

# ***Emergency Medicine and Medical Toxicology: Past, Present, Future***

## ***A Very Personal Overview***

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When I began my medical school education forty years ago, Medicare and Medicaid had not become law and the total health care bill for the nation was 1% of what it is today. There were no training programs in medical toxicology or in emergency medicine. A few poison centers had been established, but there were no Departments of Emergency Medicine; in fact, there were no Medical Toxicology or Emergency Medicine specialty organizations.

As a first year medical student, I visited what was literally a single emergency room and one night observed a resident treating a patient with a heart attack in pulmonary edema with rotating tourniquets; Cardiac Care Units where CPR and electrical defibrillation were performed represented a recent innovation not available in most hospitals. At that time many physicians were still uncertain whether alcohol withdrawal resulted from alcohol abstinence. At that time delirium tremens had a 15% mortality rate.

On a shift during the first week in September 2003, the junior emergency medicine resident, supervised by the chief resident and the Board certified emergency physician cared for a patient with an acute myocardial infarction and debated the use of tissue plasminogen activator or the option of angiography, angioplasty and stenting. On the same day a patient with life threatening ethanol withdrawal was initially managed by the emergency medicine resident, admitted to the intensive care unit while the medical toxicology fellow and a board certified medical toxicologist supervised the patient with the absolute presumption of the patient's survival.

The use of this clot lysing agent and the survival of patients with DTS were only recently dreams much like the development of teams of emergency physicians, and the specialty of medical toxicology.

What surprises me most about my career in medicine is not simply that medical toxicology and emergency medicine have grown exponentially and emerged as respected medical specialties, but that these are specialties in which practitioners never tire of the variety and complexity of clinical problems and the web of psychosocial forces at work in people's lives. These are specialties that challenge us to keep learning new things and to genuinely help people. Most of all I am proud that medical toxicology and emergency medicine have served faithfully as society's health care delivery and public health safety net; and that we have gained such enormous popular support.

But we must address the fact that we spend an inordinate amount of time as health care providers on things that we shouldn't have to concentrate on in the first place.

My reflections today will focus on where I have seen progress, how we in emergency medicine and medical toxicology have achieved this progress and what we can do to continue that progress.

I believe that we can only succeed as emergency physicians and toxicologists in our specialties through the integration of public health measures in each component of our work: in our clinical practice, our organizations, our education and our research.

When I was a young physician, I saw caustic injuries to the oropharynx and esophagus every month.

Why don't I see them today? Previously children had access to NaOH containers with very high concentrations of strong base and there was no attempt to inhibit inspection by a naturally curious child.

### **Several Critical Actions Took Place**

- The maximal concentrations commercially available were diminished.
- Child proofing was begun when in 1970 Congress enacted the Poison Prevention, Packaging Act (PPA) which authorized the United States Consumer Product, Safety Commission (CPSC) to require the use of special resistant packaging for toxic substances normally placed in and around the house.
- Cap and closure engineering occurred.
- Warning signals were placed on containers.
- Parents were educated about the "dangers under the sink".
- Special child proof locks were developed for kitchen and bathroom counters.

When I was a young physician, I saw hydrocarbon aspiration pneumonitis several times a month.

### **Why Don't I See That Today?**

#### **We Made Several Observations and Took Several Critical Actions:**

- Those bottles of lemon polish are now in spray form.
- Many alluring advertisements were criticized and withdrawn.
- Many of the consumer product labels that were inaccurate and contained inappropriate suggestions for treatments were withdrawn.
- Many bottles have improved warning labels; some are child proofed.
- The use of kerosene heaters has diminished.

When I was a young physician I frequently saw children with lead poisoning. In the late 1970's more than 80% of children had blood lead levels  $\geq 10 \mu\text{g/dL}$ . Although today more than one million children have levels high enough to affect intelligence and development adversely, less than

10% of children have blood lead levels  $\geq 10 \mu\text{g/dL}$ . There are so many wonderful reasons why this pernicious effect on children – only recently seen as an insurmountable problem – is being effectively approached. Much of the progress is attributable to the focus of toxicologists, pediatricians and environmentalists.

