many emergency situations that regularly occur.

EMERGENCIES AND DISASTERS

MEDICAL EMERGENCIES

RADIATION CASUALTIES—EMERGENCY PLANS AND MEDICAL CARE

William D. Norwood, M.D.

Archives of Environmental Health, Vol. 23, No. 2, pp. 129–34, Aug. 1971
American Medical Assn., 535 N. Dearborn St., Chicago, Ill. 60610

The safety record of the U.S. atomic industry has been very good. There have been so few serious detectable radiation injuries that it is not easy to get physicians and hospitals interested in planning for and care of radiation casualties.

However, the rapidly expanding nuclear industry means more radiation casualties simply because more people are at risk. An accident releasing fission products could result in panic unless there is more basic planning by hospitals and more basic training for physicians, allied medical personnel, and other emergency workers.

On the advice of the Advisory Committee on Reactor Safeguards, the U.S. Atomic Energy Commission (AEC) instituted a study in 1967 which indicated a need for improved planning and care capabilities for such accidents. Preparations for these emergencies should provide: (1) Special organization for planning and action; (2) written up-to-date plans for each facility; (3) relationship of local authorities to planning; (4) public relations; (5) training; (6) special equipment; (7) communications; (8) basis for action; (9) evacuation and take-over plans; (10) reentry and recovery plans; and (11) medical and hospital care. The written plans should cover acts of God, fire, explosion, radiation exposure, accidental criticality, release of radioactive gas or particles, transportation accidents, enemy action, sabotage, or major reactor accidents.

Most physicians need a review of fundamentals of radiation, radiation dosimetry, and radiation biology.

Instruments for measuring high-level radiation should be constantly available where accidents might occur. Plans should consider accident alarms, evacuation reentry, sorting personnel, controlling the spread of radioactive material, decontamination of area and personnel, and methods for estimating dose and for getting help. Casualties may occur from exposure: (1) To external radiation (X-rays, beta rays, gamma rays, or neutrons), and/or (2) to the radiation from radionuclides deposited within the body or on the skin or external wounds.

While the patient's medical conditions generally take precedence, every effort should be made to decontaminate patients before they are taken to the hospital. If showers are not available near the accident, remove surface contamination with soap and water, which is usually all that is needed; but in some cases other cleansing agents are required.

Each hospital should have a plan for admission of emergency radiation casualties. The Atomic Energy Commission, cooperating with the American Medical Association, the American Hospital Association, and the American Public Health Association, has a film, "Radiation Accident Patients," and publications which show the simple steps required by hospitals to give emergency care to less serious radiation casualties. This film, along with brochures individually developed for physicians, nurses, hospital administrators, and ambulance and rescue-squad personnel, may be secured from regional AEC offices.

All hospitals should be equipped to give initial emergency care to radiation accident casualties. Follow-up care for serious cases may require specially designed facilities and equipment and a highly trained team of specialists.

Accidentally ingested radioactive material is treated much like an ingested chemical poison. The stomach must be emptied first then the material must, when possible, be converted to an insoluble, nonassimilable compound.

Over a short period, exposure of the entire body to a large dose of penetrating radiation leads to a series of signs and symptoms known as the "acute radiation syndrome." Of greatest importance to the clinician is the hematopoietic syndrome which predominates at exposures of lethal dose ranges. Changes in the hemotopoietic system, together with the overall clinical signs and symptoms, give an index of the severity of the injury and indicate whether a bone marrow transfusion will increase or diminish the patient's chance for survival.

Localized radiation injuries to skin and underlying structures are treated much like injuries from other agents. However, with large doses of penetrating radiation, injury to blood vessels is often extreme. Pain may also be excruciating and earlier grafting of the wound or amputation of an extremity is often indicated.

Psychological reactions are similar to those experienced in severe burn. The nuclear "mystique" may complicate treatment.

TRIAGE

Thomas K. Hunt, M.D.

Arizona Medicine, Vol. 26, No. 3, pp. 139–40, Feb. 1969
810 W. Bethany Home Rd., Phoenix, Ariz. 85013

Triage, sorting casualties, is one of the most critical professional functions in the emergency unit when the patient load exceeds treatment facilities.

The duty of the casualty team in mass disaster is to save lives and as much human function as possible. When treatment is not mandatory, injuries must be ignored. Time and vital supplies must not be wasted on hopeless injuries. These decisions must be made by an experienced surgeon familiar with his resources and staff.

Four major casualty categories have been defined:

1. Slight injuries managable by self-help, nurses, or technicians;
2. Injuries requiring medical care but managable in part by paramedical personnel;
3. Injuries requiring major surgery—should receive the major effort; and
4. Injuries beyond repair.

The care of the individual must be adapted to the prevailing conditions. The salvage of life is more important than the salvage of limbs and preservation of function is more important than plastic reconstruction of anatomic defects.

Treatment Priorities

First Priority.—1. Airway; 2. Shock,

Second Priority.—1. Visceral injuries with severe hemorrhage; 2. Vascular injuries requiring surgery; 3. Closed cerebral injuries.

Third Priority.—1. Spinal injuries needing decompression; 2. Soft tissue injuries; 3. Lesser fractures and dislocations; 4. Eye and ear injuries; 5. Other facial injuries.

