COMET: A SYSTEM FOR MICRO, MINI AND MAINFRAME ENVIRONMENTS

Pat O'Neill, J. Jay Volkert and Gerald O. Koop

Creative Socio-Medics Corporation
16 E. 32nd St., New York, New York 10016

ABSTRACT
The exploding technology in micro and personal computers has stimulated knowledgeable occupational health professionals to examine their potential applications in their own work. Commercially available health surveillance systems are currently being offered in large minicomputers or mainframes. Does the revolution in hardware technology now mean that a comprehensive occupational health system can be supported by a small inexpensive computer? Such a machine-independent information system has been developed to perform data base management functions for tracking employee health status to discern potential health effects from workplace exposures.

INTRODUCTION
The U.S. government has estimated that one in four Americans may be at risk of illness because of past exposure to hazardous materials on the job. The National Council on Compensation Insurance (NCCI) claims studies reveal an average latency period of nine years for occupational diseases, with some diseases taking 30 years to manifest themselves. NCCI also claims that Workers' Compensation insurance pays for only 5% of these illnesses, while Social Security is covering 53%.

Litigation, class action suits, and corporate bankruptcy proceedings are among several incentives for developing more effective ways to protect workers' health through more sophisticated recordkeeping, analysis, and correlation of complex medical and exposure data to provide an early detection mechanism.

New computer and software technologies have been incorporated in the Creative Occupational Medical and Environmental Tracking System (COMET). COMET has been introduced to assist large and small businesses to meet all of their occupational health information needs.

Applying Current Computer Technology
Competitive forces in the computer industry have now produced hardware components which are a fraction of the size and cost of comparable units built just a few years ago. These advances in hardware technology have outpaced the ability to develop software to effectively utilize this potential. Many software packages designed for large minicomputer or mainframe environments cannot be adapted to the micro environment. On the other hand, developing such a system solely for a microcomputer is an expensive undertaking that may not prove cost effective. The ideal would be to have a system that is transportable, one which could operate on micros, minis, and mainframes.

A major barrier to achieving this ideal has been the constraints of operating systems that could support the same software in a variety of hardware environments.

This barrier was overcome by utilizing MUMPS as the programming environment. MUMPS has been widely accepted as an efficient tool for developing medical applications. Since MUMPS is a language, a data base manager, and an operating system, it possesses some advantages for micro applications. Its efficiency as a task and file manager enables the system to maximize the hardware's storage capacities. With the growing acceptance of MUMPS as a programming environment for medical applications, software houses have developed MUMPS operating systems for many new hardware applications. With the standardization of MUMPS (ANSI standard), MUMPS systems can now be installed on a wide range of computers from micros to mainframes.

Thus, the COMET which was developed in MUMPS and designed to be transportable from one computer to another, can now be operated on hardware ranging from micros, to large minis, and even IBM mainframes. This has particular advantages in occupational health applications where distributed processing and system networks may present distinct advantages. Now, individual departments or plants can install a system at minimal cost to meet their specific needs with the potential to evolve a corporate-wide system which may include a variety of micros, minis, and/or mainframe computers.

Since MUMPS is a very flexible programming environment and facilitates development, COMET can be easily and inexpensively adapted and modified to meet the diverse needs of industrial hygiene departments. Ease of development and its user-friendly features were important in its selection as the programming environment for the Veterans Administration hospital systems. These
attributes make it equally desirable for occupational health applications.

The complete COMET system can be installed on a hardware package comprising a 256K CPU with a 35mb disk for storage. This size system can support 4-6 simultaneous users and a data base of up to 5,000 employees. Minicomputer and mainframe environments have virtually unlimited capacities to meet any size industrial user.

System Design and Features

COMET is a comprehensive, on-line system that enables occupational health professionals and executives to effectively manage all aspects of employee health and safety. COMET is designed to monitor and integrate employee health data for corporate and industrial medical units and environmental health and safety departments. The system tracks the medical history of each employee, correlates specific health problems with work history and workplace exposures, and identifies causal factors in work-related accidents.

Data is organized in three modules which provide occupational health tracking: personnel information, medical information, and industrial hygiene/toxicology information, as shown in the illustration below.

**SOFTWARE SYSTEMS IN COMET**

The Personnel module defines employee demographic information and tracks work history. The Medical module contains medical histories, laboratory results, physical examination findings, and absenteeism information. The Industrial Hygiene/Toxicology module encompasses industrial hygiene surveys, industrial injuries and information about the toxicity of chemicals. Workers exposed to various environmental and physical stresses can be classified by job description and work area location; other biological monitoring information, such as blood lead levels, can be included in this module. Another module, the Utility and Search module, builds dictionary files, generates reports and performs general system maintenance. This software can be utilized to perform statistical analysis and epidemiological studies.

A unique feature is the on-line capture and storage of data through a questionnaire driver. The driver is a user-friendly computer program enabling the composition and editing of questionnaires or data collection instruments to cover any information needs.

System Functions

The Personnel Module manages demographic data which is collected and updated from the personnel department records. Scheduling for multiphasic health tests and physical examinations based on age, sex, and job exposures, are printed with mailing labels and notifications mailed to the employee.

The Medical Module contains several different subsystems comprising absenteeism, laboratory results, electrocardiogram, general medical review and health hazard appraisal. Laboratory data can be entered by magnetic tape and EKG, audio, metric and pulmonary function screening instruments are automated through microprocessors which directly input the data after collection, computation and interpretation.

The Industrial Hygiene/Toxicology Module utilizes the questionnaire's driver feature for quality controlled data entry. The questionnaire captures the following: 1) monitoring conditions, 2) method of analysis, 3) results, and 4) safety information. The industrial injury subsystem tracks both OSHA and non-OSHA occurrences, employing a modified ANSI 216.2 code.

The materials handling sub-system records material safety data sheets, and environmental engineering data including RCRA, air pollution index, NRC101 classifications and other pertinent data to aid in maintaining compliances with environmental regulations and guidelines.

The industrial hygiene module also maintains a file containing employee exposures to environmental stresses and cross references this to the employee identification number. Employees are then automatically classified based on job titles and departments and scheduled in the medical surveillance program using those parameters.

Reporting Capabilities

Reporting and analysis of information from a data base management system constitute the most important outcome serving management and users.

COMET offers more than thirty reports in standard formats which can be tailored to each user's requirements. However, the most powerful feature of COMET is the capability to search and identify trends in the data base. As an example, all employees with abnormal liver function tests, exhibiting fatigue and irritability when exposed to toluene above the action level can be found. A typical computer-generated search utilizes the dictionary to find storage locations for each parameter in the master file. A file of all abnormal test findings is kept to monitor for potential trends in the data.

COMET enables the user to integrate medical information, such as demographic characteristics associated with risk factors, company population census statistics, and comprehensive work histories. Completeness and reliability of the data
are so important therefore CCOMET provides for case-finding mechanisms, cause of death statements, validation of diagnosis, follow-up on terminated employees, and data validation procedures.

SUMMARY

Advanced small computers combined with low cost fixed disk storage systems and the MUMPS programming environment have enabled the design of an occupational health information system that meets the needs of both small and large users. The system is extremely flexible, adaptable to the changing information requirements, and costs a fraction of other currently available systems.