PROCEEDINGS
The Seventh Annual Symposium on
computer applications in medical care
October 23—October 26, 1983
Washington, D.C.

Edited by
Ruth E. Dayhoff
Program Chairman
# Table of Contents

Preface ................................................................. iii  
Introduction ......................................................... iv  
Program Committee ............................................... v  
Sponsors ............................................................... vii  
Board of Directors ................................................ x  
Steering Committee ............................................... xi  

## Computer Applications in Medical Care

### I. The Impact of Technology on Medical Care
- The Impact of Computer Technology on Medical Care ........................................ 3  
  - R.E. Dayhoff
- The Case for Artificial Intelligence in Medicine ...................................................... 4  
  - J.A. Reggia
- NMR Imaging in Medicine: History, Principles and Prospects .................................. 8  
  - P.C. Lauterbur
- Computers in Medical Education: Present and Future ............................................. 11  
  - G.O. Barnett, E.P. Hoffer, and K.T. Famiglietti
- Emerging Mosaic of Information Processing Standards for Computer Application in Medical Care Systems ................................................................. 14  
  - T.M. Kurihara
- Technology in Hospitals—The Effect of Prospective Reimbursement ..................... 19  
  - D.W. Simborg
- Making Medical Computation Affordable with VLSI ............................................. 23  
  - T. Kehl