WHEN LIFE BECOMES INTOLERABLE * * * AND CHILDREN DESPAIR

Emergency Medicine, Vol. 4, No. 1, pp. 25–28, Jan. 1972
Fischer-Murray, Inc., 280 Madison Ave., New York, N.Y. 10016

A man stands ready to hurl himself into the abyss * * * his family doctor is often the nearest, sometimes the only person who can help him—often before his thoughts of suicide are clearly formulated.

The typical victim is a 40-year-old white male with a wife and two children who has recently suffered an unforeseen tragedy. Anxiety and depression in such a patient should alert the physician to trouble, according to Drs. Paul F. Slawson reporting in *Annals of Internal Medicine* (*Vol. 75, No. 3*), and Charles W. Wahl of the Neuropsychiatric Institute in Los Angeles. They give the following advice to physicians:

- Whenever you feel suicide is a possibility, set aside time for a consultation to draw the patient out in a warm, interested, but not conciliatory way. Encourage him to talk about his problems and don't hesitate to mention suicide. Often the patient is relieved to have his feelings faced head-on.
- Contact the closest member of the patient's family. A conspiracy of silence can be a tragic mistake for the patient and the doctor should not have the full responsibilty.

Despite every effort to head him off, suppose the patient makes an unsuccessful suicide attempt—what then is the physician's responsibility? Dr. Edwin S. Schneidman of the Institute stated that post-crisis followup is vital because the patient is most dangerous to himself in the first three months after the attempt. The common pattern is a series of increasingly lethal attempts. Too many suicides have been released from emergency rooms—sometimes with callous or ill-advised remarks from physicians—only to complete the deed within hours.

There is no place in medical practice for a disdainful or hostile attitude toward people in distress. Bear in mind the patient has done something that to him is the most serious and significant act of his life and you must indicate by your attitude that you recognize this. Give the patient sympathetic, undivided attention. Saying something obvious but which validates the patient's feelings—"You must have been feeling extremely unhappy"—often has a profound effect.

Show compassion and concern. No single thing saves more lives than the ability to make the patient feel profoundly and immediately understood. Dispassion is as important as compassion. Your job is to keep the patient alive—you can reform him later.

Finally, offer some specific help—referral, further interview, or merely the promise that life can be better—with follow-through.

Dr. Wahl advises that a suicidal gesture is just as serious and lethal as a real attempt. On the other hand, in Dr. Slawson's view, it is vital that you differentiate between the two in your own mind. Many people who make suicide gestures have been behaving neurotically all their lives.

At the other extreme, many people who try in earnest to kill themselves go through life without a sign of psychopathology.

Dr. Slawson believes as a general rule, patients who have attempted suicide should be hospitalized, not necessarily in a psychiatric hospital which still bears a stigma. Because at least 80 percent of the patients are depressed, drugs are often useful. He suggests using imipramine (*Tofranil,* Geigy), but points out that antidepressants do not demonstrate total effectiveness for up to three weeks during which time the patient must be protected.

When a child of six or older who has swallowed poison is rushed into your office, don't let him go until you have arranged for a family consultation as soon as possible. Such poisoning is written off as accidental, but the fact is, in one case out of four, he was attempting suicide.

Suicide is the 10th cause of death in children and adolescents and third among 15- to 19-year-olds. According to a recent survey reported in *Clinical Pediatrics* (*Vol. 10, No. 7*), of 1,103 patients ages 6 to 18 treated in 50 poison centers here and abroad, self-poisoning attempts fall into four categories: accidental, 13 percent: "kick" or "trip", 16 percent; manipulative gesture, 45 percent; and real suicide attempt, 26 percent.

"Once the child has been medically treated, the physician's job is to find out what group he fits and manage accordingly," stated Dr. Matilda S. McIntire, interviewed for this report. "Most important—find out what was going on in his mind when he poisoned himself. What did he think would happen after he took those pills? * * * Did he want his family to feel sorry for him? * * * Did he want to die?" Most children over 10 are quite capable of imagining death as total cessation of consciousness. Believing "the patient didn't know what he was doing" is naive.

Unfortunately, many physicians have a hard time confronting adolescents. A history of significant emotional stress was uncovered in eight out of 10 of the 17- to 18-year-olds in the survey, as well as in 42 percent of the 6- to 10-year-olds. Precipitating stresses involved the "five P's": parents, peers, privation, punctured romance, and pregnancy.

In teenage girls an unhappy love affair or unwanted pregnancy usually triggers the attempt. Boys are more often driven to desperation by a sense of failure and lack of self-regard.

Younger children are frequently driven by hostility and fear of retribution. Typically, the child belong to a minority group, his parents are separated, and he has a number of adult caretakers. It is vital to enlist the help of a social service agency right away. These patients are much more than disappointed and frustrated—they are really desperate.

Self-poisoning may be the end stage of long-standing problems or an impulse attempt to control interpersonal conflict. Once the emergency is over, take another look at the youngster. Maybe he did take the stuff by mistake; but again, maybe he didn't. Your awareness may be the crucial first step in redirecting a young life.

CUMULATIVE SOURCE INDEX

(Pages 1–54, Digest No. 1; pages 55–131, Digest No. 2; pages 137–184, Digest No. 3; pages 189–260, Digest No. 4)

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Emergency Medical Identification Symbol

Stop! Look before you treat. This is the message of the Emergency Medical Identification symbol that is worn or carried by many people. The American Medical Association designed this symbol to identify people who have medical problems that might be neglected in an emergency or aggravated by usual emergency treatment.

For information about the symbol and its uses, contact the

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Division of Emergency Health Services
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