A Nonstatistical Algorithm for Automated Surveillance of Poison Control Center Data

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OBJECTIVE

To develop an automated system which examines Poison Control Center data and provides (1) early recognition of events, both man-made and naturally-occurring, which may pose a threat to public health, and (2) real-time notification to Poison Specialists, the on-site experts who evaluate those alerts.

BACKGROUND

Poison Control Centers (PCCs) provide management advice and toxicological information to health care professionals and the public. Often the initial point of contact after exposure to a hazardous substance has occurred, PCCs have early access to information about exposures which may pose a threat to public health. Operating continually with on-site experts (Poison Specialists), PCCs are ideal sites for early detection of public health threats, allowing early response which may reduce or prevent harm to the at-risk public. Experienced Poison Specialists often identify events by recognizing subtle changes in case patterns apart from expected variations (e.g., seasonal, weekday versus weekend, etc.) We developed a nonstatistical algorithm to more closely approximate event recognition by Poison Specialists.

METHODS

When a call is received, a Poison Specialist gathers demographic information about the caller and patient, information about the substances involved and circumstances of exposure and clinical information about the patient. The Poison Specialist provides treatment advice, any necessary consultations with the Medical Toxicologists and follow-up calls to ensure successful resolution of the exposure. The Poison Specialist also creates a case data record; in our center, these data are recorded in ToxiCall®, a poison control center database. Case data are deidentified and loaded from ToxiCall® to AllegroCache™, a dynamic object caching system. Inquiry cases and exposures are included, as inquiries may provide the first indication of an event. Case data are compared with one or more threshold values (specific or default); if a threshold is exceeded, the Poison Specialist is alerted to respond by: (1) dismissing an event known to be insignificant, (2) referring verified events to appropriate responders (e.g., public health or public safety officials, local health care facilities, poison center management, etc.), or (3) deferring uncertain events for later reevaluation (e.g., after additional research).

RESULTS

Currently data from one Poison Control Center (Connecticut) are evaluated. Threshold values are set for specific or similar substances within specified time periods. When no specific threshold applies to a particular case, a default threshold is applied. At this time, "old" case data are not removed from the data base; rather, the limits of data to be scanned are based on the threshold parameter (e.g., for a 24 hour threshold, data older than 24 hours is not scanned). Additional development work is planned to incorporate evaluation of spatial proximity of cases to one another and to locations of interest (e.g., bodies of water, transportation routes, nuclear power plants, schools, etc.), and to provide graphic representation of this proximity. The system has been developed on a desktop personal computer; this has the benefit of providing physical security for the data, but the system could run in a larger environment (e.g., a server) if a larger volume of data is to be processed.

CONCLUSIONS

Poison Control Centers have early access to information about events of public health significance and the on-site experts to interpret and act on that information. Often these data never become available from other sources within the health care community. A nonstatistical algorithm can provide a valuable alternative to statistical methods for evaluating patterns of case information.

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