### II. Computer Systems in Hospitals

#### IIA. Hospital Information Systems: Planning, Evaluation, and Implementation
- AHIS Planning and Evaluation .................................................................................. 28  
  - G.S. Cohen
- Methodology to Establish Institutional Priorities for Information Systems .................. 29  
  - S.D. Jaworski and D.C. Morris
- An Information Services Planning Methodology for an Academic Health Center ........ 36  
  - W.R. Menning, F.L. Williams, and D.C. Morris
- Automated Hospital Information Systems: A Benefits Optimization Program ............. 40  
  - J.E. Siemon
- sys/PLANR: A Decision-Support Tool for HIS Planning .......................................... 44  
  - G. Kolenaty and M. Holland
- A National Survey of Hospital Data Processing ..................................................... 49  
  - R.R. Grams
- AHIS Implementation ............................................................................................... 52  
  - R.M. DuBois
- Large Scale Implementation of Compatible Hospital Computer Systems within the Veterans Administration ................................................................. 53  
  - M.T. Ivers, G.F. Timson, H. von Blankensee, G. Whisfield, P.D. Kelz, and C.N. Pfeil
- The Evolving Marriage of a Local Area Network (LAN) and a Hospital Information System (HIS) ................................................................. 57  
  - E.T. Harrison, J.D. Pickren, P. Mangum, H.F. Tomlins, and A.S. Pickren
A MUMPS-Based Patient Reporting System .......................................................... 61
W.T. Chave and R.E. Keefe
Computers in Community Hospitals—for Patient Care—for
Doctors—for Nurses—for Administrators .................................................. 68
W.J. Ritter
Hospital Based Customization of a Medical Information System .................. 72
M.A. Rath and J.C. Ferguson
The Veterans Administration’s Approach to Hospital Automation ................. 76
J.F. McGuire and R.M. Cooper
IIB. Medical Records and Quality Assurance
Automated Medical Records and Quality Assurance ........................................ 81
K.J. Dickie
A Medical Utilization Review System for Ambulatory Care Based on Automated Claims Data .......................................................... 82
S. Silva, A. Berkowitz, S. Lizanich-Aro, and P. Jenkins
Validation Techniques for Medical Data ..................................................... 86
B. Brown, B. Harbort, K. Lattimer, and S. Peake
A Simulation Study of Automated Treatment Planning in a Mental Hospital ........ 90
Evaluating Hospital Compliance with the JCAH Quality Assurance Standards .......................................................... 94
J.E. Downey, R.M. Walczak, and W.M. Hohri
The Computerized Notation System (CNS)—A Direct Data Entry System for Physicians and Nurses .......................................................... 98
S.R. Ash and D.K. Ulrich
The Medical Record—Session Overview ..................................................... 99
F.R. Jelovsek
Adapting to the Day to Day Growth of TMR .................................................. 101
Functions Required to Allow TMR to Support the Information Requirements of a Hospital .......................................................... 106
W.W. Stead and W.E. Hammond
Is Computerization Worth the Price? An Evaluation of 7 Years’ Use of TMR .......................................................... 110
S.R. Kozel
Implementation of TMR in an Oncology Research Hospital ......................... 116
J.T. Casagranda, J.R. Daniels, I. Kapuy-Carlos, and A.B. Mayer
Database Marketing Using TMR .............................................................. 120
M. Bernes, R. Margolis, and M. Jasper
Standards for the Transmission of Diagnostic Results from Laboratory Computers to Office Practice Computers—An Initiative .......................................................... 123
C. McDonald
IIC. Hospital-Based Specialty Care Systems
Computer Aided Diagnosis of Drug Poisoning:
A Consult-I Subsystem .............................................................. 126
C.L. Emerman and E.A. Patrick
Emergency Services Management Data System ........................................... 129
D.G. Friese and L.L. Beach
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dental Trauma Diagnostic Program</td>
<td>133</td>
</tr>
<tr>
<td>J.J. Hyman and M.C. Diehl</td>
<td></td>
</tr>
<tr>
<td>Computer Assisted Evaluation of the Jaundiced Patient</td>
<td>135</td>
</tr>
<tr>
<td>C. Safran, R.A. Greenes, M.L. Kierstead, and T.F. Bynum</td>
<td></td>
</tr>
<tr>
<td>Evaluation of EMERGE, a Medical Decision Making Aid for Analysis of Chest Pain</td>
<td>138</td>
</tr>
<tr>
<td>D.L. Hudson, M.E. Cohen, P.C. Deedwania, and P.E. Watson</td>
<td></td>
</tr>
<tr>
<td>Mathematical Optimization Techniques for Multi-Phase Radiation Treatment Design</td>
<td>142</td>
</tr>
<tr>
<td>D. Sonderman</td>
<td></td>
</tr>
<tr>
<td>The Development of a Regional Computerized Cancer Registry</td>
<td>146</td>
</tr>
<tr>
<td>S.L. Priest, V.J. O'Sullivan, and H.W. Neitlich</td>
<td></td>
</tr>
<tr>
<td>Integration of a Computer-Based Consultant into the Clinical Setting</td>
<td>149</td>
</tr>
<tr>
<td>MEDINFO at the MGH Oncology Data Research Center</td>
<td>153</td>
</tr>
<tr>
<td>S.A. Stickler, E.A. Foster, A.M. Cohen, G.O. Barnett, M.O. Cameron, J. Herrmann, and D. Midman</td>
<td></td>
</tr>
<tr>
<td>The New German Medical Concept for Cancer Centers—Example Frankfurt</td>
<td>156</td>
</tr>
<tr>
<td>B.R. Beier</td>
<td></td>
</tr>
<tr>
<td>Automated Information Handling in the Newborn Intensive Care Unit of the University of New Mexico Hospital</td>
<td>159</td>
</tr>
<tr>
<td>R. Lander, G. Luger, and P. Stibbard</td>
<td></td>
</tr>
<tr>
<td>An Interactive Patient Data Base for Intensive Care</td>
<td>163</td>
</tr>
<tr>
<td>Trend Analysis</td>
<td></td>
</tr>
<tr>
<td>J.V. Gomez, A.G. Haddad, W.M. Mentz, M. Friedman, and J.D. Charlton</td>
<td></td>
</tr>
<tr>
<td>The Design of a “Functional” Database System and its Use in the Management of the Critically Ill</td>
<td>167</td>
</tr>
<tr>
<td>J.A. Pollizzi III</td>
<td></td>
</tr>
<tr>
<td>A Computerized Bedside Clinical Information System for an Intensive Care Unit Teaching Service</td>
<td>171</td>
</tr>
<tr>
<td>P.W. Burridge and E.N. Skakun</td>
<td></td>
</tr>
<tr>
<td>Computer Based Morbidity Screening for Intensive Care</td>
<td>174</td>
</tr>
<tr>
<td>H.R. Champion, W.J. Sacco, and M. Stega</td>
<td></td>
</tr>
<tr>
<td>Application of a Hand-Held Computer for Data Capture in the Operating Room</td>
<td>176</td>
</tr>
<tr>
<td>G.F. Maruschak, S.S. Mack, G.I. Rosenfeld, and T.J.J. Blanck</td>
<td></td>
</tr>
<tr>
<td>Designing a Database System for the Division of Rheumatology</td>
<td>179</td>
</tr>
<tr>
<td>M.G. Peterson, T.J. Lerer, and M.A. Testa</td>
<td></td>
</tr>
<tr>
<td>Henry Ford Hospital Nephrology Information System</td>
<td>182</td>
</tr>
<tr>
<td>N. Levin and B. Say</td>
<td></td>
</tr>
<tr>
<td>Computer-Assisted Assessment of Fetal Growth and Development</td>
<td>185</td>
</tr>
<tr>
<td>J.G. Och</td>
<td></td>
</tr>
<tr>
<td>Client Functional Assessment Data as Management Information: Woodrow Wilson Rehabilitation Center's Management Information System</td>
<td>188</td>
</tr>
<tr>
<td>E.F. Steidle</td>
<td></td>
</tr>
</tbody>
</table>
Deciding the Operative Opportunity of Acute Obstructive
Suppurative Cholangitis Using a Microcomputer .......................................................... 191
F. Huang and Y. Ruan
Recent Progress in Clinical Radiology Systems ............................................................. 194
J. N. Gitlin