- The Department of Housing and Urban Development has begun to remove home from aging housing.
- The CPSC has removed lead from toys and house paint.
- The FDA has worked to phase out lead soldered cans.
- The EPA has worked to phase out leaded gasoline.
- The medical community has focused on the problems of behavioral and learning disabilities attributed to lead.
- Individual communities have worked on lead screening, abatement and education.

When I was a young physician, I saw childhood burns from excessively hot tap water several times a month.

### **Why Don't I See That Today?**

#### **We Have Made Critical Observations that Have Led to:**

- Legislation limiting water heater maximal temperatures to 125° F (52° C)
- Protective engineering advances such as maximum thermostat controls
- And substantial educational efforts

When I first started working in Emergency Medicine I saw dental caries in almost every mouth.

### **Why Don't I See That Today?**

- The fluoridation of water has become routine.
- The understanding of the potential benefits and the capacity to control potential risks of fluorine have been enhanced by the efforts of environmentalists, toxicologists, dentists and pediatricians.

When I began my career, I saw horrendous vehicular crashes every day. The impact of the 1966 National Highway Safety Act to fund ambulances, communications and prehospital personnel training programs through the Department of Transportation had just begun to be appreciated.

### **Why Do So Many Crashes Occur Without Lethal and Disfiguring Injuries Today?**

- Seatbelts and/or air bags are routinely available.
- Child seats have been placed in almost every car, bus and airplane.

- Automobile glass is now a tempered glass; antilock brakes are improved; automotive materials more effectively absorb energy.
- Motorcycle helmets have been improved and become safety alcohol standards.
- Greater legal vigilance for drinking and driving is in effect.
- Improved roadway design and lighting have been advanced.

All of these engineering steps in our medical progress have a philosophic trend. The concept of the "Accident" has been replaced by the term "Injury." There is a less fatalistic assessment of our interactions with our environment with a greater allocation of societal and personal responsibility.

We have continued to expand these efforts into our care through research, data collection, analyses and system monitoring all effectively integrated into the continuum of prevention and rehabilitation. The dramatic improved survival due to the systematic approach to health care is no better demonstrated than the paradoxical decrease in homicide at a time when there is an ever increasing incidence of aggravated assault.

When I was a young physician I saw patients with meningitis far too often; I saw patients with tetanus once a month. Twenty-five years ago, one of my coworkers got Hepatitis B every year. Some died. When we worked with patients who used intravenous drugs we feared Hepatitis B, later we feared HIV infections and tuberculosis. Ten years ago, every social worker in my emergency department developed a positive PPD. Some developed active tuberculosis. The link between substance use, alcoholism, poverty and HIV placed us all at risk.

### ***Why Don't These Events Occur Today?***

- Legislative actions led to Medicaid and Medicare which have increased patient access.
- Immunization with remarkable vaccines such as that for Hepatitis B protect the previously unprotected.
- Engineering advances with new needleless IV systems have begun to reduce risks.
- OSHA (Occupational Safety and Health Act) standards protecting health care workers were established.
- Universal or standard precautions utilizing gloves and improved waste collection were implemented.
- Retroviral post-exposure therapy became routinely available.
- It is understood that alcoholism and HIV are directly linked to tuberculosis and often only effectively treated

with special programs such as DOT (Directly Observed Therapy).

- New ED strict triage standards were established for patients with symptoms potentially associated with tuberculosis or other airborne diseases.
- New ED architectural standards such as the presence of negative pressure isolation rooms and use of ventilation at 10 air circulations/hour with no recirculated air were established.

We have focused on the development of programs for intravenous drug users including substance abuse prevention, substance abuse treatment and harm reduction such as methadone maintenance and needle exchange programs.

When I traveled the world as a young man, I received a smallpox vaccination.

### ***Why Don't We Give Those Immunizations Any Longer?***

- The public health model of the WHO and UN has changed our world.
- Today when we worry about smallpox it is about biological or chemical terrorism. At the heart of this discussion you will find the poison center, medical toxicologists and emergency physicians.

