A COMPUTERIZED SYSTEM FOR RECORDING, REPORTING AND RESEARCHING DATA FOR NEWBORN INTENSIVE CARE UNITS (NICU) TRANSFERABLE TO MOST SITES

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Introduction

We have reported 3 experimental computer systems for recording, reporting and researching data on newborn intensive care unit (NICU) infants.1-3 Forms and programs necessary for implementing these systems were made available to interested sites. Yet, to date, only 2 of more than 20 interested NICU's have implemented such a system. We describe a new NICU computer system, modeled after our previously-reported systems, which is designed to be, and has been, successfully implemented at sites throughout USA and Canada.

Database and Forms Definition

An interested NICU is first categorized by whether it 1) is located at one or several physical locations, 2) has its own transport team or not, and 3) does backtransports (transport of patients discharged from the NICU to intermediate or primary care nurseries prior to discharge to parents). Forms in use at the interested site are exchanged for a set of our forms designed for that category of NICU. Medical and nursing staff are encouraged to become familiar with our forms, identify items which are of limited interest to their site, and identify areas of special interest which are not adequately addressed. Staff then meet with our medical database analyst for 1 to 2 days to review, modify and complete a database particular to the interested site. Questions are constructed by the analyst to correctly solicit data, and are structured into numeric, multiple-choice single or multiple answer, short-phrase and textual forms, in that preferred order. Questions are then carefully worded to control acquisition, recording and reporting bias.

Questions are then grouped into pre-transfer (initial consultation), transfer, history, admission physical examination, NICU care, discharge physical examination and discharge modules. Questions are then ordered within modules to correspond to the interested site's usual chronological sequence of data acquisition. After pretesting, correction and approval, forms are professionally-produced for use in patient data collection.

Approximately 200 diagnoses are similarly reviewed, modified, grouped into functional categories (syndromes, multi-system groupings, organ-specific groupings and isolated abnormalities, in that preferred order) and ordered to reflect the interested
site's particular teaching and research beliefs. Each diagnosis is then assigned a unique 4 digit recording code and an International Classification of Disease (ICD-9) or World Health Organization (WHO) reporting code. After pretesting, correction and final approval, each functional category of diagnoses is professionally printed on a single page with space at the bottom for identifying patient diagnoses, qualifiers and comments.

Once database and forms definition is complete, pre-existing, largely table-driven programs are modified to capture data and produce admission notes and discharge summaries directly from the database.

Data Entry and System Description

Data from forms are entered onto the computer by a project coordinator. Questions appear on the computer in the same order and format as they appear on forms, and data are entered without further interpretation exactly as they are recorded on forms. After entry of admission information, an admission note is produced by the computer directly from the patient's database. This note adheres to style, phrasing and format of a dictated NICU admission note. After hospitalization, the remaining data are entered and a discharge summary is similarly computer-produced. At some sites, a copy of the discharge summary report leaves the unit with the infant.

Research and evaluation data are obtained by specifying up to 10 selection criteria (e.g. birth weight less than 1500 grams, diagnosis of PDA, etc.), and up to 20 items of information to be reported for selected infants. The computer automatically searches for and identifies infants meeting selection criteria and prints out the information requested on each selected infant in columnar format. All such queries are controlled by a single, prewritten program.

A Digital Equipment Corporation (Maynard, Massachusetts, USA) or DEC-compatible LSI-11 microcomputer, two 500K-byte flexible disc drives, VT-102 terminal/keyboard, and letter quality printer are required. The operating system used is RT-11; applications programs are written in FORTRAN 4.

Discussion

Implementing a successful, experimental NICU computer system is a costly and risky undertaking. Several successful, experimental NICU computer systems have been reported. An interested NICU should, therefore, be able to select one which most nearly addresses its perceived needs, obtain copies of forms and programs, acquire the necessary hardware and implement the system at considerably less cost and risk. Of over 20 such sites requesting forms and programs from us, we know of only 2 which have successfully implemented a system such as we described, and only 1 within our projected (less than initial implementation) cost. Our experience is apparently not unique.

Moving a successful medical computer system to another site involves more than acquiring forms, software and hardware. We have found that after selecting a host system, an interested NICU must still 1) obtain outputs, forms and programs, 2) iden-