II. Pharmacy and Nutrition Systems
APRIL—The Evolution of a Long Term Care System ..................................................... 196
B. S. Lee
Selecting a Pharmacy Information System ......................................................................... 200
F. L. Williams and E. G. Nold
Physician Acceptance of a Computerized Outpatient Medication System in a Teaching Hospital Group Practice .......................................................... 203
C. Blish, R. Proctor, S. W. Fletcher, and M. O’Malley
The Effects of a Computerized Drug Order Review System ............................................. 207
C. Siegel, J. Dlugacz, S. Fischer, and M. J. Alexander
Formulation of Phlebotomist’s Work Schedule and Nurse’s or Pharmacist’s Dosing Schedule Using an HP-41CV Hand Calculator with Clock Function .......................................................... 211
W. F. Nicholson and R. W. Jelliffe
“Smart” Infusion Apparatus for Computation and Automated Delivery of Loading, Tapering, and Maintenance Infusion Regimens of Lidocaine, Procainamide, and Theophylline ............................................. 212
W. F. Nicholson and R. W. Jelliffe
An Investigational Drug Monitoring System ..................................................................... 214
B. A. Brantley and V. S. Lucas, Jr.
Computer Assistance to Formulate, Order and Evaluate Parenteral Nutrition Solutions .................................................................................................................. 219
J. W. Thorp, W. M. Heroman, and D. I. Wright
Stochastic Control of Pharmacokinetic Systems ................................................................ 222
A. Schumitzky, M. Milman, D. Katz, D. Z. D’Argenio, and R. W. Jelliffe
Continuous Blood Glucose Monitoring: A Review and Preview ........................................ 226
C. D. Saudek
Improved 2-Compartment Time-Shared Programs for Adaptive Control of Digitoxin and Digoxin Therapy ........................................................................................................ 231
Improved M.A.P. Bayesian Timeshared Computer Programs for Planning, Monitoring, and Adjusting Drug Dosage Regimens .................................................................................. 234
Use of the Pocket Computer in a Pharmacokinetics Education Program .............................. 234
J. L. Daly, R. Godefroid, R. C. Gentilcore, L. R. Hendershot, J. W. Fletcher, and R. M. Donati
Summary of Proposed Workshop on Computerization of Hospital Pharmacy ...................... 235
G. T. Cutting
Panel: Nutrient Database Systems in Patient Care and Research ...................................... 236
L. Hoover
### IIE. Clinical and Anatomic Pathology Systems

**Session Introduction: Clinical and Anatomic Pathology**

Computer Applications for Anatomic and Clinical Pathology 

A.F. Krieg

A Technique for Monitoring the Placement of Computer-Generated Laboratory Reports in Patients' Medical Records 

B.A. Friedman

Enhancement of Infection Data Management System through Color Graphics Interface 

S.A. Streed, S.P. Miller, J.R. Wagner, and W.J. Hierholzer, Jr.

Enzyme Immune Assay—Portable Microcomputer Interfaced System 

M. Korper, M. Stek, Jr., W. Wurzel, R. Hodder, C. DeSanti, and J. Duncan, Jr.

Bugs, Drugs, and Computers 

J.E. Kilroy, B.D. Campbell, H.O. Mathewson, P.D. Scarfale, and S.H. Solomon

The Regenstrief Clinical Laboratory System 

C. McDonald, L. Wheeler, T. Glazener, L. Blevins, J. Haas, L. Lemmon, and M. Valenza

An Automated Cytopathology System in an Integrated Hospital Information System 

M. Shaferman, T. Miller, and D.W. Simborg

Surgical Pathology Accessioning and Management on a Multi-User Hard Disk Microcomputer System 

T.S. Talamo and F.J. Losos III

Development of Microcomputer Based Software for Encoding and Retrieving Medical Information in Pathology 

L. Hause, D. Rothwell, and C. Frey

Decision Making and Laboratory Test Utilization: Expert–Novice Differences 

S.A. Haight, D.P. Connelly, L.C. Gatewood, and M.D. Burke

Canonical Discriminant Analysis of Cancer, Heart, and Control Patients' Data from Spectrophotometric Scans of Protein Concentrations in Blood 

G. Colmano, G. Nunn, and R.W. Berlien

Computer-Aided Generation of Result Text for Clinical Laboratory Texts 

P.M. Kuzmak and R.E. Miller

A Flexible Software Scheme for a Clinical Laboratory Computer Network 

P.R. Fouls, R. Megargle, G. Shecket, J. Su, and A. Dartt

Portable Medical Laboratory Applications Software 

J.A. Silbert

LABDOC: A Laboratory Documentation System with Aids for Clinical-Decision Making 

J.R. Svirbely and J.W. Smith

### IIF. Systems which Support Resource Allocation and Utilization

Resource Allocation and Utilization 

E.E. McColligan
Managing a Radiology Department: A Three Dimensional Problem

T. Waldhauser, A. Schack, and A.F. Keegan

Computerized Operating Room Information System

P. Helsel, R.B. Smith, and M. Albin

An Automated Medical Resource Allocation and Planning System (MEDRAPS) for U.S. Naval Medical Treatment Facilities

C.W. Wrightson, T.L. Kay, J.M. LaRocco, and H.H. Chang

A Microcomputer Simulation Model to Assist Nursing in Unit Care Planning, Staff Budgeting and Resource Management

