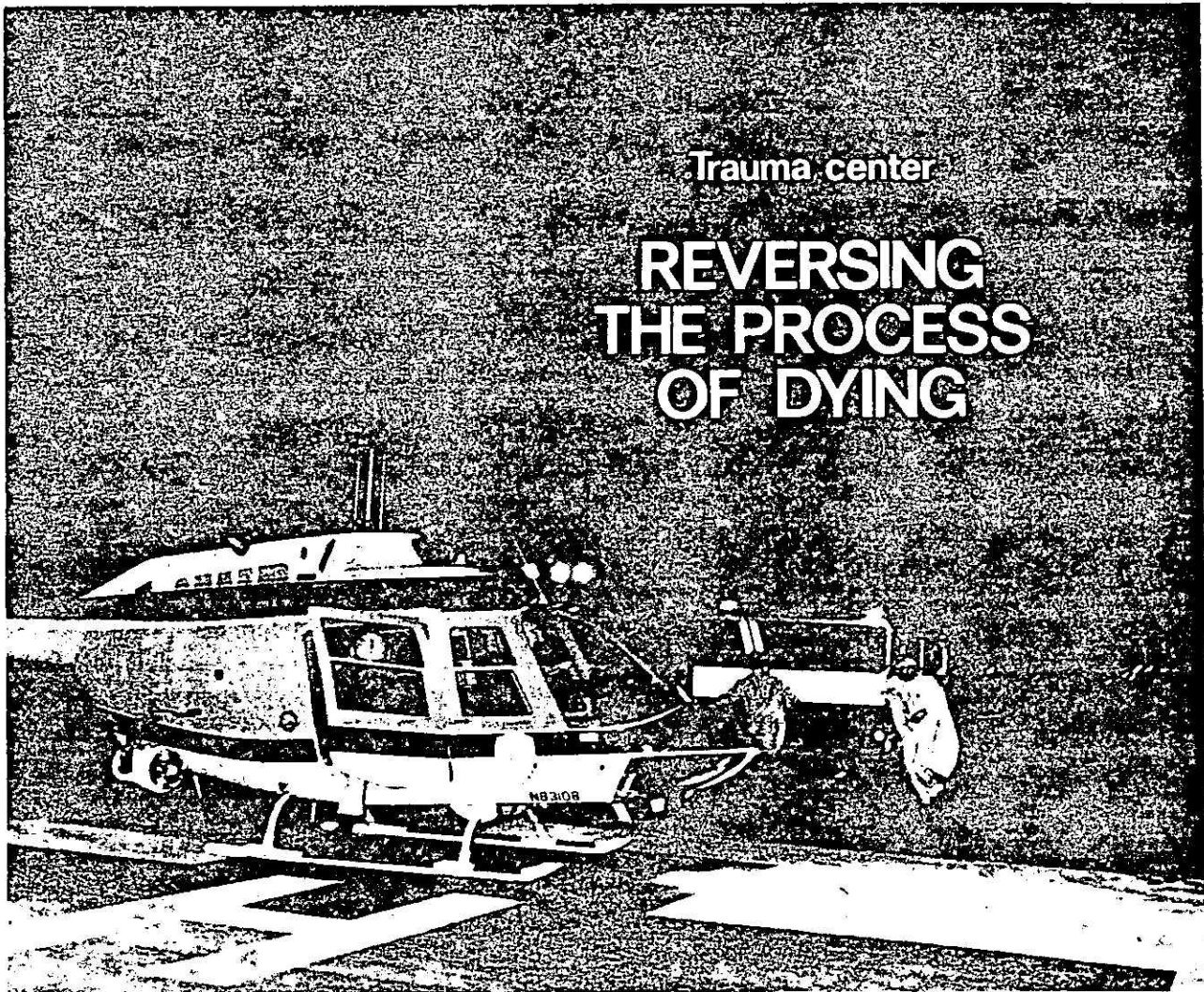


Trauma center

# REVERSING THE PROCESS OF DYING

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Trauma center

## REVERSING THE PROCESS OF DYING

Thanks to the fast action of the dedicated teams of nurses, doctors, and technicians in the Maryland Institute for Emergency Medicine, hundreds of auto-crash victims are surviving accidents that not too long ago would have meant almost certain death.

By Rhea Felknor  
RN Managing Editor

The elevator door opens at the Maryland Institute for Emergency Medicine in downtown Baltimore, and the stretcher bearing an ashen-faced patient is propelled out by two attendants. A nurse runs to stay at the patient's side. The patient, a middle-aged man, was found by state troopers less than an hour before, with a splintered telephone pole pushed through the side of his car and into his chest. Neither the nurse nor the ambulance men know everything that is wrong with him,

but the man has obviously lost a lot of blood.

