The Value and Evolving Role of the U.S. Poison Control Center System

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Poison control centers (PCCs) in the United States play a hybrid role, functioning as part of the public health infrastructure and as direct-service providers, while offering poison treatment advice. In 2003, partially in recognition of their place in the public health infrastructure, Title XII of the Public Health Service Act was amended to specifically include authorization for PCCs. As the sophistication of the PCC system has increased, the role of poison centers has evolved over time to include involvement in health-care cost reductions and public safety by toxico surveillance, as well as serving as a repository of valuable research data on product safety and toxicity.

This article focuses on the five key benefits of PCCs: (*1*) accessible and affordable health care, (*2*) health-care cost reduction and dollar savings, (*3*) toxico and public health surveillance, (*4*) public and professional education, and (*5*) research data on product safety and toxicity.

POISON CENTER HISTORY

PCCs in the U.S. began in the 1950s to provide poison information to health-care professionals and primary physicians. Within a decade, their services expanded to include provision of poison information to the general public.[1,2] There was initially little, if any, coordination of services among the centers. By 1970, more than 600 PCCs were operating in the U.S. with varying levels of service. However, through regionalization and center certification (begun in 1978) overseen by the American Association of Poison Control Centers (AAPCC), an increasing coordination of efforts began to occur.

In the early 1980s, a national database of all poisoning cases reported to U.S. PCCs was created with a nationally coordinated data collection tool and medical record. This database included patient demographic information, geographic identifiers, substances involved, clinical effects experienced, therapies provided, and medical outcomes. Poison centers moved to electronic recording of medical records in the 1990s. And in the fall of 2001, PCCs provided the only national health-care database covering the entire U.S. population that could be accessed in real time.

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POISON CENTERS: ROLES AND BENEFITS

Assessment, triage, and monitoring

Presently, the 61 existing PCCs operate in close cooperation to provide assessment, triage, management, and continued monitoring of more than 2.4 million poisoning patients per year.[3] Patient care has long been considered the core function of a poison center. Jointly, these 61 centers provide services to the entire U.S. population in all 50 states and U.S. territories. PCCs act as primary care providers for patients managed at home or as toxicology consultants to health-care practitioners and institutions. This service is provided at no direct cost to the patient, practitioner, or health-care institution. Immediate access is available 24 hours a day, allowing for rapid contact and assessment. In many cases, the initial contact occurs within minutes of the poisoning exposure, allowing early intervention measures to have the greatest potential impact. Additionally, this early contact allows for an appropriate level of triage, especially in cases that can be managed outside of the hospital setting, which is one of the important mechanisms for reducing health-care costs.

PCCs utilize nurses, pharmacists, and physicians with extensive training and expertise in toxicology, in addition to board-certified clinical and medical toxicologists. Together, the associated staffs of the PCCs house one of the greatest assemblages of toxicology expertise available. In addition to the personnel expertise, poison centers house extensive information resources, allowing rapid and timely availability of hard-to-find information in critical situations. Access to a PCC is through a toll-free number (800-222-1222). The present system allows for rapid, open, and free access to highly specialized care for demographic populations that are typically underserved or lack access to high-quality health care, such as low-income, rural, or elderly people.[4,5]

Health-care cost reduction

A second important value of PCCs is their significant impact on reducing health-care costs. The primary driver of these health-care dollar savings is through reduction of health-care dollar utilization. Studies have been conducted in two areas: (*1*) reduced emergency department (ED) visits for poisoning and (*2*) reduced length of stay for patients hospitalized for poisoning.[5–13] Several studies have examined PCC impact on ED utilization for poisoning cases. Following the closure and loss of poison control services in Louisiana and Michigan, there was a documented 40% increase in ED visits for poisoning; in one state, it resulted in an additional 15,000 cases annually.[10,11]

In California, lack of direct access to a PCC resulted in a significant increase in inappropriate use of the ED for poisoning cases.[12] In a subsequent study, more than 1,700 ambulance runs were averted in a single city (El Paso, Texas) through cooperation and coordination of 911 dispatch centers with their regional PCC.[14] Zaloshnja et al. also associated availability and use of a PCC with a significant reduction in ED visits for poisoning.[8] Another study estimated that in 1997, poison center activity in the U.S. led to a reduction of more than 350,000 ED visits annually.[6] The estimated annual cost savings from this benefit was more than $310 million.[15]

These figures have likely risen significantly in the last decade, as the U.S. population has continued to increase and coverage of the U.S. population by PCCs has also increased. In one study in northern Arizona, a minimum of $36 in unnecessary health-care charges was saved for each dollar in state funding support received by the PCC—for a total annual savings of $33.2 million—through a reduction in ED visits.[13] This figure is important because state and federal governments are the two primary beneficiaries of these cost savings due to reduced Medicare, Medicaid, and State Children's Health Insurance Program (SCHIP) costs.[13]

Additional studies have investigated the impact of poison center consultation on patients requiring hospitalization for a poisoning. Vassilev et al. noted a reduction in hospital stay of more than three days for patients with a poisoning in which a poison center was consulted, resulting in savings of more than $2,100 per patient.[9] In a second study, Bunn et al. reported similar findings of reduced length of hospital stay and costs in patients hospitalized with a poisoning, regardless of preexisting medical or psychiatric condition.[7] In 2005, Medicare, Medicaid, and SCHIP were the primary payers in 47% of nonfatal poisoning hospital admissions, so much of these savings directly benefit federal and state governments.[16,17] It has been estimated that each dollar spent on PCC services provides a cost saving of $7 to $15.[15,18] The total cost savings attributable to PCC services is estimated at more than $900 million annually.