T.E. Grazman

III. Ambulatory Care Computer Systems

IIIA. Office Practice Systems

Panel: What Medical Information Systems Can Do for Group Practice


IIIB. Systems for Large Group Practice and Outpatient Settings

Advances in Ambulatory Care Systems

B.D. Kerlin

Microcomputer-Based Pediatric Health Maintenance System

C.M. Maxwell, H.F. Philipsborn, Jr., R. Napier, and R. Nigro

Summary Time Oriented Record (STOR)—A Node in a Local Area Network

Q.E. Whiting-O'Keefe, D.W. Simborg, A. Warger and G. Harden

Extending Medical Center Computer Application to Rural Health Clinics

D.K. Gottfredson

The Capturing of More Detailed Medical Information in COSTAR


A Total Primary Care Medical Information System: DUCHESS

S.C. Lloyd

Workshop: Installing COSTAR

R.D. Zielstorff

Evaluating a Practice for Computer Automation

D.M. Brickman, J.M. Ashton, and J. Balsam

Success or Failure of Automated Data Processing Systems in Physicians' Offices after System Acquisition

L.L. Dahm

Depth Variance in Medical Record Automation for Ambulatory Care

M. Ostrowski and M.R. Bernes
IIIF. Implantable Devices: Cardiac Pacemakers
Computer-Aided Detection of Pacemaker System Problems ........................................... 398
   A.D. Bernstein and V. Parsonnet
Software Simulation of an Implantable Pacemaker ....................................................... 402
   R.E. Riley and M.A. Rossing
Designing a Computer-Assisted Clinic to Cope with the
Evolution of Pacemaker Technology ............................................................................. 406
   C.N. Pfeifel, P.D. Kelz, E.W. Gerz, and M.H. Okawachi
Use of Microcomputers and Personal Computers in Pacing ......................................... 409
   L. Sasmor, P. Tarjan, V. Mumford, and E. Smith

IIIIG. Public Health and Epidemiology Systems
Public Health and Epidemiology II .................................................................................. 414
   D.F. Crues
The Use of Computer-Stored Diagnosis Codes to Generate
a List of Reportable Diseases ......................................................................................... 415
   C.L. Murray, V. Schwarting, and T. Ellingson
AIDS Case Registry Interactive System ............................................................................ 418
   S. Alterescu, C.A. Friedman, S. Margolis, and M.G. Ritchey
A Statewide Management Information System for the
Control of Sexually Transmitted Diseases ........................................................................ 421
   R.R. Fichtner, J.H. Blount, and J.N. Spencer
Research Implications of Computerized Death Records ............................................... 424
   G.D. Healy and J.E. Smialek
Development of a Navy Dental Epidemiology Information System .................................. 427
   M.C. Diehl
Evolution of a Microcomputer Based Statewide Kidney
Dialysis Registry Management and Reporting System ................................................ 431
   J.C. Solanchick and R.C. Jamieson
Austin-Travis County Health Department's Information System ..................................... 434
   R.F. Shoup and A.G. Randall
A Data Management System for Multi-Phase Case-Control
Studies ............................................................................................................................... 438

IV. Computers in Medical Education
Information Management of a Structured Admissions
Interview Process in a Medical College with an Apple II System .................................... 443
   R. O'Reilly, S. Fedorko, and N. Nicholson
Design of a Computerized Medical School Admissions
Process ............................................................................................................................... 447
   R.J. Oberst, N.A. McPeters, and M.R. Comas
ISIE-81 Interpersonal Skills Assessment Technique ...................................................... 451
   M. MacDonald and B. Templeton
Question Database Management and Program for
Generation of Examinations in National Board of Medical Examiners Format ................ 454
   J.R. Hall and F.L. Weitz
Panel: The Microcomputer and Continuing Medical Education ...................................... 457
   W.C. Felch
ABIM Computer-Based Examination System ................................................................... 458
   D.B. Swanson and G.D. Webster
Information Management in Medical and Graduate Education

T.M. Mikiten

An Alternative Organizational Structure to Address the Technology Requirements in Health Science Library Information in the '80's

R.M. Winant

Libraries and Technology: A Call to Action

C. Bandy

V. Computers in Nursing

VA. General Nursing Applications

Introduction—General: Nursing Applications

V.K. Saba

Computer Applications in Nursing

V.K. Saba


T.J. Jacobsen and S.E. Fennell

Nursing Participation in Computer Vendor Selection

C.G. Weaver and J.E. Johnson

Identifying Requirements for a Nursing System

K.A. Rieder and M.L. Houser

VB. Nursing Education

Nursing: Educational Applications Introduction and Overview

K.J. Mikan

Development and Implementation of a Micro-Based Computer Workshop Series for Nurses

D.J. Skiba and R.C. Hardin

Development of the University of California, San Francisco Microcomputer Facility for Nursing Research and Development

W.L. Holzemer, M.J. Slichter, R.E. Slaughter, and N.A. Stotts

Using COSTAR to Assist Nurses in Hypertension Screening and Education


Applications of a Nursing Knowledge Based System for Nursing Practice: Inservice, Continuing Education, and Standards of Care

S.A. Ryan

Guidelines for Evaluating Faculty-Student Acceptance and Effectiveness of Computer Technology in Schools of Nursing