The blood loss has been so acute, in fact, that the patient goes into cardiac arrest. The nurse leaps on top of the cart, and—even though the man apparently has some broken ribs—begins closed-chest cardiac massage.

Stretcher, nurse, and attendants fly down the corridor and through the doorway of the admitting area, and doctors and nurses converge from all sides. No one has to be told

what to do. Six I.V. lines are started within seconds, the ECG leads fastened to the waiting monitor, defibrillation paddles applied. The heart, shocked into life, shows a near-normal sinus beat on the monitor screen. As the patient becomes more stable, a surgeon presses a scalpel into the abdomen. The three doctors and two R.N.s will know the extent of the patient's major problems within 15 minutes. Long before that, the institute's lab will have provided precise reports on urine and blood-gas levels via teleprinter and intercom.

The doctors are talking, frequently at the same time. A technician keeps bringing in new reports from the lab. The nurses check the I.V. lines, take the blood pressure, observe respiration, assist in the insertion of a central venous pressure line, and hand instruments to the two surgeons on the team as they need them. When the patient appears to be regaining consciousness, a nurse bends close to his ear, comforting and reassuring him.

The Maryland Institute for Emergency Medicine is unique for its concentration on treating trauma victims whose lives are imperiled by injury to more than one body system. Its results are beginning to attract worldwide attention. Although only the most critically injured are admitted, four out of five survive. About 70% of the patients are flown in by state police helicopter, a ride of less than an hour from anywhere in the state, and the rest come by ambulance. Most are victims of traffic accidents.

Last year the institute's 120-man

team of doctors, nurses, and technicians treated 1,000 patients—roughly three a day. One night eight patients were admitted almost simultaneously, but sometimes nearly two days pass without a new admission. The overwhelming number of badly injured patients impresses a trained observer. "Sixty per cent of the patients who were brought here by helicopter last year probably would have died if they had been treated in a conventional setting," says Dr. William Gill, the institute's Edinburgh-trained clinical director.

The institute's success can be attributed to three main factors: the hard-working, dedicated staff of nurses and doctors, the strict measures for diagnosing and treating trauma quickly, and its own findings on the causes and prevention of shock-trauma deaths.

Says Mary Kellogg, R.N., who is in charge of the operating rooms: "Most of our patients have head injuries, chest injuries, abdominal injuries—at least two orthopedic problems. We don't know what's wrong internally, of course, until after they're here. But we try to get a 100% assessment within 15 minutes. Then everything that can be surgically corrected will be corrected before the patient leaves this area."

To get that fast assessment and to stabilize patients before the massive hemorrhages common to trauma victims can cause irreversible brain and liver damage, the institute's staff members have developed a number of diagnostic and operational techniques that differ mark-

edly from those at most hospitals. Among them: routine abdominal lavage, immediate laparotomy (often without anesthetic), opening the chest or abdomen and compressing the aorta with a fist if the patient has no blood pressure, using whole blood without crossmatching to keep hemorrhaging patients alive. It's common for patients to receive 35 or 40 units of blood within a very short period. Textbook diagnostic techniques that may work well enough in the setting of a conventional hospital—arteriography to detect spleen injuries, for example—are never employed. There simply isn't time.

The abdominal lavage is essentially a fast five-minute miniature exploratory laparotomy. Dr. Gill has developed a simple method of inserting a cannula under direct vision through a small incision made below the navel. ("We insist on direct vision," Dr. Gill says. "I have seen cannulas run right through the bowel by surgeons who couldn't see what they were doing.") If the patient is conscious, local anesthetic is used. One liter of saline is infused into the catheter, and allowed to drain out by gravity. If it comes out clear, it is concluded that the patient has no intraperitoneal injuries, the catheter is removed, and he is sewn up. If it comes out even slightly pink, the abdomen is explored further after the patient has been moved into the operating room, to see whether it is the liver, spleen, or bowel that has been damaged.

"The test is accurate—it will pick up even two or three drops of blood



*Meeting the helicopter as it lands on the roof, nurse and doctor immediately begin their assessment of the patient's condition. The M.D. (center) is William Long, clinical fellow at the institute.*



*Heliport is marked with a cross on the roof of the University of Maryland's six-story garage. A waiting ambulance transports patients to the Emergency Medicine Institute (five-story building near the center of the adjacent building complex.)*



*Long red line guides ambulance attendants to the admitting area. Note the R.N. atop the gurney, administering closed-chest massage.*

from small torn vessels within the peritoneal cavity," says Dr. Gill. "We've performed some 3,000 of these 'mini-laparotomies' in the last three years, and 40% have been positive.