Detecting and monitoring disease

The emergence of the need for public health and toxico surveillance has added a third major direct benefit for local, state, and national public health protection efforts. Because of their 24-hour availability, extensive usage by the population (more than 3.5 million individual direct contacts annually), and experienced professional staff, PCCs act as a broadly distributed sentinel. Around-the-clock human surveillance by hundreds of alert clinicians, as well as electronic monitoring

by automated surveillance programs, provides a robust system for timely recognition of and helping with any medical response to detected events. Recent examples of events include: (*1*) local: site contamination by a mercury spill at a high school with 500 students, (*2*) state: carbon monoxide poisoning from gasoline-powered generators after region-wide power outages from a hurricane, and (*3*) national: imported contaminated consumer or food products (e.g., lead, melamine, or 1,4 butanediol).

All 61 U.S. PCCs use an electronic medical record, with data collected minute by minute, which is submitted in real time and collated almost instantaneously into a coherent national database. Follow-up information on existing cases is also added in real time, allowing for monitoring of the clinical course and final case outcome. This system, which is monitored daily by the Centers for Disease Control and Prevention (CDC) and the AAPCC, has resulted in the detection of a number of aberrations and outbreaks.[19]

Sophisticated automated surveillance programs, enterprise-level reports, and geographic information system mapping capability provide public health entities involved in local, regional, or national efforts a tool for recognition and mitigation of threats. Poison center data have been used to detect threats or monitor emergence of trends in (*1*) cases of drug and substance abuse, (*2*) foodborne illness outbreaks (e.g., botulism), (*3*) food/medication contamination, (*4*) detection of adverse drug reactions to new or older medications, (*5*) injuries from commercial and consumer products, and (*6*) pediatric poisoning trends.[20–33]

Additionally, poison center data have been used to monitor selected illnesses in the general population (e.g., influenza), health threats from natural disasters (e.g., hurricanes), and foodborne/waterborne disease threats.[34–38] Because of their experience, expertise, and existing infrastructure, all 61 PCCs have been trained and are prepared to play an integral role in an all-hazards event.

Public and professional education

A fourth value of the PCCs is their role in both public and professional education. Public education is a crucial function of poison centers and serves the dual role of promoting poison prevention behaviors and delivering outreach messages meant to foster awareness of poison center services.[39,40] Promoting poison prevention behaviors has been shown to significantly reduce hospitalizations and ED visits for poisoning.[41] Secondary education efforts intended to result in greater awareness and utilization of poison center services allow a greater proportion of the population to receive the benefits of poison control services (e.g., cost avoidance).[40]

Formal professional education is provided through toxicology training to physicians in medical school, in residency training, and as part of toxicology fellowship training programs; to pharmacists in their doctor of pharmacy student and residency training programs; and to nurses in their student and specialty training programs. Additionally, professional education is given to health-care providers through continual and extensive in-service training programs, symposiums, grand rounds, and online forums for continuing education concerning the most current patient treatment and management guidelines for known or suspected exposure to poisons. Informal professional education occurs on a daily basis during toxicological consultation requests from physicians, pharmacists, and nurses at the bedside. These consultations impact on-the-spot patient care and improve the health-care provider's treatment of subsequent patients.[42]

Information and data source

Finally, PCCs, with more than 2.4 million cases recorded annually, are a rich repository of information and data source for research on product safety and toxicity. Hundreds of research reports published in the literature have utilized these data. These data are also used for researching improved patient management, evaluation of antidotes, epidemiology, and development of public policy. PCC data have been used by the Consumer Product Safety Commission, the Food and Drug Administration, the Environmental Protection Agency, and CDC, as well as state and local health departments.

PCC CHALLENGES

Despite significant advances in recent years, PCCs have a number of noteworthy shortcomings and opportunities for improvement. The Institute of Medicine (IOM) report on the U.S. poison center system commented on a number of these areas needing improvement, including persistent underfunding—with a significant amount of time and resources spent on funding efforts—and a lack of coordination with other surveillance initiatives.[15]

In an effort to increase coordination with public health authorities, the following actions have been taken: (*1*) joint surveillance of the national poison center database by both CDC and AAPCC, (*2*) an increasing number of PCCs providing timely reports to state authorities on food poisoning cases and occupational injuries in their region, and (*3*) increased

involvement by PCCs in all-hazard preparedness and response programs.

Funding, however, has remained a problem. In 2002, the IOM documented 29 separate funding sources for the then existing 64 PCCs. Since that time, several centers have closed and funding sources remain fragmented, ranging from federal block grants, state and federal Medicaid programs, and line-item appropriations from states, to state-funded universities, telephone surcharges, and individual hospital funds. With forecasts indicating large federal and state budget deficits, these sources of funding may become more difficult to maintain and the persistent funding crisis at PCCs may become more acute.

CONCLUSION

PCCs have long played a largely unrecognized, yet integral role in protecting the public health of our population. In the last 25 years, poison centers have evolved into a highly sophisticated system that helps provide protection and significant health benefits to society at large, while at the same time saving hundreds of millions of health-care dollars annually. Funding for this system has been provided by health-care institutions, university resources, and the public. As with many public health services, poison centers remain perpetually at risk of reduced funding and closure. Recognition of the evolving and growing role that PCCs play and the value they provide may help engender continued support for their future existence.

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