The Emergency Medical Systems Act of 1973 and its extension in 1976 mandated a systems approach and design to alter delivery modalities. There were seven major clinical categories to develop including behavioral emergencies, burns, cardiac, high risk infants, neurotrauma, general trauma and poisoning emergencies. When I first began to work with Sylvia Micik and David Boyd, the Nixon administration advocates, the national support for emergency medicine, poison management, education and prevention was limited. Our ability to show the link between all of the other types of emergencies and poisoning led to a dramatic improvement in funding. These changes altered clinical care and our treatment in the prehospital setting was revolutionized. The care of patients with alcoholic emergencies is an excellent example.

### ***Why Don't I See Wernicke's Encephalopathy? I Used to See it Every Week.***

### ***Why don't I See Patients with Post Hypoglycemic Encephalopathy?***

We have as much alcoholism and hypoglycemia, but paramedics and emergency physicians routinely give Thiamine hydrochloride and 50% dextrose in water intravenously to patients with altered levels of consciousness. Clinical leadership from the ED with an understanding of medical toxicology improved the clinical

course of these patients in the prehospital and emergency settings. The toxicologic education about alcoholism, thiamine, and hypoglycemia has diminished morbidity and mortality from these disorders.

When I was a young physician I saw numerous adults die of heat stroke every summer and many poor die of hypothermia every winter.

### **Today, we have:**

- Heat alerts emphasizing the protection offered by armories, air conditioners and ice.
- Cold alerts emphasizing the protection offered by shelters, heat and clothing for the disenfranchised.
- Extensive education on how to take reliable temperatures, the importance of taking a rectal temperature and how to rapidly cool and slowly warm patients.

We talk about the care of the homeless, the psychiatric patients, the risks of drugs that affect the hypothalamic – thalamic axis. We have stopped an epidemic.

In the early 1980's a single toxicologic emergency associated with non-seasonal heatstroke altered the level of support for and importance of medical toxicologists and emergency physicians.

A patient was admitted and examined by an intern and a resident after being brought to an emergency department with agitation, fever, chills, myalgias, and arthralgias. Her medical history included psychiatric treatment for stress and a recent tooth extraction and earache. She was taking phenelzine, oxycodone, and erythromycin. On admission her temperature was elevated to 39.7°C (103.5°F) and she had orthostatic pulse and blood pressure changes.

The young woman's private attending physician declined to come to the hospital. The resident diagnosed the patient as having a "viral syndrome with hysterical symptoms," obtained blood cultures, and prescribed acetaminophen for fever and meperidine for agitation and shivering. The intern was called when the patient became restless and disoriented, and, rather than evaluate the patient, she ordered physical restraints and haloperidol by telephone. When that patient became more agitated and febrile (42°C axillary [107.6°F]), the intern was again called; she ordered, by phone, a cooling blanket. Four and one half hours after admission the patient experienced a respiratory arrest and died.

The cause of death was unclear, but infection and drug reaction or interaction were implicated. Meperidine is known to react adversely with phenelzine. Whatever the cause, respiratory and cardiovascular arrest resulted from inadequate treatment of hyperthermia (nonseasonal heatstroke).

The New York State Health Department concluded that unsupervised house officers should not care for patients in emergency departments and that there should be limits on the number of consecutive hours an emergency physician worked. The Health Department also felt that computerized systems to identify drug interactions should be utilized. My involvement with the development of these standards helped me develop my perspective on the special role of medical toxicologists in emergency medicine and emergency physicians in medical toxicology. This experience established my absolute commitment to the development of both specialties and to the employment of numerous individuals who have been trained in both specialties. This experience reinforced my belief that responsible care could only be provided when residents were contemporaneously supervised by fully trained faculty twenty four hours a day seven days a week.

When I was a young physician agitated young males died in police custody routinely.

### **Why Doesn't that Occur Today?**

- They don't go directly to police precincts any longer.
- They are initially brought to hospitals.
- Vinyl body bags were replaced with mesh to allow heat dissipation.

We established links between the Health Care Providers and Public Safety agencies. These collaborative relationships with the police emergency services have saved lives and resulted in a shared educational process. That EDP [emotionally disturbed person] is considered under the influence of a toxin until proven otherwise. The police have taught us about violence awareness and thereby limited the risk to health care providers.