"We didn't always do so many. We'd take the doctor's word when he referred a patient with a head injury to us and told us that nothing else was wrong. There would be cases where the patients would appear to be very alert, and you'd be sure nothing else was the matter with them. Then three or four days later we'd pick up ruptured spleens, tears in the liver. When you have a trauma patient whose spleen has been ruptured for four days without being detected, you have real trouble then."

The institute's history dates back to the mid-1950s when heart surgeon R. Adams Cowley, M.D., later to become its founder and present director, became interested in shock. His reading and experiments convinced him that a multidisciplinary approach involving surgeons, mathematicians, biochemists, and other specialists would be needed to solve some of the riddles posed by shock deaths. With the help of an Army grant he opened a pilot four-bed clinical shock trauma unit during 1961.

"We began a systematized collection of data on shock and trauma patients on a 24-hour basis—the first time this had been done anywhere," he recalls. "Experimental data from animals was used to support the observations we found in humans. As a result, we were able to collect and analyze a large amount

of previously unknown clinical, physiological, and biochemical information on patients in various stages of shock."

A National Institutes of Health research grant followed in 1963, and six years later the Maryland State Legislature voted to spend \$1,200,000 in matching funds to establish a permanent Center for the Study of Trauma. On Feb. 26, 1973, Gov. Marvin Mandel signed an order to give the center its present name. Today the institute occupies its own five-story building in the University of Maryland Hospital complex in Baltimore, with its own admitting areas, laboratories, operating rooms, intensive-care units, and medical and nursing staffs.

The institute has five main patient-care areas: the six-bed admitting unit, the two operating rooms adjoining it, a 12-bed critical-care unit, a 14-bed intermediate-care unit, and a final six-bed step-down area. Each has its own appeal for nurses.

The concept of treating a trauma victim without waiting for an attending physician, lab report, or an empty bed is one of the reasons why Dr. Cowley is convinced that a shock trauma program must be completely independent from a general hospital, both in staff and facilities. "In most large general hospitals, doctors and nurses do their best to treat severely traumatized patients," Dr. Cowley says. "But many of the patients deteriorate and die. Why? Because the accident victim is actually an unwelcome patient. Unlike a patient with an acute disease for whom

some type of definitive therapy and care is planned, the accident victim has no one in the hospital family immediately prepared or geared to handle his emergency. Thus decisions are often delayed."

Says Dr. Gill: "You simply can't wait for someone to make up his mind in a place like this. Shock is a pause in the act of dying. If you wait, the patient will be gone. That's why we treat first and diagnose later. If you wait for someone to make a detailed diagnosis, you'll only have a corpse to work with."

The institute has solved this problem by employing full-time general surgeons who serve as senior clinicians; at least one is on hand to head the admitting team. In addition to the senior clinician, a typical team consists of an anesthesiologist, two residents, a physician's assistant, and one or two R.N.s. There is a sense of teamwork among them that is immediately evident.

It takes even an experienced OR nurse several months to learn to function efficiently as a member of the admission team. But gradually, as the same doctors and nurses continue to work together, five pairs of hands can converge on a patient at the same time, each doing something different that needs to be done. When a patient enters the admitting area with a serious stab wound, he'll be ready for the OR within 20 minutes. During that time, nurses, doctors, and technicians will have cannulated him; hooked him up to the monitor, inserted a chest tube, connected both venous and arterial lines, taken blood samples, typed and cross-

matched him, and checked his blood pressure several times. It takes smooth coordination to get so much done that quickly. "When we need something, we ask the doctor. When he needs something, he asks us," says Judy Bobb, R.N. "Everybody does what is absolutely necessary to stabilize the patient."

Another essential characteristic of the institute is the emphasis on preplanning. It is followed without variation. "You know you can depend on the people and the equipment," says Mrs. Kellogg. "Everything is in its place in the OR and admitting areas, and the layout of each room is identical. You can reach behind for something and know it will be there. You don't have to turn around to look for things."

The emphasis on preplanning dovetails exactly with the emphasis on teamwork. "It's not a case of having a different surgeon for every operation or waiting until the scrub nurse can be called from home," says Dr. Gill. "Everybody is here, the equipment is here, and by working together regularly we get to know each other's weaknesses and strengths."