D. Pocklington

Computer Assisted Instruction: An Educational Issue for Nursing

R.H. Carlsen

Nursing CAI Development Workshop

S.J. Grobe

VC. Nursing Administrative Computer Applications

Nursing: Administrative Applications

R.L. Simpson

xxi
The Microcomputer—Nursing Workstation: Organization, Implementation, and Practical Benefits .................................................. 500

E.M. Lichten and I.C. Soble

Key Features and Benefits of a Computerized Position
Requisition System as Utilized by the Division of Nursing .................. 505

J.E. Anderson

The Microcomputer as a Management Tool for Nursing Executives .......................................................... 506

N.F. O'Donohue and M.T. Ramshorn

Monitoring and Evaluating Implemented HIS ...................................... 507

K.A. McCormick

Making the Most of a Message Function for Nurse Services .................. 510

L. Edmunds

VD. Computer Use Studies in Nursing
Nursing Computer Use Studies .............................................................. 515

H.H. Werley

Clinical Staff Satisfaction with a Computerized Critical-Care Database System ............................................................... 516

K. Milholland and L. Brady

Nursing Expectations of Computers in the Hospital ..................................... 519

B.L. Chang, M. Jordan-Marsh, and A.F. Chang

Learning Needs and Attitudes of Nursing Education with Respect to Computers ............................................................... 523

J.S. Ronald

Microcomputers in the Nursing Dean’s Office ...................................... 527

B.M. Johnson

VE. Ambulatory Care Systems in Nursing
Introduction to Applications in Ambulatory Care ..................................... 530

K.S. Nascimento

A Microcomputer Based Community Health Nursing Database Management System ............................................................... 531

S. Schultz II and M.L. McHugh

Ambulatory Care Database .............................................................. 533

T.R. Misener

An Occupational Health Nursing Computer Application in Medical Care: An Army Approach .................................................. 537

M.K. McKenna

The Development of a Management Information System for a Local Public Health Department .................................................. 540

R.P. Locey

VF. Nursing Practice Applications
Nursing: Practice Applications .............................................................. 544

J. Baron

Computers in Hospitals Nursing Practice Defined and Validated .............................................................. 545

J.B. Kelly

Implementing a Micro-Based Nursing Acuity Information Systems: NAIS—Removing the Paper Mountain ............................ 551

C. McPherson, R.C. Hardin, S.F. Coady, and E.M. Stone

The Nursing Care Plan: Computerized, Professionalized, Utilized .............................................................. 556

L.E. Brennan
Design and Implementation of Computerized Nursing Care Plans ............................................................ 561
The Comparative Utility of a File Cabinet Program vs a General Statistical Program in Micro-Computer Management and Analysis of Clinical Nursing Data ............................................................ 565
P.M. Schwirian
Microcomputerization of a Theory-Based Nursing Assessment of Discharge Medication Knowledge ............................. 568
I.C. Soble
VG. Computer Uses in Nursing Information Systems: Future Perspectives
Visions of the Future for Nursing Information Systems: A Panel Discussion ............................................................ 572
J.G. Ozbolt
VI. Research
Protein Identification System: Methods of Searching for Similar Sequences ............................................................ 579
B.C. Orcutt and M.O. Dayhoff
Cataloging Genetic Diseases and Mapping the Genes on Chromosomes ............................................................ 582
V.A. McKusick
Identifying Unknown Proteins ............................................................ 584
W.C. Barker and M.O. Dayhoff
Data Reduction for the Human Protein Index ............................................................ 589
N.L. Anderson, J. Taylor, and N.G. Anderson
Components of the Protein Sequence Identification Service: A Demonstration ............................................................ 590
W.C. Barker, B.C. Orcutt, L.T. Hunt, and D.G. George
Policy Issues in Medical Computing
VII. Health Care Economics and Medical Computing
Determining the Impact of Prospective Reimbursement on Shaping Information Requirements in Health Care ............................................................ 593
R.D. Ladd
Case-Mix and DRG Reporting ............................................................ 595
J.R. Coleman
Diagnosis Related Groups as a Casemix/Management Tool for Hospice Patients ............................................................ 596
R. Johnson-Hurzeler, R.J. Leary, and C.L. Hill
Using DRGs to Conduct Utilization Review in Naval Hospitals ............................................................ 599
T.L. Kay
Applying Case-Mix Methods to Ambulatory Care ............................................................ 603
C.L. Rogerson
The Computerization of Patient Management Categories: Clinical Basis for a Case Mix Application ............................................................ 606
J.L. Schuchert
Introduction—Hospital Cost Containment ............................................................ 609
B.L. Watson
How a Data Base Management System Integrates Patient Care and Financial Data to Manage Diagnosis Related Groups ............................................................ 610
M.E. McIlvane
Private Review—Running a Medical Care Foundation with a Microcomputer .............................................................. 613
W.H. Kincaid
Evaluating System Performance at TRIMIS ......................................................... 616
A.P. Nadell and F.J. Seidel
Case Mix Information to Assist the Hospital Management Team ................................. 620
C.L. Hulm
A “Cookbook” Cost Analysis Procedure for Medical Information Systems ............................... 621
J.L. Torrance, G.W. Torrance, and H.D. Covvey
Health Implications of Aging in America ............................................................ 625
K. Davis
VIII. Legal Issues in Medical Computing
Medical Data and Computer Generated Evidence .............................................. 633
B.L. Watson
H.L. Novick
American Bar Association—Computer Law Division Legal Protection for the Value of Information in Computer Systems .............................. 643
L.J. Ochs
Medical Computing Law—The Way to Correct Medical Information and Documentation ............................................................. 645
B.R. Beier
Patient Privacy: A Consumer Protection Approach .................................................. 648
V.M. Brannigan
IX. Clinician-Computer Interactions
Clinician-Computer Interaction: Factors Impacting Acceptance ................................. 653
G.S. Conklin and N.S. Kline
Implementing Complex Clinical Information Systems in Complex Situations II: Facilitating User Acceptance of Clinical Information Systems ............................................. 654
G.S. Conklin and N.S. Kline
Clinician-Computer Interaction: Automated Review of Psychotropic Drugs Five Years Later ...................... 658
T.J. Craig, N.S. Kline, and R.M. Mehta
Post Implementation Changes in Physicians’ Attitudes towards an Automated Drug Review System .............................. 660
M.J. Alexander, C. Siegel, Y. Dlugacz, and S. Fischer
The Computer as Rorschach: Implications for Management and User Acceptance ............................. 664
B. Kaplan
Who Can't Get No Satisfaction? Reactions to Medical Information System Training .................................................. 668
K.H. Kjerulff, M.A. Counte, J.C. Salloway, and B.C. Campbell
X. Project Management
B. Kaplan, J.A. Maxwell, G.S. Conklin, P.J. Fischer, and B. Harbort
Coordinating a Multicenter Trial Using a Microprocessor Based Clinical Research Data Acquisition System ........................................ 728
K.E. Swisher, H. Moore, M.S. Yoko, and Y.Y. Palesch
Applications of MEDLOG, a Microcomputer-Based System for Time-Oriented Clinical Data ........................................ 731
M.W. Layard and D.J. McShane
An Automated System for Coding Data from Summary Time Oriented Record (STOR) .................................................. 735
Q.E. Whiting-O'Keefe, P.C. Strong, and D.W. Simborg
SLIPS: A Database System for Computer Storage and Analysis of Phonological Errors .................................................. 738
M.S. Morris, J.A. Reggia, S.B. Ahuja, and J. Hart
The Medical Query Language ............................................... 742
D.J. Shusman, M.M. Morgan, R. Zielstorff, and G.O. Barnett
Huntington's Disease Research Roster Support with a Microcomputer Database Management System .......................... 746
J.M. Gersing, Jr., P.M. Conneally, and K. Beideman