When I was a young man, there were days when those with chronic lung disease and asthma could not venture out into the streets due to the smog. In Donora, Pennsylvania, in 1948 twenty people died and thousands became ill. In London in 1952 four thousand deaths occurred.

### **Why don't We See that Today?**

- The EPA has changed automobile and industrial emissions standards.
- Health environmental alerts are routine.
- The practice of preventive, occupational and environmental medicine has increased dramatically and has been intimately linked through the American Board of Medical Toxicology.

The public health, toxicologic and emergency medical events that I have discussed have formed my coworkers and me. I have spent my entire postgraduate career in the

public hospitals of the City of New York. When I started working in the South Bronx in 1973 as the Director of Emergency Medicine at Morrisania City Hospital there were no texts in Emergency Medicine and only a few texts focused on medical toxicology. Certainly none of these texts focused on what I saw in the South Bronx and few texts or journals offered me an evidence based approach to this field. My assignment in the South Bronx was to develop emergency health care and teach whatever I wanted. In a matter of a few weeks I had seen alcoholic hypoglycemia, methanol, ethylene glycol, heroin, quinine, and salicylates in overdose, yet I could find little information as to the appropriate therapies for these agents. Many articles and texts did not make sense and it was unclear how I would teach others when I myself was so uncertain about the evidence. I began to write down every question that I was asked about these cases and developed a Socratic approach to my responsibilities in a monthly conference. Shortly thereafter I met a young editor and publisher, Peter Frishauf of Hospital Physician and I began to transcribe my monthly conference into a column for his journal. I began work with my first associate Robert Kirstein, later with Harold Osborn and Eddy Bresnitz, to create these columns in a manner that was focused on history and anecdote, attentive to the curious mind, concerned with practical issues, controversial and reality based and above all in a way that would allow our personalities as evolving emergency physicians and toxicologists to be heard and understood.

When I moved to Bellevue Hospital and the NYC Poison Control Center in Manhattan in 1979 I began work with Neal Flomenbaum, Neal Lewin, Richard Weisman and Mary Ann Howland in the development of our special brand of academic medical toxicology. Several years later Robert Hoffman added his immense skills to our effort as we attempted to link the passion of clinical medicine with the promise of science to solve a few of medicine's problems that previously were considered insoluble.

With these coworkers we have produced seven editions of our text. We have tried to be provocative – to contribute to the advancement of our knowledge, to inspire others, to allow us all to treat patients better and to improve the public's health. We have been remarkably fortunate to create an environment where we can combine patient care for the truly needy and teaching of diverse types of medical, pharmacy, nursing, prehospital, college and high school students with clinical and laboratory research. The union of our specialties offers a unique environment to develop physician-scientist-clinician-teacher roles. It also is an environment where multispecialty interdisciplinary collaboration is valued. Our historic links between pharmacy, medical toxicology, medicine, pediatrics, internal medicine, preventive medicine and emergency medicine are the foundation of our immense strength and importance.

Medical toxicology, emergency medicine and all components of our health care system must adhere to the public health model of disease prevention based on a definition far broader than the medical model.

In the United States, we have an outrageous health care system that permits 11x10<sup>6</sup> children of less than 18 years of age to be without insurance and we allow more than 45 million adults to be without health insurance. And who truly has access?

Yet for many, the problems may be the lack of assurance not insurance. We do invest millions in saving the lives of neonates of single parents only to realize that the mother can't get day care or education or social support or a job. So what will those children's futures be?

If we truly practiced health care, we would expand social care.

It is essential to change the definition of "health care"

- to participate in public education,
- to enlist community involvement,
- to develop public policy advocacy, and
- to initiate governmental action.

The medical model has a minimal impact on the long-term health care of children and adults. Engineering and passive counter measures are expensive responses to medical problems but they are far more productive and permanent than the reliance on behavior modification.

Every effort must be viewed with respect to individual and community needs. The strength of these community relationships is essential for the success of our efforts.