The admitting area is staffed by both ICU and OR nurses. Some of the ICU nurses have been specially trained for the role, and rush to set up the area for a patient's anticipated needs when the radio reports that an ambulance or helicopter is on its way. If the admitting area needs more nurses than have been scheduled for that shift (usually three), one or more OR nurses will leave the operating room in order



*Moments mean life in the admitting area, as doctors and nurses converge from all sides. Each knows what to do without being told, thanks to a carefully rehearsed preplan.*



*Trauma wounds that are obvious are not always the most serious. Here the team has given quick assessment to the gaping hole in the chest, and begins to search for other serious—and as yet unknown—abdominal injuries.*



*Abdominal lavage: Saline solution is infused into the abdominal cavity via an intracath, then allowed to drain out. If the solution comes out pink, the trauma team knows there's trouble inside.*

to assist until the crisis is over.

Mrs. Kellogg insists that every R.N. assigned to the operating room must have at least one year of OR experience. "You just can't teach someone what to do while a trauma patient is being stabilized," she explains. "My nurses now have a range of from 2 to 14 years of OR experience. The youngest is 24, the oldest 40. I need nurses with experience and maturity. I wouldn't recommend this type of work for every nurse—there are some who make fantastic bedside nurses, but don't work well in an emergency setting. But many OR nurses who have tried, genuinely enjoy the challenge. And we have plenty of challenge here."

R.N.s need a "trauma personality," according to Mrs. Kellogg, to work in such a unit. "The doctors expect the nurse to think," she says. "If you see something wrong, they want you to tell them."

The idea of "telling the doctor what to do" is hard for many R.N.s to get used to. "It did seem odd at first that I was responsible for seeing that the doctor did his job right," says one of the nurses. "But if you believe something he is doing is not in the best interest of the patient, Dr. Gill expects you to speak up."

Mrs. Kellogg also insists on having the nurses learn to set and follow priorities, which sometimes startles newcomers to the nursing staff. One of the nurses was caring for a patient in a cubicle in the ICU when the patient went into cardiac arrest, her first such experience at the institute. "All at once people came from all directions," she recalls. "There

must have been four nurses and a doctor, and they all helped. But the minute the patient was stable, everybody disappeared. There was blood all over the room, the patient needed to be turned, the bed needed to be made, I had medicines to get, and everybody was gone. I can remember standing there saying, 'Where did you all go? Come on, I'm not done yet, I need some help! I didn't, really, but I felt deserted, and it was quite a strange experience.'

Where everybody had gone, of course, was back to his or her initial priority, and in the ICU that is usually a one-nurse/two-patient relationship. The patients in the intensive-care unit look like battlefield casualties. Each is in his own cubicle with a nurse in constant attendance. Monitoring equipment is also installed at the nursing station in the center of the unit. Most patients remain in this critical ICU for at least five days, and during this period data on their blood, urine, respiration, and heartbeat are collected constantly and stored in a computer. Then they're transferred to the intermediate ICU next door, where they remain for perhaps a week until they are well enough to be transferred to a general surgical floor. Some patients are so badly injured that they remain under intensive care for weeks.

"We feel that the nursing program in the critical-care and intensive-care units is truly exceptional," says Dr. Cowley. "There is continuous monitoring of seven vital signs, along with continual breath-by-breath oxygen

analysis of every patient. We are proud of the fact that this nursing program provides primary-care nursing to the emergency patient."

The insistence on taking nothing for granted has been passed on by the institute staff to the state police pilots who bring trauma victims to the center by helicopter. Each has received 84 hours of first aid training, spent two weeks at the institute receiving special shock-trauma instruction, and comes back once a year for refresher courses. The pilots learn to control external hemorrhage and establish airways, and leave most other treatment for the doctor and nurses. One helicopter pilot brought in a trauma victim who had been pronounced dead by a doctor at the accident scene. The victim was successfully resuscitated—with, however, a high spinal-cord injury that made him permanently quadriplegic.

While the strain of the shock-trauma program has taken its toll of the nursing corps—many nurses transfer out after a year of such pressure—other nurses prefer it to less-demanding assignments. Three of the OR nurses—Mrs. Kellogg, Pauline Beine, and Virginia Day—have handled trauma for years. Elizabeth Scanlan, R.N., institute associate director, began working with Dr. Cowley in the early 1960s.