XIV. Computers for Medical Imaging and Graphics
A Parallel Algorithm for Muscle Tissue Images Classification .......................................................... 751
E.K. Wong and K.S. Fu
Analyzing Pulmonary Deposition and Clearance Using Histogram Skew, Dispersion Moment, and Polar Coordinate Grid .................................................. 755
J.F. Schreiner
Computer Analysis of Organelle Traffic in Human Axons .......................................................... 759
A.C. Breuer, R.E. Dayhoff, R.S. Ledley, A.W. Dudley, and K.E. Marks
Muscle Biopsy Data Acquisition and Display .......................................................... 763
A.W. Dudley, Jr., R.E. Dayhoff, and R.S. Ledley
A Radiological Image Processing Facility and some of its Three-Dimensional Data Manipulation Capabilities .............. 767
Three-Dimensional Reconstruction of the Hip Using CT Scans .......................................................... 772
R.E. Caton and T.L. Huntsberger
Molded 3-D Representations Reconstructed from Sequential CT Scans .......................................................... 775
P.C. Lee, R.S. Ledley, R.D. Ray, T.F. Gleason, J.B. Wilson, and C.M. Park
Three-Dimensional Imaging of the Temporomandibular Joint in vitro and in vivo .......................................................... 779
D. Roberts, J. Pettigrew, and J. Udupa
Computer Tomosynthesis: A Versatile Three-Dimensional Imaging Technique .......................................................... 783
U.E. Ruttimann, R.A.J. Groenhuis, and R.L. Webber
Use of Computers for Increasing the Information Content of NMR Imaging .......................................................... 787
D.A. Ortendahl, N.M. Hylton, L. Kaufman, and L.E. Crooks
XI. The Media and Medical Computing
Are the News Media Providing Adequate Information about Medical Computing? A Panel Discussion .................................................. 678
  H.G. Heffernan, Chair; R.R. Grams, M. Golin, and M. Nathanson, Panelists

XII. A Framework for Medical Informatics
A Framework for Medical Information Science .................................... 680
  B. Blum