The simplest proposal might be to assure as Dag Hammarskjold, a previous secretary general of the United Nations once suggested that "We'd have no difficulties if everyone were born in Scandinavia."

Most of our great successes, that I have reviewed are based on the fact that we recognize that health care must be considered far more than each individual's medical services.

Think how fortunate you are that you are not:

- Uneducated,
- Hungry,
- Poor,
- Homeless, or living in foster care.

Think about our patients. How many would be in your ED or on your poison center telephone line if each and everyone had

- A family,
- a home,
- two parents,
- an education, and
- preventive health care.

I believe that we will treat our vulnerable patients better and make their access more appropriate when we systematically look at each and every patient and ask ourselves:

1. What is the lesion in our public health system that brought this man, woman or child to the emergency department today?
2. What aspect of this patient encounter can be transformed into a public health teachable moment?

Our only solution is a true social contract for our society. Our great accomplishments have come and will come from our commitment to public health, public policy and universal health care in the context of an educated population, with reasonable housing, social support, opportunity, job training and employment. Public health models emphasize the interconnectedness of our society and it is this concept that leads to our success and reinforces our importance.

The chasm between the computerized statistical elegance of the poison center or the newest innovative medical record system and the random social chaos of the emergency department must be bridged. Only by an integrated effort can we effectively use the former to assist in developing solutions for the latter.

I don't expect us to solve all of society's problems in the poison center or in the ED, but we are the best barometers of our societal failures. If we don't address the issues, define the problems and suggest solutions they will not be recognized and there will be no solutions. Our communities must understand our roles, our efforts should be linked to the disaster/emergency medicine costs of our society – the essential stand ready costs that some inappropriately call “non productive costs” – but that we understand are critical for a safe and functional society.

It is essential that we rethink our organizational approach to health care as a part of a public health process which is a far more important step than re-engineering our health care market.

I see no commitment to confront our societal ills from those who favor the commercialization of healthcare and medical education. The explosive increases of tuberculosis (particularly multiply drug resistant TB) among the inner city poor and homelessness among psychiatric patients in the 1980's can be directly attributed to our abandonment of public health measures. The devastating results of employing the cheapest social policies for these patients led to a reinstitution of public health measures to care for TB and homelessness in America's inner cities in the 1990's. These experiences must be used as examples of

what will happen as health economists seek to curtail the efforts that have led to the obvious remarkable public health advances we see everyday.

The goals of education and clinical practice must be to address societal need not self-interests. Our goals as medical toxicologists and as emergency physicians must be to be compassionate caregivers. We must use science and humanism as the basis for each of our decisions. We must show that poison services and the emergency department have an intrinsic value and our social mission can not be financed optimally in a competitive market place. We should be considered an integral part of the social mission of Academic Health Centers and Health Departments.

Our vantage point (of the world) offers a broader vision than that available to any other physicians. Our mission can be shared by all others devoted to the public's health. Our educational goals must be to go on as soon as possible beyond that which is taught, to create knowledge, maximize originality and define novel solutions to our problems.

I am proud to have worked in so many areas where we have succeeded and protected future human beings. I am reminded of John F. Kennedy's comments in New York City in 1961 as he improved on Teddy Roosevelt's effort of an earlier time; “the credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood, who knows the great enthusiasms, the great devotions, and spends himself in a worthy cause: who at best, if he wins, knows the thrills of high achievement, and, if he fails at least fails daring greatly, so that his place will never be with those cold and timid souls who know neither victory nor defeat.”

The world that I saw in the emergency department in 1963 is very different from the world I see today. Today I see America's finest medical students competing for positions in 125 emergency medicine residencies (1200 positions annually) and I see the finest graduates competing for positions in 20 fellowships in medical toxicology. These young doctors in every state of our country are supervised at the bedside by a mature emergency physician in an attempt to guarantee the best healthcare for each patient and permit the earliest recognition of a complex new societal dilemma. The world for all of us and particularly the poisoned patient and the emergency patient will be better still in the twenty-first century if we continue to emphasize altruism and humanism while creatively expanding the strength of a public health approach to our problems.

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