"I like the challenge," explains Sally Zinn, R.N., who drives 52 miles from her home in Pennsylvania. "It's stimulating work that I look forward to. Before I came here I worked for 12 years in an operating room where you weren't allowed to do anything. This is certainly differ-

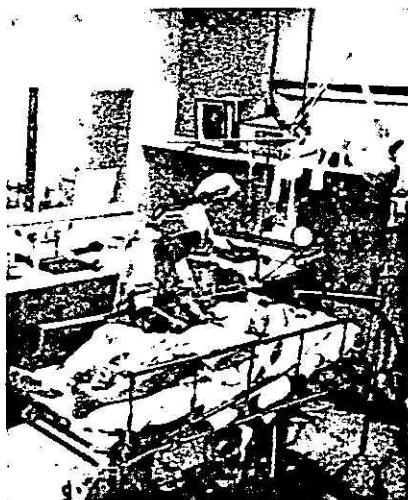
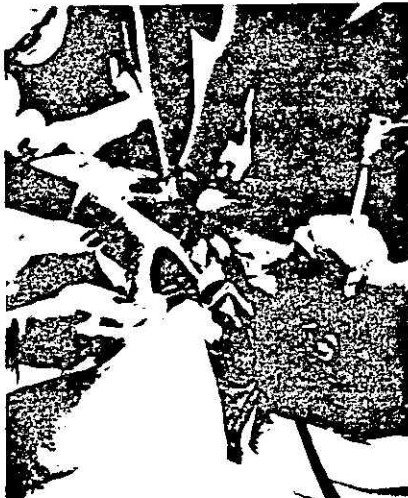
ent, and I'm learning something new every day."

Pay is better at some other Baltimore hospitals. But it would be hard to find a nursing situation where the R.N.s receive more education and backing from the administration. Once when Dr. Gill found a group of his nurses near tears after university doctors had contaminated a newly cleaned and stocked OR for teaching purposes, he directed the M.D.s to scrub and restock the room themselves.

Mrs. Kellogg says one of her problems is keeping her nurses from getting too involved with their patients. Several of her nurses have worked for eight or 10 hours with a single patient, as multiple operations were performed, one after the other. "I can remember working 22 hours overtime one week—62 hours in all—when I was supposed to be 'off,'" one recalls.

On one day, for example, a 46-year-old man was brought into the OR at 5 A.M. Following the principle that everything that could be surgically corrected should be corrected before the patient left the area, the team of doctors performed a splenectomy, repaired a lacerated liver, inserted an intermedullary rod for the reduction of a fractured femur, did an open reduction of the tibia, and completed the fixation of a fractured patella. It was nearly 4 P.M. before the plastic surgeon on the team began the final operation, restoration of the avulsed right ear.

Near the mid-point in the operation word came that two more trauma victims were coming by helicopter. The helicopters landed



*With heartbeat stopped, death is near, but the trauma team refuses to give up. The R.N. (center, left) continues closed-chest massage while two M.D.s insert I.V. lines and the anesthesiologist adjusts the endotracheal tube.*

*More blood is readied for transfusion (above).*

*Some patients receive as many as 40 units within 24 hours.*

*Hyperbaric chamber (left) is used to increase oxygen supply in the blood. Hypoxia is the prime cause of death in shock, and one way to correct it is by saturating the blood going through the cells with oxygen via this technique.*

*Continuous monitoring of seven vital signs begins once the patient arrives in the critical-care unit. "One patient, one nurse" is the rule for the most critical patients in the unit."*

within a few minutes of each other, one bringing a victim of carbon monoxide poisoning for possible treatment in the hyperbaric chamber, the other with a 21-year-old tractor operator who had become entangled in and run over by the huge wheels of the machine.

"It's sometimes tough," admits Miss Day. "You work hard. You see patients here for the most part who are in the most productive period of their lives, and you realize that they will die if you don't help them. Sometimes you work with a patient for six hours, and then realize that he still needs more than five more hours of surgery before you're finished. You go home exhausted. But then, four or five days later, you go up to the ICU and sit by his bed and talk to him and realize that it was all worthwhile."

Adds Mrs. Beine: "It's stimulating to work in a place you really believe in, where the doctors accept you as human beings, and where, if you find a better way of doing something, the people you work for have enough confidence in you to let you do it."

One doctor, commenting on the rapport between M.D.s and R.N.s, said the surgeons have come to have a real respect for the nurses because they see what they are accomplishing day after day. "These nurses are devoted to the kind of care not often seen anywhere else," he said. "They work hard, and we don't compensate them very well. But they do have the satisfaction of seeing the results of a job well done against overwhelming odds." □