Methodologies for Medical Computing

XIII. Database and Management Database Management
Database Management Systems—Technical Issues—
Introduction .......................................................................................... 683
  G. Wiederhold
Smart Files: A Method of Managing Non-Deterministic Data for Multi-Tasking and Distributed Systems ............................................. 684
  P.D. Kelz, C.N. Pfeil, M.H. Okawachi, and E.W. Gertz
Computer Structuring of Free-Text Patient Data .................................... 688
  C. Friedman, N. Sager, E.C. Chi, E. Marsh, C. Christenson, and M.S. Lyman
A Database of Literature Organized by Relations ...................................... 692
  N. Sager and M. Kosaka
COSTAR in a Specialty Clinic: The MGH Transplant Unit System .................. 696
Database Management Systems: Applications ........................................ 700
  T.A. Marciniak
Development of a Friendly, Self-Teaching, Interactive Statistical Package for Analysis of Clinical Research
Data: The BRIGHT STAT-PACK .......................................................... 701
  D. Rodbard, B.R. Cole, and P.J. Munson
The Use of Relational Databases as a Tool for Conducting Clinical Studies ................................................................. 705
  R.A. Miller, W.N. Kapoor, and J. Peterson
MEDUS/A: 1983 Status of a Database System for Research and Patient Care ............................................................... 709
  C. King, R.M. Strong, and K. Donovan
The Oxford Surgical Data System: A Tool for Self-Audit .......................... 712
  M.H. Gough, M.G.W. Kettlewell, J.M. Holderness, M. Huntly, and P. Arcuri
  C. King, L. Manire, and R.M. Strong
Clinical Research Data Bases .............................................................. 720
  I.G. Fishman and S.C. Kunitz
Research Use of a General Psychiatric Data Base ..................................... 721
  G.A. Coffman and J.E. Mezzich
The Michael Reese Hospital Stroke Registry—A Microcomputer-Implemented Data Base ...................................................... 724
  G. Banks, L.R. Caplan, and D.B. Hier
Coronary Artery Imaging with a Computerized Linear Diode Array Radiographic System .................................................... 791
Detection and Characterization of Early Atherosclerosis ............................................ 797
R.W. Barnes, M.G. Bond, W.A. Riley, L. Czapla, C.J. Mazzola, and J.D. Birdwell
Quantitative Analysis of Three-Dimensional Images of the Left Ventricle Generated with the DSR .................................................. 804
R.S. Schwartz, A.A. Bove, and E.L. Ritman
Picture Archiving and Communications Systems (PACS) for Medical Applications .......................................................... 808
H.K. Huang
A Prototype Digital Image Management System ......................................................... 809
Design Considerations for Multi-Channel Picture Communication Networks ............. 814
P.O. Scheibe
Efficacy of a Real-Time Digital Disk in the Digital Lightbox ....................................... 816
M. Gray and H. Rutherford
Panel: Medical Imaging Standards ............................................................................. 820
J.T. O'Neill
E.M. Knapp
Video Diabetes: A Teaching Tool for Children with Insulin-Dependent Diabetes .......... 822
F. Mazzola and D.W. Rowe

XV. Medical Decision Support Systems
HT-ATTENDfNG: Critiquing the Pharmacologic Management of Essential Hypertension .................................................. 824
P.L. Miller and H.R. Black
Symbolic Coordinate Anatomy for Neurology (SCAN) ............................................. 828
G. Banks and B. Weimer
The Use and Construction of Problem-Knowledge Couplers, the Knowledge Coupler Editor, Knowledge Networks, and the Problem-Oriented Medical Record for the Microcomputer ......................................................... 831
L.L. Weed and R.Y. Hertzberg
Modeling and Encoding Clinical Causal Relationships in a Medical Knowledge Base ........................................................................... 837
R.L. Blum
Critiquing as a Modality for Computer Advice in Medical Management and Work-Up .................................................. 842
P.L. Miller
Application of a New Theorem of a posteriori Probabilities of Events to Medical Diagnosis .................................................. 844
J.M. Fattu and E.A. Patrick
HINT for Squint: A Computer Reliant Diagnostic Aid for Strabismus ....................... 848
L.R. Gieszl, J. Morris, and D.L. Guyton
Making the Most of RECONSIDER: An Evaluation of
Input Strategies .............................................................. 852
   S. Nelson, S. Hoffman, H. Kanekal, and A. Varma
Performance of a Fuzzy Set Theoretic Model for Medical
Diagnosis ................................................................. 856
   A.O. Esogbue
Demonstration of AI/RHEUM, an Expert Clinical
Consultant System in Rheumatology ................................. 859
   D.A.B. Lindberg, G.C. Sharp, D.R. Kay,
   L.C. Kingsland III, C.A. Kulikowski, S.M. Weiss,
   J.M. Benge, S.E. Hazelwood, G.R. Reese, and
   J.K. Kastner
Computer Assisted Diagnosis in Renal Transplantation:
A Bayesian Classification for Differential Diagnoses .......... 860
   F. Dumler
An On-Line Bayesian Program for Acute Abdominal Pain .... 863
   A.C. Harvey, P.F. Moodie, N. Swirsky, and
   J.R. Kirkpatrick
Validation of PFDx—A Microcomputer Program to Aid
in Diagnosing the Cause of Pleural Effusions ..................... 868
   E. Rich, L. Martin, and B. Jeffreys

XVI. Networks and Intercomputer Communications
Networking Computers: Some Practical Applications .......... 872
   N.J. Thompson
Automatic Transmission and Capture of Medical Data
from a MUMPS System to a RSTS System ......................... 875
   R.B. Goldstein and J.E. Duncan
The Development of Word Processor-Mainframe
Computer Interaction .................................................... 878
   M. Cain and T. Stocker
The Virtual Circuit Function in the Hospital ..................... 882
   D.W. Simborg, M. Chadwick, and Q.E. Whiting-O’Keefe
Regional Health Information Networks—The Mode of
the Future is Present Reality ........................................ 885
   B.W. Mathis

XVII. Microcomputers and Instrumentation
Microcomputer-Based Food Coding .................................. 889
   L.B.M. Ellis, S.Y. Chow, and I.M. Buzzard
Adapting Features from a Large Hospital System to
Microcomputers ............................................................. 892
   D.K. Gottfredson
Eyetracker Communication System .................................. 895
   M.B. Friedman
Gait Analysis Using A Portable, Microprocessor-Based
Segmental Foot Force Measuring System ......................... 897
   M. Polchaninoff
Use of Microcomputers for Testing of Nursing and
Medical Knowledge ....................................................... 900
   L.S. Joseph
A User Friendly Authoring Program for Patient
Management Programs .................................................. 900
   J.A. Cowan
A Microcomputer Program for the Differential Diagnosis
of Chest Pain Simulating Angina Pectoris ......................... 900
   D.P. Copley

xxviii
Interpretive Software for Critical Care Medicine .......................................................... 900
  P.L. Marino and J. Krässner
Microcomputer Applications: Physiological Measurements ........................................... 901
  M.J. Ackerman
Microcomputer-Based Data Collection System for Electrophysiological Experiments on Epithelia .......................................................... 902
  G.W. Kidder III
The Use of a Microcomputer in Collecting Data from Cardiovascular Experiments on Muscle Relaxants .......................................................... 905
  P.D. Thut, G. Polansky, and E. Przynansky
Utilization of a Microcomputer Development System as a Task Dedicated Laboratory Computer .......................................................... 908
A Continuous Portable Intravesophageal pH Monitoring System ........................................ 911
  R.S. Johannes, W.J. Ravich, W. Schneider, J.T. Massey, R.J. Johns, and T.R. Hendrix
Microprocessor Automation of Bipolar Electrocoagulation ........................................ 915
  J.P. L'Huillier, Y. Oumerzouk, P. Le-Huy, E. Yvroud, F. Guillemin, and R. Frisch
Microprocessor-Based Ambulatory ECG Monitoring System ........................................... 917
  P. Le-Huy, J.P. L'Huillier, Y. Oumerzouk, and E. Yvroud
Fourier Descriptors for Morphological Analysis of Vectorcardiograms .................................................. 919
  B.R.S. Reddy, P.C. Chatterjee, and I.S.N. Murthy
A New Microprocessor Based Data Reduction for Monitoring Communication and Storage of ECG Signal .......................................................... 922
Correction Factors for Underreporting in a Life Table Analysis of Product Performance .......................................................... 926
  K.M. Lundberg and R.G. Holcomb
Mapping the Healing Process in the Burned Patient with Apple II High-Resolution Graphics .......................................................... 929
A Microprocessor-Based System for Color Contrast Perimetry ........................................ 933
  K.W. Clark, W.M. Hari, Jr., R.W. Hagen, R.K. Hartz, and M. Zelenka
Using Experience to Improve Clinical Decision Making .................................................. 936
Computer-Supported Assessment and Consultation for Emotional Crises in a Submarine Environment .......................................................... 940
  J.S. Levin, J.L. Hedlund, and B.W. Vieweg
Panel Session on Microcomputers in Information Storage and Retrieval .................................................. 944
  A.O. Wist
XVIII. Interactive Audiovisual Learning Interactive Audiovisual Learning: Session Chair's Overview .......................................................... 948
  S.D. Reich
Videopaper/ VICTER: A Production/Distribution System
Using Television and Computers ...................................................... 949
L.G. Van Son

Computer Assisted Video Instruction (CAVI) in an
Anesthesia Training Program ....................................................... 953
J. Gilbert, R. Hodgkinson, and R.B. Smith

A Computer Assisted Human Relations Training Tool for
Small Group Interactions .......................................................... 957
J.L. Ayers and S.A. Haight

Use of CAI/VIDEO in Diabetes Patient
Nutritional Education ................................................................. 961

Workshop on Interactive AudioVisual Learning ......................... 965
S.D. Reich

Construction of a Computer Assisted Video Instruction
(CAVI) Lesson ........................................................................ 966
J. Gilbert, S. Swartzman, and P. Helsel

CAI/Interactive Video Demonstration .......................................... 966
F.E. Scott, P. Seel, and R. Miller

XIX. Software Development Techniques
Rapid Detection and Reporting of Programming Errors in
Medical Information Systems ....................................................... 968
R.J. Oberst and J.A. Johnson

Software Maintenance: Case Studies ......................................... 971
D. Bellin

Transportability of Software Applications
In Microcomputers ..................................................................... 974
W.P. Welbourne

Developing Functional Specifications Using Nominal
Group Technique ....................................................................... 978
H.D. Covvey and N.H. Craven

Author Index ............................................................................. 982

Keyword Index .......................................................................... 987